IUCN/SSC PRIMATE SPECIALIST GROUP NEWSLETTER

NUMBER 4 MARCH, 1984

The IUCN/SSC Primate Specialist Group Newsletter is produced and circulated courtesy of the World Wildlife Fund — US and the Dept. of Anatomical Sciences of the State University of New York, Stony Brook.

Front Cover: The Peruvian yellow-tailed woolly monkey *(Lagothrix flavicauda)*, largest mammal endemic to Peru and one of South America's most endangered primates. The individual shown here is a young male, the only captive yellow-tailed woolly in the world. It is presently kept at the Parque las Leyendas Zoo in Lima, Peru (photo by Andy Young).

Back Cover: Bolivian dusky titi monkey *(Callicebus moloch donacophilus)*. Mother and infant from the breeding colony at the Riverbanks Zoological Park, Columbia, South Carolina. This colony is discussed in an article in the News from Captivity Section (photo by Jakki, courtesy of Riverbanks Zoological Society).

A Word from the Editors

Some of you may have been wondering what happened to the October, 1983 issue of the PSG Newsletter, and the answer is that we decided to publish a booklet entitled *Primates and the Tropical Forest* (see p. 13) in its place. A complimentary copy of this booklet is being sent to PSG members and subscribers with this issue of the newsletter, and we hope that you find it interesting.

During the past year, we have added 14 new members to the group, which continues to grow at a rapid pace. Names and addresses of the new members are given in Appendix I, together with address changes for current members. In the next issue, we will once again publish a complete list of all Primate Specialist Group members for your convenience.

We have been really pleased with your response to the newsletter, and think that both the quantity and quality of articles reflects your growing interest in the publication. Indeed, it seems that we have reached the point where we need something more than just a newsletter on primate conservation and, as a result, we will be changing to a combined newsletter/journal format as of the next issue. The journal section will be for longer articles (3-20 double-spaced typed pages) on various aspects of primate conservation, and the first journal issue will include a series of articles on the conservation status and distribution of primates in several South American countries.

The Announcements Section and the News from the Field and News from Captivity Sections will continue to appear and, as before, contributions should be 1-3 double-spaced typed pages in length. Please try to illustrate your contributions with high quality photographs and also a map if you are discussing a particular geographic region.

We look forward to hearing from you and receiving your contributions to the newsletter, and thank you for your help in making this newsletter the major vehicle for communication among the world's primate conservationists.

Russell A. Mittermeier
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ANNOUNCEMENTS

Symposium on Primatology in Latin America Held at the IX Latin American Zoology Congress in Arequipa, Peru

A symposium on primates was held on October 11 and 13, 1983 in Arequipa, Peru. This symposium was part of the IX Latin American Zoology Congress and featured 34 presentations by primatologists from Peru, Brazil, Venezuela, Colombia, Paraguay, Argentina and the U.S. (including about a dozen PSG members). The symposium was organized by PSG chairman, Russ Mittermeier, and the proceedings will be published in Spanish and Portuguese in the near future.

The symposium was really exciting because it showed how far Neotropical primatology has come in the past few years, and how it is becoming a major research priority for several of the South American countries with large primate populations. Conservation was a major theme of the symposium, with two-thirds of the papers presented dealing with this topic in some way.

The PSG and its South American members would like to take this opportunity to express their appreciation to the organizer of the Congress, Dr. Pedro Aguilar, for making the primate symposium possible.

First Brazilian Training Course in Primatology

The first-ever Brazilian Training Course in Primatology was held from September 26 — November 18, 1983, and focused on conservation and management of primates. The course was organized by the University of Brasilia, in cooperation with the Brazilian Society of Primatology and the Smithsonian Institution, and was coordinated by PSG member, Prof. Milton Thiago de Mello, President of the Brazilian Society of Primatology. Eleven graduate students were selected from some 20 candidates, and they included eight biologists, two veterinarians, and one psychologist. Field work was conducted in Brasilia (basic techniques), at Fazenda Montes Claros, Caratinga, Minas Gerais (primate censusing, mainly involving *Brachyteles* and *Alouatta fusca*), the Poço d'Anta Biological Reserve (observations of *Leontopithecus rosalia* in its natural habitat), and the Rio de Janeiro Primate Center (FEEMA-CPRJ) (breeding of endangered primate species).

During the course, the student had the unique opportunity to observe two very important reintroduction projects, one of them Scott Lindbergh's efforts to introduce 18 *Alouatta caraya* bred in France into Brasilia National Park and the other the golden lion tamarin project headed by PSG member Devra Kleiman of the National Zoo in Washington, D.C. (see News from the Field section).

Professors in the course included R. Rudran, Devra Kleiman, James Dietz and Margaret O'Connell from the U.S. and Adelmar Coimbra-Filho, Celio Valle and Doris Santos de Faria from Brazil. Similar courses in primatology will now be held each year in Brazil, organized by the University of Brasilia and the Brazilian Society of Primatology.

Prof. Milton Thiago de Mello
Instituto de Ciencias Biologicas
Universidade de Brasilia
70.910 Brasilia, D.F.
Brazil

Regional Conference Held on Tanjung Puting Reserve, Kalimantan, Indonesia

Tanjung Puting Reserve, which consists primarily of tropical rain forest, is the largest conservation area in the province of Kalimantan Tengah (Central Borneo), Indonesia and home to such endangered species as the orangutan *(Pongo pygmaeus pygmaeus)*, as well as to protected and endemic species such as the proboscis *(Nasalis larvatus)* and red leaf monkeys *(Presbytis rubicunda)*.

On September 3 and 4, 1982 the Nature Conservation and Protection Office (P.P.A.) of the Indonesian Forestry Department held a regional conference at Palangka Raya, the provincial capital, on Tanjung Puting, which is slated shortly to become a National Park. Organized primarily by P.P.A. officers Mr. Toga Siallagan and Mr. Harry R. Hadisoemitro, the conference involved the presentation of over twenty papers and short reports on all aspects of Tanjung Puting as well as much discussion, and was attended by over fifty officials from various government agencies and departments at the provincial and local levels, including the army and police. The Governor of Kalimantan Tengah, Mr. W. Gara, made the unusual gesture of both opening and closing the conference while Mr. Wartono Kadri, the Director of P.P.A., presided over many of the sessions. The conference succeeded in its primary aim of attracting wide attention among government officials to Tanjung Puting as a National Park as well as providing a forum for the discussion of conservation problems and concerns in the province.

Biruté M. F. Galdikas
Orangutan Research and
Conservation Project
Tromol Pos 1
Pangkalan Bun
Kalimantan Tengah
INDONESIA

Sapo National Park Established

The March 1983 PSG Newsletter featured an article on the wildlife and development of Sapo National Park, Liberia by Dr. Philip T. Robinson of the Zoological Society of San Diego. At the time the article was written, Sapo was still awaiting official establishment. In May, 1983 the government of Liberia officially declared Sapo a national park, the first to be established of three national parks and four nature reserves in Liberia, selected in late 1978 and early 1979 with the assistance of the IUCN and World Wildlife Fund.

The park is located in southeastern Liberia and covers an area of 1,308 km^2. At present Sapo is protected by a staff of twenty-two. Four are trained Liberian graduates of the College of African Wildlife Management in Tanzania.

The official establishment of Sapo National Park is a major breakthrough for wildlife conservation practices in Liberia and its development may stimulate the creation of the other national parks and nature reserves which have been proposed in that country. Emphasis in the early management of the park is being placed on research on the biological resources of the region, under the Direction of the Forestry Development Authority.

Anyone wishing further information on Sapo National Park should contact:

Division of Wildlife and National Parks
Forestry Development Authority
P.O. Box 3010
Monrovia, Republic of Liberia
WEST AFRICA

Next Congress of the International Primatological Society to be Held in Nairobi, Kenya in July

The next Congress of the International Primatological Society will be held in Nairobi, Kenya, from July 22-27, 1983. The theme of this Congress will be "Primates at the Source — Past, Present and Future", and it will take advantage of the fact that Kenya is both a primate source country and a country in which a number of very significant paleontological discoveries relating to primate evolution have been made. The scientific program will include symposia, workshops, paper sessions, poster sessions and films, and there will also be a number of social events and tours. The Congress is being organized by Dr. James Else, Director of Kenya's Institute of Primate Research, and all inquiries about the Congress should be directed to the IPS Congress Office at this address:

IPS Congress Office
National Museums of Kenya
P. O. Box 34505
Nairobi
KENYA

The Primate Conservation Appeal: Progress from July, 1982 through January, 1984

The Primate Conservation Appeal (P.C.A.) was established at the International Primatological Society's (IPS) Congress in Atlanta, Georgia, in July, 1982, as a response to the urgent need to preserve the world's remaining primates and their habitats. Learning that the world lost one half of its tropical forests between 1950 and 1980, we realized that the next 10-20 years would be critical for primate and tropical forest preservation. While numerous primate conservation projects were in progress, we also realized that the funds needed to implement them were extremely limited. For instance, the World Wildlife Fund — U.S., which bears the major burden for financing conservation projects in the tropics, has only about two and a half million dollars a year to devote to this monumental effort. Consequently, the Primate Conservation Appeal was established under the auspices of IPS and WWF-US, its goals to assist in funding and implementing selected, especially significant primate conservation projects. The four projects selected for 1982-84 are:

1. Conserving the mountain gorillas in East Africa
2. Creating Korup National Park in West Africa
3. Saving the muriqui, or woolly spider monkey, in Brazil
4. The Primate Conservation Training Program for nationals from countries where wild primates reside

While primatologists have been developing methods for implementing conservation projects over the past ten years or more, there was little precedent within our society for raising funds for conservation. Therefore, the Conservation Committee has had to explore several ways to do this. During 1982, we explored various fund-raising approaches and produced a P.C.A. brochure. We began our actual fund-raising efforts in March 1983.

The first effort has been a grass-roots approach. On the suggestion of Lois Newman (New Jersey), we started campaigns in colleges. Most campaigns lasted a week, and as suggested by Katie Milton (University of California, Berkeley) they were called "Primate Conservation Awareness Weeks". The purpose of these campaigns was educational — to promote primate conservation awareness, to recruit volunteers for future efforts, and to raise funds for the four conservation projects.

Awareness Weeks were held on four California campuses during the Fall of 1983: San Francisco State University, organized by Peggy McCormick; the College of Marin, organized by Betty Goerke; the University of California, Berkeley, organized by Phyllis Johnston with the assistance of Katie Milton; and the University of California, Davis, organized by Meredith Small with the assistance of Diane Rich and Steve Smith.

College campaign organization consisted of the following: 1) contacting faculty in departments associated with primate research or forest ecology through fliers or by telephone before the campaign began, in order to enlist their support both in recruiting student volunteers and in promoting conservation education forums; 2) posting announce-

ments around campuses during the Awareness Weeks to alert people to the campaign; 3) setting up tables and disseminating conservation literature, soliciting donations, and selling primate posters and t-shirts produced by WWF-US and the P.C.A.; 4) on some campuses, faculty or P.C.A. volunteers held primate conservation lectures and film showings. Some of these featured the film "Cry of the Muriqui", produced by Andy Young with the assistance of Russell Mittermeier and Mark Plotkin, and distributed by WWF-US.

The University of California, Davis campus also held a Primate Conservation Awareness Day at the California Primate Research Center, participated in a Student Activities Fair on campus, and held a pre-Christmas sale, offering cards representing donations in the recipient's name, as well as posters and t-shirts.

Interest in the campus Awareness Weeks has been generally high. We have noticed that interest seems to be directly related to the emphasis on primate studies on each campus, and does not seem to be related to the size of the student body or to the percent of undergraduate or graduate students.

Two area campaigns were carried out last Fall. Steven Gilbert, in Ottawa, Canada, focused his campaign on animal researchers in his area, meeting personally with individual researchers. In the San Francisco Bay Area, Suzanne Chevalier-Skolnikoff carried out a small media, mailing and telephone campaign. Press releases and supporting literature were sent to the major Bay Area newspapers, which published articles on the P.C.A. The media coverage was followed immediately by letters and then telephone calls to 150 potential donors. The response from this effort was very good.

Two primate conservation symposia were held at Davis and in San Francisco in January, 1984. The Davis symposium took place on the U.C. campus. It was sponsored by the California Primate Research Center as well as the IPS and WWF-US. It was organized by Joe Skorupa and moderated by Peter Rodman, and featured presentations on ethnobotany and tropical forests by Mark Plotkin and on endangered primates of the Atlantic forests of Brazil by Russell Mittermeier. Also included was a showing of the film "Cry of the Muriqui".

The San Francisco event took place at the California Academy of Sciences. It was hosted jointly by the Academy and the San Francisco Zoological Society and received additional support from the California Primate Research Center and Marine World, Africa USA, as well as being sponsored by the IPS and WWF-US. This symposium was well publicized. Forty thousand announcements were sent out to individual people, it was announced over four radio stations, and was written up in four local newspapers distributed to about 400,000 people.

This symposium was moderated by Donald Johanson and included presentations by Roger Fouts on the importance of preserving the great apes, Thomas Struhsaker on the fragile rainforests, Mark Plotkin on ethnobotany and tropical forests, Russell Mittermeier on endangered primates of the Atlantic forests of Brazil, and Suzanne Chevalier-Skolnikoff on the Primate Conservation Appeal and what we can do to save these primates and their forests. The films "Korup, an African Rainforest", produced by Phil Agland, and "Cry of the Muriqui" were also shown. The symposium seemed to generate a great deal of interest. We had a full house of 400 people. Afterwards, many people commented on how much they had learned from the presentations and films, and on how concerned they were about the future of the world's tropical rain forests. We also received quite a few donations.

It is difficult to evaluate the results of our endeavors, but we will attempt to do so. One of our primary goals has been education. Approximately 2,000 college students passed by our tables or came to our events and picked up brochures on the four campuses. Four hundred people attended the San Francisco symposium. An additional 455,000 people received newspapers with major articles on primate conservation and the appeal.

Another goal has been to enlist volunteers. In northern California we presently have about 35 people who have donated time to our efforts and are willing to help in the future. Approximately 25 are university students and faculty. The others are not primatologists, but have special skills such as secretaries, computer programmers, science writers and journalists.

Financially, we have made about $27,000. Approximately $1,000 represent donations from IPS members, $1,000 from the mailing campaign, $2,000 represent sales profits and donations from the campus campaigns, $4,000 were from ticket sales for the San Francisco symposium, and $19,000 were donations and pledges resulting directly from this symposium. Of the pledges, $16,000 represent a one-to-two challenge to raise the last $32,000 needed for the downpayment on the Montes Claros Forest in Brazil, one of the last remaining homes for the muriqui. This 2,000 acre forest is for sale for approximately $400,000, or about $200 an acre. We have raised more than $23,000 that could be applied to this purchase if the remaining $32,000 that we have been challenged to raise can be obtained.

We would like to urge other primatologists throughout the world to join us in our efforts to support primate conservation by organizing P.C.A. campaigns of various kinds in their colleges or cities. All efforts, from those involving only an hour or two seeking contributions from several co-workers, friends or students, to organizing large media or mailing campaigns or symposia will be valuable.

Please contact Suzanne Chevalier-Skolnikoff for brochures or for further information on organizing Primate Conservation Appeal campaigns.

Suzanne Chevalier-Skolnikoff
Coordinator, Primate Conservation Appeal
Conservation Committee,
International Primatological Society
205 Edgewood Avenue
San Francisco, California 94117
Telephone: (415) 661-5103

Meredith Small
University of California, Davis
Davis, California 95616

Fig. 1: WWF-US President Russell Train presenting the panda trophy to marathon winner Carlos Ortiz (photo by Andy Young).

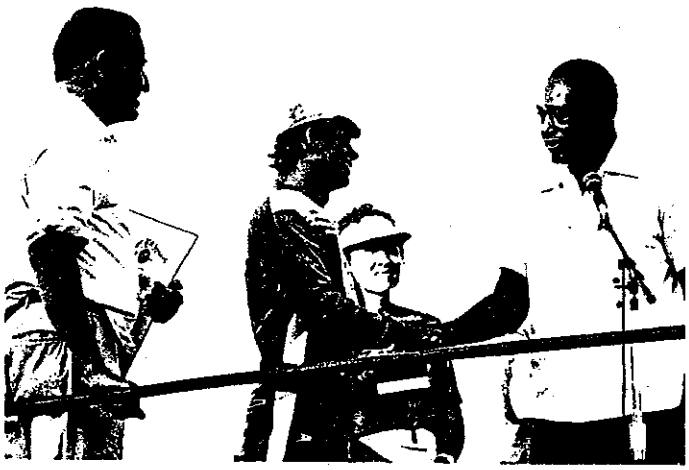

Fig. 2: L. A. Mayor Tom Bradley congratulating the triathlon winner Jim Brady as Julie Leach and Russell Train (holding World Wildlife Week proclamation) look on (photo by Andy Young).

World Wildlife Fund — US Sponsors Marathon and Triathlon in Los Angeles

On August 21, 1983, a special Panda Marathon/Centaurion Triathlon, sponsored by WWF-US, took place in Los Angeles. The two events, which started and finished in Manhattan Beach, were held to benefit WWF's many conservation projects around the world. More than 100 athletes participated in the gruelling triathlon (which included a 2.4 mile swim, a 112 mile bike ride and a full marathon) and 557 ran in the marathon. The men's triathlon was won by Jim Brady in a time of 10:24:02, and the women's triathlon by Julie Leach in 11:29:28; Ms. Leach is considered one of the top female triathletes in the world. The marathon was won by Carlos Ortiz in a time of 2:38:06.

Although the marathon was named for WWF's symbol, the giant panda, non-human primates were also in evidence. The WWF-US Primate Program had a booth selling t-shirts, posters and a variety of other materials, and the Brazilian muriqui *(Brachyteles arachnoides)* was also represented among the marathon participants (Figs. 1-4).

At the award ceremony, Los Angeles mayor Tom Bradley presented WWF-US president Russell Train with a proclamation declaring the week to be World Wildlife Week in Los Angeles.

Fig. 3: Muriqui and friend crossing the finish line in the marathon (photo by Andy Young).

Fig. 4: The Primate Program booth at the Marathon/Triathlon, with Newsletter Assistant Editor Bill Konstant in charge (photo by Andy Young).

The Primate Society of Great Britain's Conservation Working Party

The Primate Society of Great Britain (PSGB) has a Working Party on Conservation (CWP), which acts as a panel of experts on matters of conservation and reports back to the Society. It investigates problems facing primates in their natural habitats, their illegal export and import, problems encountered in transit, and other misuses. The Working Party acts directly, or through Council, to support local action and write to the relevant authorities.

As a small group working in the United Kingdom, its sources of information are limited, so the Working Party continues to develop as wide an information network as possible, partly through communication with other national and international conservation groups, but mainly through experts in primate source countries who are asked to become corresponding members of the Working Party. These corresponding members are encouraged to maintain regular contact, either by sending periodic notes or copies of reports, which may be published in Primate Eye, journal of the PSGB.

One subject which recently concerned the CWP was the status of the Barbary macaque. The CWP's work here resulted in a conference held in Gibraltar in June 1982, organized by Dr. John Fa. Recommendations for the conservation of this species were published as an appendix in PSG Newsletter No. 3. The proceedings of the conference will be published in 1984 in a book entitled "The Barbary Macaque: A Case Study in Primate Conservation" (Plenum Press), edited by John Fa.

Another matter which concerned the CWP in 1983/84 is the use of chimpanzees by beach photographers in Spain and the Canary Islands. This matter was first brought to the attention of people in the United Kingdom by Dick van Hoorn's article in the October 1980 IPPL Newsletter, which pointed out that there was an alarming increase in the number of photographers using young chimps as animal models to pose with tourists. These chimpanzees are all young animals imported by Spain and Tenerife from West Africa, primarily from Equatorial Guinea. It is estimated that at present there are 100-150 chimps being used in this manner. The CWP helped to inform people of the problem and distributed a leaflet produced by IPPL which urged tourists in Spain and the Canary Islands not to have their pictures taken with chimpanzees. Simon and Peggy Templer, based in Spain, are helping to confiscate some of these animals and to date have received 18 chimps. Some of these have been sent to rehabilitation sites in West Africa.

No import licenses have been issued by the Spanish authorities for four years and most of the animals now in use have been illegally imported into Spain. The photographers are not only breaking import laws, but are also in violation of two Spanish sanitary codes and can be prosecuted if reported to the police and the nearest Civil Governor. The main problem to be tackled, however, is the export of chimpanzees from West Africa and the subsequent illegal imports.

Members of the CWP are contributing information to the Global Strategy for Primate Conservation. David Chivers recently prepared a report on Asian rain forest conservation which will be a major contribution to the forthcoming updated strategy.

The Primate Society of Great Britain, through its Working Party, helped organize a symposium on the Conservation of Primates and their Habitats, which was held at Leicester University and Twycross Zoo in September, 1982. The two volume proceedings of this symposium are now available and can be obtained from David Harper, University of Leicester, Department of Adult Education, University Road, Leicester LE1 7RH. The cost of the volumes is £4.5, with overseas shipping and handling costing £1.

Currently the CWP is in the process of discussing and taking action upon the problem of proposed use of Liberian chimpanzees in biomedical research, conservation in Sierra Leone, primate exports from Kenya, the Tucuri Dam project in Brazil and the importance of the relationship of captive primate management to conservation.

Anyone interested in receiving more information on the CWP, or who would like to become a corresponding member, should write to the chairman at the following address:

Dr. Miranda F. Stevenson
Chairman, PSGB CWP
Royal Zoological Society of Scotland
Murrayfield
Edinburgh EH12 6TS
UNITED KINGDOM

Conservation Strategy for African Primates

The African section of the revised Global Action Plan for Primate Conservation is now being planned. Suggestions as to the chief priorities of such a strategy would be welcome. If you recommend a specific project, please give a clear justification of its importance and an estimate of costs. Recommendations, together with any information that might argue for a change in the currently recognized status of an African primate, should be addressed to:

Dr. John Oates
Dept. of Anthropology
Hunter College
695 Park Avenue
New York, New York 10021
UNITED STATES

Madagascan Section of the PSG to Be Reorganized

The Madagascan section of the PSG, which has suffered from lack of a coordinator for several years, will now be reorganized. The role of section coordinator will be assumed by Dr. John Pollock, a well known specialist on the primates of Madagascar's eastern forests who conducted the first long-term field study of the highly endangered indri. Dr. Pollock will also be in charge of compiling the PSG Action Plan on Madagascar in collaboration with current group members and a number of new members soon to be invited. Dr. Pollock is currently Research and Colony Manager of the Duke University Primate Center in Durham, North Carolina and can be reached at the following address:

Dr. John Pollock
Duke University Center for the Study of
Primate Biology and History
3705 Erwin Road
Durham, North Carolina 27705

Wildlife Preservation Trust International Funds Five Projects on Endangered Primates

The Board of Directors of the Wildlife Preservation Trust International has funded five new projects on endangered primates over the past year, with special emphasis being placed on captive breeding of these animals. A brief description of each follows:

1. **Marmoset Breeding Colonies.** A grant to the Rio de Janeiro Primate Center (FEEMA-CPRJ) is supporting expansion of breeding programs for three callitrichid species and establishing a breeding program for a fourth. This effort will include colonies of Geoffroy's white-faced marmoset *(Callithrix geoffroyi)*, the buffy-tufted-ear marmoset *(Callithrix aurita)*, the buff-headed marmoset *(Callithrix flaviceps)*, and Wied's marmoset *(Callithrix kuhlii)*. The CPRJ is currently engaged in cooperative efforts with the Jersey Wildlife Preservation Trust that include exchange training of staff and establishment of satellite colonies of endangered eastern Brazilian monkeys.
2. **Muriqui Breeding Program.** The muriqui *(Brachyteles arachnoides)* has been the subject of a number of previous PSG Newsletter articles and is featured once again in this newsletter. WPTI is funding construction of the first captive colony for this animal at the Rio de Janeiro Primate Center.
3. **Ruffed Lemur Facility.** A grant to the Duke University Primate Center made possible the fencing of a 6 ha outdoor enclosure for a free-ranging colony of ruffed lemurs *(Varecia variegata)*. This group will serve as an extension of the existing breeding colony and a focus of behavioral research. Duke will also have two graduate students from Madagascar working with the primate collection.
4. **Great Ape Reproduction.** Dr. Terry Maple will be conducting a computer modelling study to investigate the relationship between environmental and social variables and reproduction in gorillas, orangutans and chimpanzees. This study will compare existing demographic data with data on housing, group organization, handling and other information to develop management guidelines for improving reproductive success in these species in captivity in North America.
5. **Primates and Domestic Species in Madagascar.** This field study, conducted by Dr. Sheilo O'Connor, will investigate the impact of local domestic species on populations of *Lemur catta* and *Propithecus verreauxi* in the Bealoka and Malaza forests of Madagascar. The Malaza forest contains domestic species, and one of the objects of this study is to determine if direct competition exists for food.

Jon Jensen
Executive Director, WPTI
34th St. and Girard Ave.
Philadelphia, Pa. 19104

Ten Field Projects Supported Out of the 1983 WWF-US Primate Action Fund

As discussed in Newsletter no. 2, the WWF-US Primate Action Fund is a special project intended to provide rapid support of worthy primate conservation projects in the $500 -3,000 range. This Fund places special emphasis on projects by researchers from the 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 40 projects have been supported out of this Fund since it began in 1979, including 10 during 1983. A brief list of the 1983 field projects follows; brief reports on four of these are included in this newsletter, and others will appear in future issues:

South and Central America

1. A survey of primate populations in southwestern Belize.
   Project leader: Jeremy Dahl
2. Evaluation and conservation of squirrel monkey *(Saimiri oerstedii)* populations in Costa Rica
   Project leader: Sue Boinski
3. A census of the Panamanian tamarin *(Saguinus geoffroyi)*
   Project leader: Carol Skinner
4. Conservation of the Peruvian yellow-tailed woolly monkey *(Lagothrix flavicauda)*
   Project leader: Mariella Leo Luna
5. Distribution and conservation of the tufted capuchins *(Cebus apella* sspp.) in Argentina
   Project leaders: Orestes Colillas and Alejandro Brown

Africa

6. Survey of DeBrazza's monkey *(Cercopithecus neglectus)* populations in Kenya
   Project leader: Jean Brennan
7. Behavioral ecology of the mountain gorilla *(Gorilla gorilla beringei)*
   Project leader: David Watts

Asia

8. Ecology, distribution and conservation of the lion-tailed macaque *(Macaca silenus)* in south India
   Project leader: Ajith Kumar
9. A survey of potential research sites for an investigation into the effects of timber management practices on primate densities in Sumatra
   Project leader: Arthur Mitchell
10. Population size, habitat preferences and conservation of the Simeleu macaque *(Macaca fascicularis fuscus)*
    Project leader: J. Sugardjito

In addition to field projects, some student training stipends for researchers from developing countries are provided out of the Primate Action Fund, and small grants are also made for distribution and/or publication of important publications dealing with primate conservation. For further information on this Fund and on the WWF-US Primate Program in general, please contact PSG Chairman Russ Mittermeier.

PSG Newsletter to Be Distributed Free-of-Charge to Members of the Brazilian Society of Primatology

Through a special arrangement with the President and Vice-President of the Brazilian Society of Primatology (SBP), both of whom are members of the PSG, our newsletter will be distributed free-of-charge to members of the SBP. We see this as an important way to stimulate further interest in primate conservation within Brazil, the country with the richest and most diverse primate fauna in the world. Inquiries about membership in the SBP can be directed to either of the following addresses:

Prof. Milton Thiago de Mello
President, SBP
Dept. de Biologia Celular
Instituto de Ciencias Biologicas
Universidade de Brasilia
70.910 Brasilia, D.F.
BRAZIL

Prof. Celio Valle
Vice-President, SBP
Dept. de Zoologia — ICB
Universidade Federal de Minas Gerais
Pampulha
Belo Horizonte, Minas Gerais
BRAZIL

New Books by PSG Members

Three new books by PSG members have appeared recently. They include the following:

A Faunal Survey of Sabah. One of the thirteen states in the Federation of Malaysia, Sabah, which is situated in northern Borneo, is home to ten primate species. They include the orang-utan, the proboscis monkey, the Bornean gibbon, three leaf monkeys, two macaques, a tarsier and the slow loris. With technical assistance from World Wildlife Fund — Malaysia, the Sabah Forest Department conducted a faunal survey from 1979-1981, and a report, entitled *A Faunal Survey of Sabah* (G. Davies and J. Payne), was published in 1982. Although intended primarily for use within Sabah, and covering larger mammals and birds generally, the report is of interest to anyone concerned with the status and distribution of wild southeast Asian primates. Some copies, bound with hard cover, are still available from the Sabah Forest Dept. at Malaysian $30 each (approx. $14.00 US). Requests for this publication should be addressed to:

The Chief Game Warden
Sabah Forest Dept.
P. O. Box 311
Sandakan, Sabah
MALAYSIA

A Complete Guide to Monkeys, Apes and Other Primates. This attractive hardcover book was written by Michael Kavanagh and is lavishly illustrated with color photographs of many primate species. The price is £10.95 in the UK and it was published by the Oregon Press.

The Oregon Press Limited
Faraday House
8 Charing Cross Road
London WC2H OHG
ENGLAND

Primates and the Tropical Forest. This publication (Fig. 5) is a 55 page booklet edited by PSG chairman Russ Mitter-

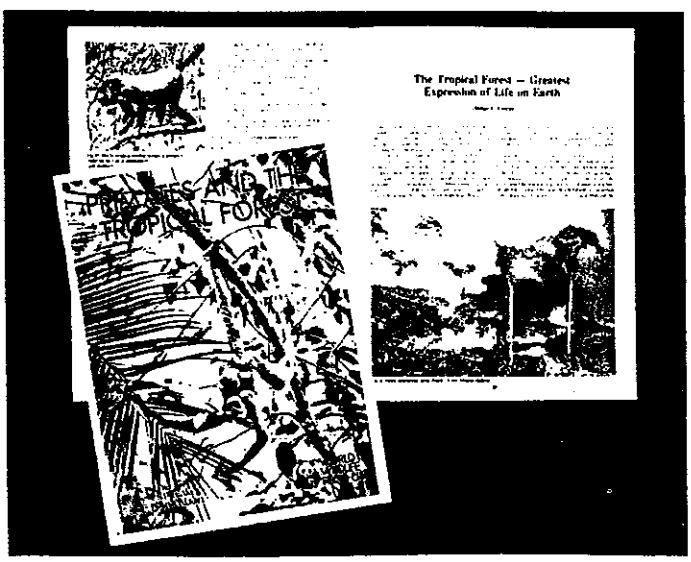

Fig. 5: Primates and the Tropical Forest, the proceedings from a Symposium held in Los Angeles in September, 1982.

meier and Mark Plotkin of the IUCN/SSC Ethnobotany Specialist Group. It includes the proceedings of a seminar held in Los Angeles in September, 1982 in which H.R.H., the Prince Philip, President of WWF-International participated (see Newsletter no. 3 for further details). The six chapters in this illustrated booklet are entitled:

— The world's endangered primate species: an introduction and a case study — the monkeys of Brazil's Atlantic forests (Russ Mittermeier)
— The world's endangered primate species: a case study on the lemur fauna of Madagascar (Alison Richard)
— Living primates as a key to human behavior (Shirley Strum)
— Living primates as a key to human evolution (John G. Fleagle)
— The tropical forest — greatest expression of life on earth (Thomas E. Lovejoy)
— Ethnobotany, conservation and the future of the tropical forest (Mark J. Plotkin)

This booklet was published by WWF-US and can be purchased for $6.00 from Bill Konstant at the Stony Brook address. Please make checks payable to World Wildlife Fund — U.S.

Latest International Zoo Yearbook Includes Special Section on New World Monkeys

The latest *International Zoo Yearbook*, Volume 22 (edited by P. J. S. Olney, Pat Ellis and Benedict Sommerfelt), features a 152 pp. special section on New World monkeys, both in the wild and in captivity (Fig. 6). The section on wild populations of these animals includes seven papers on conservation and was organized by PSG chairman Russ Mittermeier; the captive section, which was organized by another PSG member, Dr. John Hearn, is composed of 13 papers on a wide variety of Neotropical species. This volume of *International Zoo Yearbook* is perhaps the best compendium on New World monkeys to date and is a must for anyone interested in these important animals. It can be ordered directly from the Zoological Society of London and costs £23.75 in hardback and £18.50 in softback. The address of the Zoological Society is given here and an order blank for Volume 22 is enclosed with this newsletter:

International Zoo Yearbook
The Zoological Society of London
Regent's Park
London NW1 4RY
ENGLAND

World Wildlife Fund — India Publishes Booklet on Primates

A 38 page booklet entitled *The Primates* (Fig. 7) was published by WWF-India. This beautifully illustrated book includes a general introduction to primates and a review of the status of India's primate species. A poster of endangered Indian primates is included as well. The book can be purchased for $5.00 US from:

The Publicity and Promotions Executive
World Wildlife Fund — INDIA
c/o Godrej and Boyce Mfg. Co. Pvt. Ltd.
Lalbaug, Parel
Bombay — 400 012
INDIA

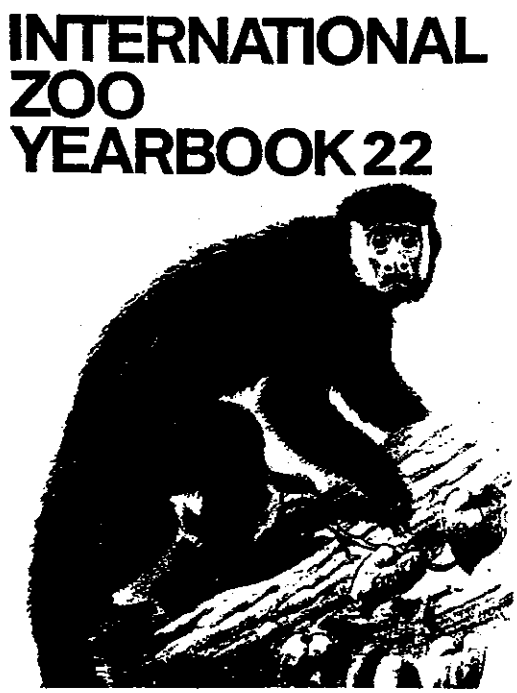

Fig. 6: International Zoo Yearbook 22, which features a special section on New World primates.

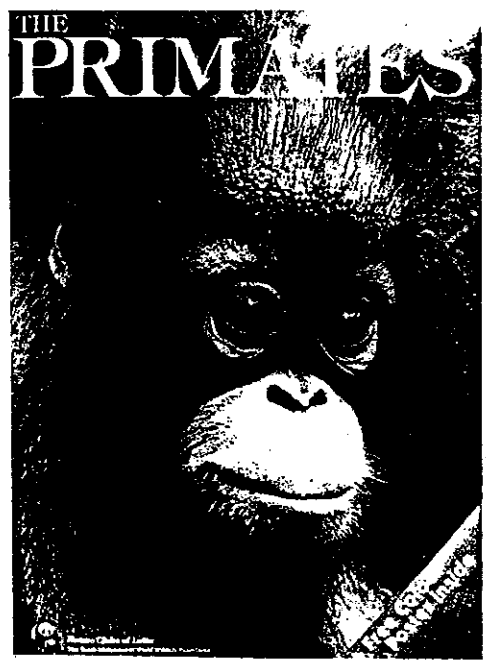

Fig. 7: *The Primates*, a 58 page booklet published in 1983 by WWF-India.

New Primate Posters, T-Shirts and Note Cards Available from the WWF-US Primate Program

Several new primate items are available from the WWF-US Primate Program, including a t-shirt depicting the golden lion tamarin (Fig. 9), a t-shirt, a poster and note cards of the yellow-tailed woolly monkey (Figs. 10-12), and a calendar entitled Vanishing Rain Forest (Fig. 8), with two primates, the golden lion tamarin and the mountain gorilla, among the 12 animals and plants shown.

The golden lion tamarin t-shirt is being distributed in eastern Brazil as part of our primate conservation program there, and the yellow-tailed woolly monkey materials are being used in Peru in a new campaign that WWF is initiating in that country (see p. 19). Sales of these items in the U.S. are channeled directly back into the projects in question and help to ensure continued distribution in the areas critical to the survival of these species.

T-shirts are available in yellow, light blue and beige and in small, medium, large and extra-large sizes. Sizes of posters and 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, N.Y. 11794

Checks should be made out to World Wildlife Fund.

All the posters and t-shirts shown in Newsletter no. 3 are still available as well.

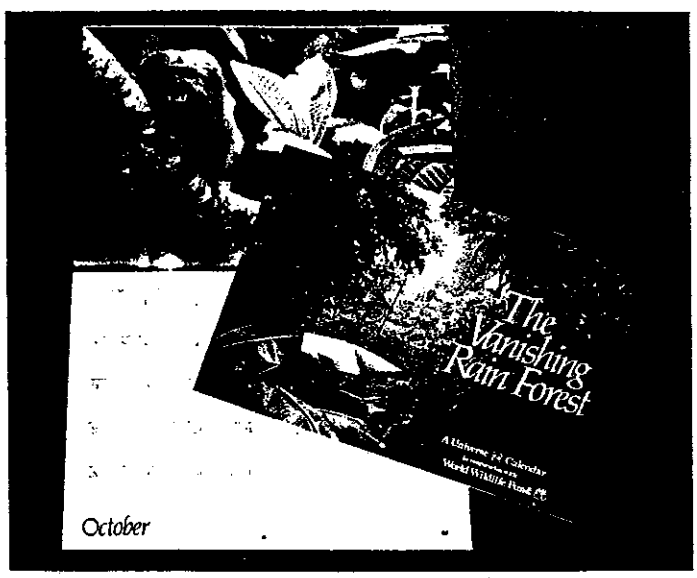

Fig. 8: ***VANISHING RAIN FOREST CALENDAR.*** **This 1984 calendar depicts a variety of rain forest species which are currently threatened by habitat destruction in tropical countries. For each month there is a large colorful photograph of an unusual and beautiful animal or plant. The text of the calendar is in English.** ***LIMITED NUMBER AVAILABLE.*** **Price: $5.00.**

Fig. 9: ***GOLDEN LION TAMARIN T-SHIRT.*** **This t-shirt depicts an adult golden lion tamarin carrying two infants (both males and females share this responsibility). This species is critically endangered in its native Brazil and there are presently more of its kind in captivity than in the wild. The text on the t-shirt is in Portuguese and reads as follows: "MICO-LEÃO DOURADO" = "GOLDEN LION TAMARIN"; "ESPÉCIE BRASILIERA AMEAÇADA DE EXTINÇÃO" = "BRAZILIAN SPECIES THREATENED WITH EXTINCTION"; and on the back: "EXTINÇÃO É PARA SEMPRE" = "EXTINCTION IS FOREVER". Available in beige, light blue and yellow, and in small, medium, large and extra-large sizes. Price: $10.00.**

Fig. 10: ***YELLOW-TAILED WOOLLY MONKEY T-SHIRT.*** **This t-shirt depicts Peru's yellow-tailed woolly monkey, which was at one time believed to be extinct, until rediscovered in 1974. The text on the shirt is in Spanish and reads as follows: "ESPÉCIE PERUANA EN PELIGRO DE EXTINCIÓN" = "PERUVIAN SPECIES THREATENED WITH EXTINCTION"; "CHORO COLA AMARILLA" = "YELLOW-TAILED WOOLLY MONKEY"; "AYÚDANOS A SALVARLO" = "HELP US SAVE IT"; and on the back: "EXTINCIÓN ES PARA SIEMPRE" = "EXTINCTION IS FOREVER". Available in beige, light blue and yellow, and in small, medium, large and extra-large sizes. Price: $10.00.**

Fig. 11: ***YELLOW-TAILED WOOLLY MONKEY POSTER.*** **This poster depicts the yellow-tailed woolly monkey in its natural habitat, the Andean cloud forests of Peru. Below its common Spanish name and scientific name are several local names by which this species is known. The brief Spanish text describes that this monkey is found only in Peru and is endangered mainly due to habitat destruction. Actual size of poster: 18" x 24". Price: $5.00.**

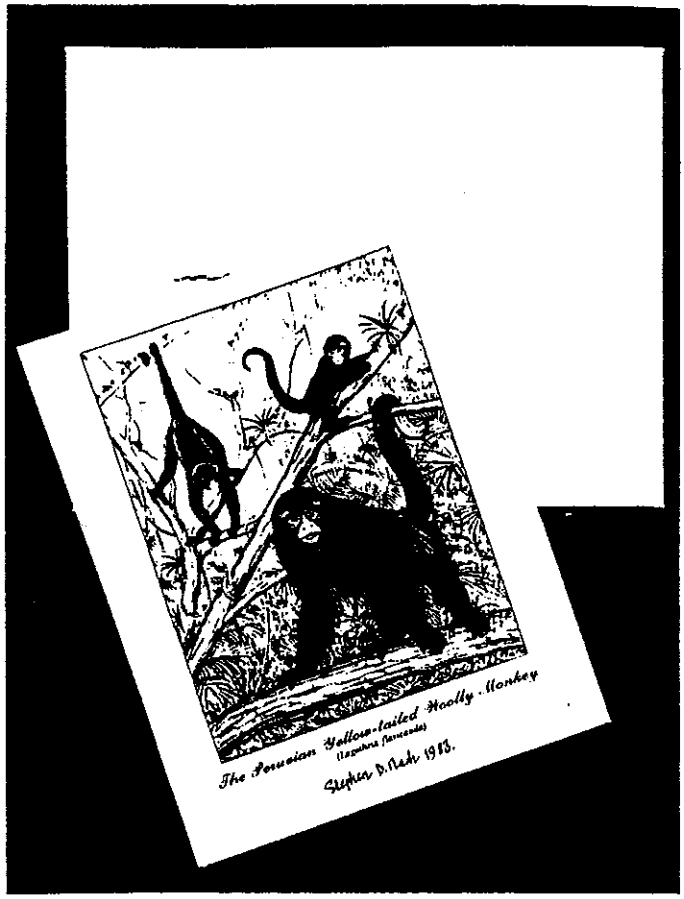

Fig. 12: ***YELLOW-TAILED WOOLLY MONKEY NOTE CARDS.*** **The cover illustration is the same as on the yellow-tailed woolly monkey poster. On the back of the card is a short text which describes this monkey and its Andean habitat. The cards are cream-colored and printed in brown ink. Price: $5.00 per dozen (envelopes included).**

Fig. 13: Ethnobotany t-shirt. The text of this shirt reads as follows: "AS MATAS DO BRASIL" = "THE FORESTS OF BRAZIL"; "A FARMÁCIA DO MUNDO" = "THE PHARMACY OF THE WORLD"; and on the back: "AS MATAS SÃO NOSSAS..." = "THE FORESTS ARE OURS"; "AJUDE NA SUA PROTEÇÃO" = "HELP IN THEIR PROTECTION."

Ethnobotany T-Shirts Available

The IUCN/SSC Ethnobotany Specialist Group, which was created in 1981, has now made available a t-shirt (Fig. 13) which is intended to increase interest in tropical plants and their importance to both man and wildlife. The text and design of the shirt focus on the natives and endangered plant fauna of Brazil, and the text is in Portuguese. Artwork for this shirt was done by Stephen Nash, who has also done all the t-shirts produced by the WWF-US Primate Program. Shirts are available in small, medium, large and extra-large sizes, and in the colors blue, yellow and beige. Their cost is $10. Anyone interested in ordering Ethnobotany t-shirts should contact the Ethnobotany Specialist Group secretary at the following address:

Mark J. Plotkin
Secretary, Ethnobotany Specialist Group
Harvard Botanical Museum
Oxford Street
Harvard University
Cambridge, Massachusetts 02138

Fig. 14: Sierra Leone's chimpanzee stamps, first in a series of endangered species stamps being produced by International Philatelics Inc. on behalf of World Wildlife Fund.

Sierra Leone Issues Postage Stamps Depicting the Chimpanzee

A set of four postage stamps depicting chimpanzees was issued by the Sierra Leone government in 1983 (Fig. 14). These stamps are the first in a series of endangered species stamps being developed by International Philatelics Inc. on behalf of WWF, and the stamp program will include an album with a chapter of text on each endangered species shown on the stamp. Stamps will include the WWF logo and the accompanying text will discuss behavior, ecology and conservation. Several other primate stamps are planned in this series and will be announced in future issues of the PSG newsletter.

Three New Great Ape Posters

Three new posters depicting the mountain gorilla and the chimpanzee have recently appeared. The mountain gorilla poster (Fig. 15) was made specifically for Uganda. Since Uganda may contain 25% of the remaining mountain gorillas, this poster was developed to increase public awareness of the severity of the animal's situation and to encourage conservation of gorillas within that country. The photograph and design of the poster are by Lysa Leland, Conservation Fellow of the New York Zoological Society and printing was arranged by Mark Boulton of the WWF-International Education Project. Funding was from an anonymous donor and the Elsa Wild Animal Appeal.

Several thousand gorilla posters are being distributed to wildlife clubs, schools, government offices and other public locations throughout Uganda by the Kibale Forest Project of the New York Zoological Society and a few hundred are now available here in the U.S. Proceeds from the sale of this poster in the U.S. will be used for conservation of mountain gorillas and wildlife education in Uganda. Anyone interested in a copy of this poster, please send $5.00 US to Bill Konstant at the Stony Brook address.

The two other posters (Figs. 16 and 17) depict chimpanzees from the Gombe Stream National Park in Tanzania, and were produced by the National Geographic Society for the Jane Goodall Institute. The cost of each poster is $6.00. The cost for the pair is $10.00. Postage and handling fees are $1.50 on either order. Anyone interested in ordering these posters in quantity should contact the Jane Goodall Institute at the following address:

The Jane Goodall Institute
P. O. Box 14485
San Francisco, California 94114-0485

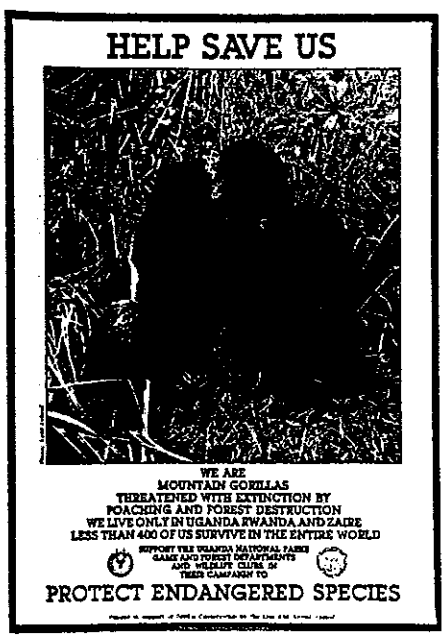

Fig. 15: Mountain gorilla poster; *Help Save Us.*

Fig. 16: Chimpanzee poster; *Fifi fishes for food by poking a grass blade into a termite mound.*

Fig. 17: Chimpanzee poster; *Flo sits with her children, five-year-old Fifi and baby Flint.*

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, and if any of you have requests for assistants with specific skills, please feel free to advertise here.

Volunteer field assistants:

Mr. and Mrs. John L. Couper
6208 31st Street, NW
Washington, D. C. 20015

Mr. and Mrs. Couper would like to become involved in a field study on wild primate populations, with hopes of developing field research projects of their own. Mr. Couper has a number of years of experience working at Len William's Monkey Sanctuary in Great Britain, has traveled extensively throughout Africa and Asia, and possesses language skills necessary for work in a number of tropical countries. Mrs. Couper recently received her Ph.D. in Comparative Psychology and worked specifically with primates for six years as a keeper at the Denver Zoo.

Gary Nadler
4669 Maura Lane
West Bloomfield, Missouri 48033

Mr. Nadler recently graduated from Dennison University, majoring in Biology and Psychology. He intends to study animal behavior as a graduate student and is interested in becoming involved in a field research program.

Mr. and Mrs. Mihaly Seres
15 Orton Pk. No. 408
Scarborough
M1G 3G3
Ontario
CANADA

Mr. and Mrs. Seres, both of whom have had a number of years experience working at the Zoological and Botanical Garden of the City of Budapest, Hungary, are hoping to become involved in a South American primate field project. Mr. Seres has had 10 years experience working with captive primates and his wife seven years with birds and small mammals.

Ms. Anne M. Shuler
5 Blake Street
Apt. 4
Cambridge, Mass. 02140

Ms. Shuler received her B.A. in Biology from Lehigh University in June, 1981 and has since worked as a fund raiser for the National Wildlife Federation and a program assistant for the School for Field Studies in Cambridge, Mass. She would like to participate in a Neotropical field project for anywhere between two and six months and can pay her own transportation costs. She speaks Spanish.

Bill Strausberger
Box 105
Plato Center, Illinois 60170

Mr. Strausberger wishes to become involved in a Neotropical rain forest field study. Although still a high school student, he has a good biological background and training in Spanish. He can pay his own transportation and will be available from June through August of this year.

Paul Wake
Howfield Lodge
Chartham Hatch
Canterbury
Kent CT4 7NA
ENGLAND

Mr. Wake is a secondary school student who wishes to study conservation and wildlife management in college. In addition to a strong science background, Mr. Wake also has had training in several languages, including 2 years of Mandarin Chinese.

Anne D. Yoder
4001 Harris Place
Alexandria, Virginia 22304

Ms. Yoder is primarily interested in doing field work in Madagascar. She is a recent graduate of the University of North Carolina at Chapel Hill, with majors in both zoology and anthropology. She has several years experience working with captive lemurs at the Duke University Primate Center, both as a volunteer keeper and as an independent researcher. Ms. Yoder is currently a museum technician at the Smithsonian Institution's Natural History Museum.

South and Central America

Conservation Education Campaign for the Peruvian Yellow-Tailed Woolly Monkey to Be Launched in Peru

The Peruvian yellow-tailed woolly monkey (*Lagothrix flavicauda* — Figs. 18-19) is the largest mammal endemic to Peru. It is found only in a small area on the eastern slope of the Andes in northern Peru, in the Depts. of Amazonas, San Martin and La Libertad, between 5° 30'S — 8° 30'S and 77° 30' — 78°W (Fig. 20). Until as recently as 15 years ago, this area was quite isolated, and there was little habitat disturbance and only low level hunting pressure. However, the construction of a system of roads in the late 1960's and early 1970's has greatly facilitated access to this region, with the result that the human population has increased and considerable lumber extraction and forest clearance are now taking place. At the same time, hunting has also become a more serious factor with the influx of new settlers, and the yellow-tailed woolly monkey is a primary target for hunters (as is usually the case with members of the genus *Lagothrix*). A large protected area, the Abiseo National Park, was created in a part of its range in 1983, but several other key areas are not yet protected and should be as soon as possible while they are still relatively intact. To increase awareness of the importance of this species for Peru and to provide the impetus needed to set aside further protected areas in the cloud forests of northern Peru, WWF-US is initiating a special yellow-tailed woolly monkey conservation campaign, in conjunction with the Museo de Historia Natural of the Universidad Nacional Mayor de San Marcos in Lima and the Asociación Peruana para la Conservación (APECO). A brief description of the history of this species and our plans for the campaign is given in this article.

Fig. 18: Infant yellow-tailed woolly monkey obtained in 1978 (photo by Russell A. Mittermeier).

The yellow-tailed woolly monkey was first discovered in 1802 by Alexander von Humboldt and described by him in 1812 as *Simia flavicauda* — "le choro de la Province de Jaen" (Humboldt and Bonpland, 1812). Humboldt never saw a live specimen and based his description on the flat, trimmed skins used by Peruvian muleteers as saddle covers. No type specimen was preserved and Humboldt in fact believed that the animal was a species of howler monkey. For more than a century after its discovery, there was no further mention of the species other than a passing reference by Poeppig (1832) to a *rothe choro* (red choro — choro being a vernacular name for woolly monkeys in Peru) from Yurimaguas (Dept. of Loreto). The identity of the animal mentioned was never certain, but it could have been *L. flavicauda*.

In 1925, a professional animal collector named Watkins collected two yellow-tailed woolly monkeys at La Lejia (Dept. of Amazonas) for the American Museum of Natural History in New York, and thus became the first individual from outside the region to see live individuals of this species. However, the animals were not identified as *L. flavicauda* until 1963. In 1926, R. W. Hendee, a collector for the Godman-Thomas Expedition to Peru, acquired three more specimens at Pucatambo (on the border between the Depts. of Amazonas and San Martin) and deposited them in the British Museum of Natural History in London. There, the British zoologist Oldfield Thomas described them as a new species and new subgenus of woolly monkey, *Lagothrix* (*Oreonax hendeei*) (Thomas, 1927a). Later in the same year, he raised his subgenus to full generic status on the basis of

Fig. 19: Adult male yellow-tailed woolly monkey at the Museo de Historia Natural in Lima, Peru. This is the individual that was obtained in 1974 and lived at the museum until 1980 (photo by Russell A. Mittermeier).

several features of the deciduous dentition of one juvenile specimen (Thomas, 1927b). He compared his material to Humboldt's description of *Simia flavicauda*, but concluded that *S. flavicauda* was probably nothing more than "a local *Lagothrix*, perhaps *L. lagothricha*" (Thomas, 1927c).

In 1957, the Argentine mammalogist, Angel Cabrera, decided that *Oreonax hendeei* Thomas was only specifically distinct from other woolly monkeys and not a distinct genus, and further considered Humboldt's *Simia flavicauda* to be indeterminable. It remained for Jack Fooden, an American mammalogist, to show that *Oreonax hendeei* Thomas and *Simia flavicauda* Humboldt were in fact synonymous (Fooden, 1963). He also agreed with Cabrera that the animal was distinct from other woolly monkeys at only the species level, the correct name therefore being *Lagothrix flavicauda* (Humboldt, 1812).

Of course, all these decisions were being made on the basis of five museum specimens. For nearly 50 years after the collection of the Hendee specimens in 1926, no new information emerged on wild populations of the yellow-tailed woolly — even though at least one expedition was organized to find it in the 1940's. Then, in 1974, Mittermeier, Macedo-Ruiz and B. A. Luscombe mounted an expedition to determine if the species indeed still existed. They succeeded in locating a number of skins and skulls of animals that had been shot by local hunters, and also obtained a live juvenile *L. flavicauda*, which was being kept as a pet. This proved the continued existence of the species, and brought the first live specimen of the yellow-tailed woolly monkey to the attention of the scientific world (Mittermeier, et al., 1974, 1975a, 1975b, 1977; Macedo-Ruiz and Mittermeier, 1979). This event received considerable press coverage in Peru at the time, and was discussed in a number of scientific publications.

In 1978, Mittermeier and Macedo returned briefly to the region in the hopes of finding a mate for the male that had been obtained in 1974. Unfortunately, they were unsuccessful in this endeavor, but did manage to obtain a second young male. The first male died in the Lima Museum in 1981, but the second is still alive and will soon be moved to a large island at the Parque las Leyendas Zoo in Lima. It is the only representative of its species in captivity anywhere.

As a result of the international interest generated by the rediscovery of this exciting species, several conservation organizations (New York Zoological Society, Rare Animal Relief Effort) took an interest in its conservation and financed the first field studies, which were conducted by Mariella Leo Luna in March-September, 1978 and again in June-September, 1980. Leo returned to the field again from June to November, 1983, this time on a grant from the WWF-US Primate Action Fund.

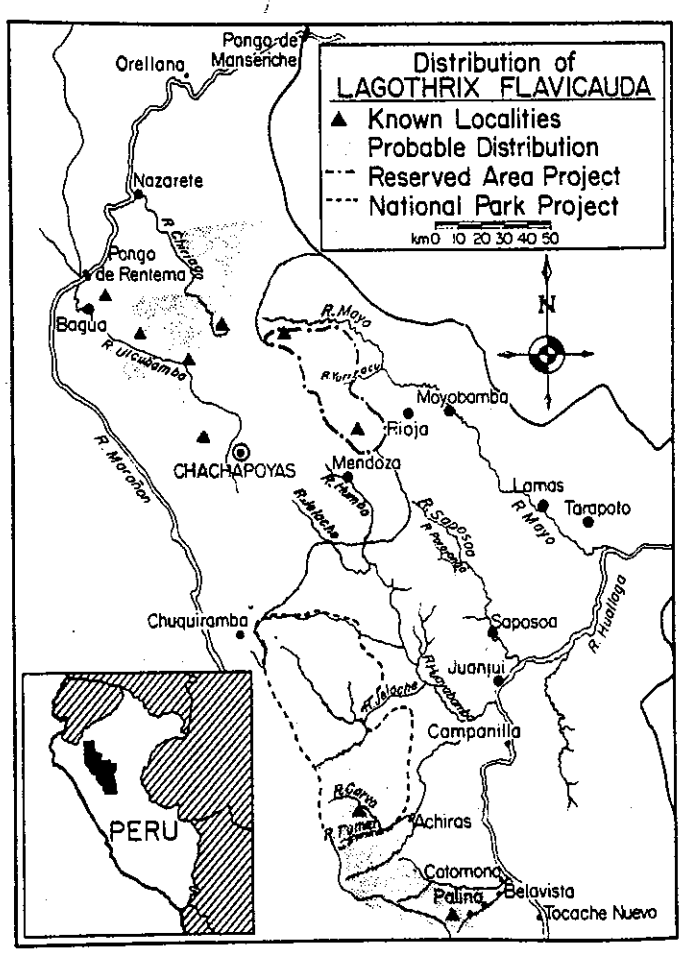

Fig. 20: The range of the yellow-tailed woolly monkey in northern Peru.

Fig. 21: Habitat of the yellow-tailed woolly monkey in the cloud forests of northern Peru (photo by Russell A. Mittermeier).

Leo's studies have helped to identify several potential protected areas, and this work has been furthered by Carlos Ponce del Prado and coworkers at the Universidad Nacional Agraria La Molina. Working on a grant from WWF-Int., they have used aerial photos and satellite imagery to study the cloud forest region of northern Peru where this monkey occurs and to develop a management plan for the entire region. As a result of their work, the Abiseo National Park was established in 1983 and their study provides a sound foundation for further conservation activity in the region.

Fig. 22: Dr. Hernando de Macedo-Ruiz is interviewed by Peruvian news media.

The conservation education campaign for the yellow-tailed woolly monkey had a preliminary launch at the Museo de Historia Natural in Lima on October 6, 1983 (Figs. 22-24). Presentations were given by Macedo, Mittermeier, Leo and Ponce, and about 50 people attended, including several members of the press. The first materials produced for the campaign include a poster (Fig. 11), a t-shirt (Fig. 10) and a sticker (not shown), and these were distributed at the preliminary launch.

This campaign will be based in part on the successful conservation education campaign for the muriqui in the Atlantic forest region of eastern Brazil. As in the case of the muri-

Fig. 23: Speakers at the preliminary launch of the yellow-tailed woolly monkey campaign in Lima, Peru. From left to right, PSG members: Carlos Ponce del Prado of the Universidad Agraria la Molina, Hernando de Macedo-Ruiz, Director of the Museo de Historia Natural in Lima, Mariella Leo Luna and Russ Mittermeier (photo by Andy Young).

Fig. 24: Carlos Ponce del Prado speaking at the yellow-tailed woolly monkey campaign launch (photo by Andy Young).

qui, the yellow-tailed woolly is the largest mammal endemic to its country, the most endangered primate species there, and also a very attractive animal. All these factors combine to make it an ideal symbol for the conservation of its unique cloud forest habitat, and indeed for Peruvian conservation in general.

The most important elements in the education campaign will be a film and a slide-tape presentation on the yellow-tailed woolly, which are now being prepared. Filming of the species was carried out in November and December, 1983, by a film crew headed by Mittermeier and Andy Young (who also produced the WWF film "Cry of the Muriqui"). The team worked with Leo in Venceremos, one of her two main study areas, and there succeeded in obtaining the first-ever wild-shot footage of the species.

Once these materials are available, they will be used both in Lima and in the region where the species occurs to generate further interest in the conservation of the yellow-tailed woolly monkey and its Andean cloud forest habitat. More details on this conservation education campaign will be included in future issues of this newsletter.

Russell A. Mittermeier
Hernando de Macedo-Ruiz
Mariella Leo Luna
Andrew Young
Isabel D. Constable
Carlos Ponce del Prado
B. Anthony Luscombe

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Ecology and Conservation of the Moustached Tamarin in Peru

As an important species in biomedical research, the moustached tamarin *(Saguinus mystax)* has been the subject of considerable effort to establish captive and semi-captive breeding programs in Peruvian Amazonia. Since 1975, *S. mystax* have been trapped to stock both breeding and biomedical research programs. A large body of demographic data and some information on this animal's ecology have been gathered during trapping operations. However, detailed ecological and behavioral studies of this species in the wild are lacking, the results of which could contribute to the assessment of conservation requirements for the moustached tamarin.

From June 1981 to November 1982, with funding from the WWF-US Primate Program, the New York Zoological Society, the Pan-American Health Organization and the Explorers Club, I conducted an ecological-behavioral study of the moustached tamarin at two sites in Peru (Fig. 25). At the Blanco Stream, a small tributary of the Rio Tahuayo, two

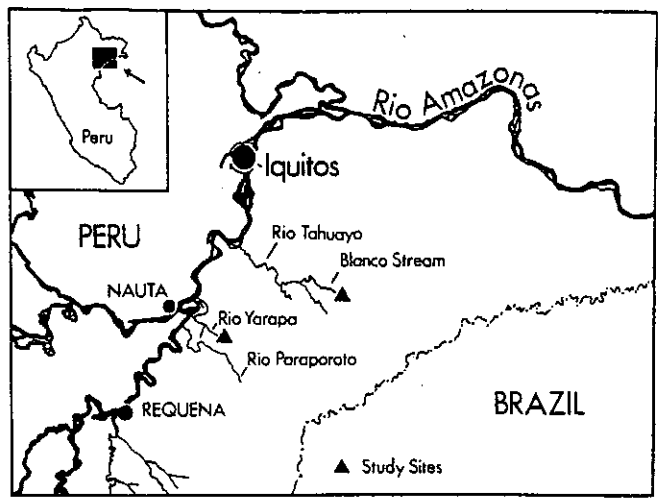

Fig. 25: Location of the Blanco Stream and Rio Yarapa study areas in the Loreto District of Peru.

marked groups of *S. mystax* were radio-tracked to learn about their daily activity and ranging patterns, feeding behavior, habitat use and behavior in general. Observations were made from dawn to dusk for at least five consecutive days every month for each group. At the 1.9 km² study area on the Rio Yarapa, two censuses and one trapping (and release) of *S. mystax* were conducted to evaluate the effects of cropping 65% of the tamarin population in 1978.

At Blanco Stream, site of the intensive field observations, I found moustached tamarins to be territorial, essentially frugivorous, upper-middle canopy inhabitants. They demonstrated a marked seasonality in food consumption, activity budgets and ranging. *S. mystax* spent a good deal of time traversing its range boundaries and invariably slept within close proximity to them, displaying long calls in the morning and defending boundaries against intrusion by conspecifics. They utilized the upper forest strata for locomotion, while feeding on the fruits of vines and trees, and while foraging for insects. Fruits constituted their main food through-

out the year, except during the driest period, at which time the consumption of insects increased greatly. Exudate feeding became more common at this time. During the dry season activities were initiated slightly later in the morning and terminated hours earlier in the afternoon. A notable reduction in the daily distance travelled was also observed. Here, as in many other areas of Amazonia, *S. mystax* lived in permanent or semi-permanent association with saddle-back tamarins, *S. fuscicollis*. Although *S. fuscicollis* fed on many of the same plant species as *S. mystax*, it differed in its regular consumption of insects and exudates as well as by its preference for the lower-middle strata of the forest. During territorial encounters, *S. fuscicollis* usually engaged in bodily contact with conspecifics, while *S. mystax* generally maintained vocal contact and very infrequently attempted physical contact with the rival conspecifics.

By 1981 the Yarapa population seemed to have recovered well from the 1978 trapping, although it had not yet reached its pre-cropping level. In the three years following cropping, the remaining population more than doubled in numbers. The age structure corresponded to that of a population with a high reproductive rate and low infant mortality, immigration was apparently less important as a factor in the recovery of this population. On the other hand, the 1982 census showed a slight decrease in the number of *S. mystax*, which suggested that the population was perhaps stabilizing at a new, lower density. It is equally plausible, however, that this decrease represents a temporal fluctuation to be followed by continued growth. The only discernible environmental changes at the Yarapa study area between 1981 and 1982 were a small reduction in forest cover and one of the largest annual floods within the last ten years, which probably affected the riverine vegetation of the tamarin's habitat. Although very few of the sympatric *S. fuscicollis* were cropped in 1978, their numbers seemed to have decreased in the ensuing three years. It was clear, however, that they were increasing during the fourth year.

The census of moustached tamarins done by Ken Glander (see PSG Newsletter No. 3) indicated that two populations with initially low and average population densities had recovered to pre-cropping levels after two and three years, respectively. At the Yarapa site, a high population density was observed prior to the cropping of 1978, but the population had not recovered completely even four years after the cropping. These observations suggest that recovery of *S. mystax* populations to pre-cropping levels may take longer for originally denser populations. Thus, a cropping schedule that would allow for complete recovery would have to consider the different speeds at which populations recover; not all populations may be able to stand similar cropping rates. If sustained yield at reduced densities is to be adopted, then the present evidence indicates that cropping a population of average to high density every three years is likely to give the best results.

The information gathered to date seems to indicate that moderate cropping of undisturbed or slightly disturbed populations of *S. mystax* does not irreversibly affect their recuperative powers. However, their largely frugivorous diet and habitat preferences set them apart from other tamarin species in that they prefer tall, mature and relatively undisturbed forests. These requirements make the species particularly susceptible to the effects of habitat destruction and unlikely to survive in secondary forest. It is therefore urgent to establish a reserve for the long-term conservation of *S. mystax*, one of two tamarin species not yet protected in a natural reserve in Peru. I propose the establishment of a nature reserve of about 500 km² along the Blanco Stream that would protect viable populations not only of *S. mystax*, but also of the red uakari (*Cacajao calvus rubicundus*) and the saddleback tamarin (*S. fuscicollis nigrifrons*), a Peruvian endemic. None of these primates are currently protected in Peru or elsewhere in Amazonia.

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Golden-Headed Lion Tamarin Contraband a Major Conservation Problem

It is reported that the distribution of the golden-headed lion tamarin (*Leontopithecus chrysomelas*; Fig. 26) has al-

Fig. 26: Infant golden-headed lion tamarin *(Leontopithecus chrysomelas)* recently confiscated in the state of Bahia by officials at the Federal University at Minas Gerais, Belo Horizonte, Brazil (photo by Russell A. Mittermeier).

ways been restricted to the southeast of the state of Bahia, Brazil, between the Rio de Contas and the Rio Pardo. The species is completely protected by law in Brazil and is included on the Brazilian Endangered Species List. As the species is listed in Appendix I of CITES, trade in them or their products is subject to strict regulation by ratifying nations, and trade for primarily commercial purposes is banned.

In 1976, the Brazilian Forestry Development Institute (IBDF) purchased 5268 km in Una as a reserve for *L. chrysomelas* and other examples of the regional fauna. In December 1980, an area of 11,400 ha was finally officially decreed as a reserve. Regrettably, since that time, the reserve has been invaded by squatters and already approximately one third of the region is no longer suitable habitat for this species. Apart from the squatters clear-cutting large areas in the west of the reserve, lumber companies are starting to move in and exploit the timber resources of this region. Due to the tremendous pressure now being exerted on the species' final refuges, in 1982 field researchers and conservationists generally agreed that unless some quite dramatic changes occurred in the very near future, all three species of lion tamarins could well become extinct in the wild by 1990.

In 1972, *L. chrysomelas* had only been recorded to have been in captivity on three occasions: once at London Zoo in 1869, once in Rio de Janeiro in 1961, and from 1971 with Dr. Coimbra-Filho. Due to its rarity and protected status in its native country, it seemed highly unlikely that any individuals of this endangered species would ever again make an appearance in a European collection. Tragically, this has proven to be incorrect, and we have seen from the 1983 plunder of the remnant wild population, that there are still some owners of private animal collections and short-sighted zoo personnel who, in order to satisfy their own selfish desire to possess such rarities, are willing to encourage the extinction of a species by handling such contraband.

From the information collected in recent months there is reliable evidence that some 50 *L. chrysomelas* were smuggled out of Brazil during 1983, the majority of which left Bolivia and were received by animal dealers in Europe. A brief case history of such importations follows.

Belgium. On November 16, 1983, the Belgian animal dealer Rene Corten sent out a list of animals for sale, which included five pairs of what were recorded as "Leone Headed Tamarin *Leontocebus chrysopygus*", the species was later established to be the golden-headed lion tamarin *(Leontopithecus chrysomelas)*. On November 23, two pairs of the species were offered by an English animal dealer, acting as an agent for Rene Corten, to the Jersey Wildlife Preservation Trust (JWPT) at a cost of approximately £1,000 per individual.

Thanks to the investigatory work of the Directors of the Belgian WWF during the following four weeks it was established that Rene Corten had, during the autumn of 1983, imported 29 *chrysomelas*, 26 of which were still living. As Belgium was not a signatory to CITES until January 1, 1984, it appeared there was no legal case in connection with the Convention that could be brought against the animal dealer, for even at the end of 1983, as the *chrysomelas* had been registered as pre-CITES entries to the country, no legal ramifications of the International Convention could be used. However, a great deal of attention has been given to this matter and it was generally considered that the only potential of presenting a legal case against Rene Corten was that as the specimens had been imported in the same way as any other item of merchandise, they should be treated in a similar fashion to stolen property.

Almost from the outset of the investigation, JWPT was contacted by the Directors of the Rio de Janeiro Primate Center and requested to do everything possible to have the 26 *chrysomelas* confiscated. At the end of November, and during the first part of December, a great deal of pressure was brought to bear on the Belgian government by representations made to them by the Brazilian government, by some of the world's leading conservationists and conservation organizations. Regrettably, in spite of the fact that a great number of people have spent a great amount of time trying to secure the animals, two months after the species appeared on the dealer's list, no real progress has been achieved.

In mid-December, there appeared to be the possibility that the dealer would be willing to sell the *chrysomelas* at cost price as the species' presence at his premises had started to cause him some embarrassment. However, after a press article that appeared in England on December 18, 1983, which named Rene Corten in person, the potential of such an offer was withdrawn. Since that time, every effort has been made to prevent the animals from leaving Belgium, as well as every attention being given to letting as many likely purchasers of such animals as possible know that they had been illegally taken from Brazil. At present, it is considered that the only real hope of securing the animals and placing them under the auspices of an International Management Committee is for an official legal case to be presented by persons in Brazil to the effect that the *chrysomelas* at Rene Corten's are stolen property and as such the Government of Brazil or the State of Brazil require the title to the *chrysomelas* to be returned to them.

If such a case fails to finally materialize and the *chrysomelas* cannot be secured in this way, it is the opinion of the author that the many conservationists involved will have to arrive at some type of compromise, in order to ensure that this very sizeable population of such a critically endangered species does not vanish forever from the remnant gene pool, just for the sake of maintaining a principle, for this could represent the last opportunity to secure the species for posterity.

France. In the early spring of 1983, it was established that Zoo de Palmyre had two pairs of *chrysomelas* represented in their collection, in spite of the fact that France had been a signatory of CITES since 1977. When the zoo authorities were queried as to how they acquired the species, they had stated that they had been sent them legally from the Rio de Janeiro Primate Center.

On April 26, 1983, Renato Petry Leal, Director of the Brazilian CITES authority/IBDF wrote to the respective French CITES authority, requesting confirmation that the animals had been sent to France from the Rio de Janeiro Primate Center. Mr. Petry Leal requested the French CITES authority to investigate their importation to France further.

and to advise him when the nature of such transaction had been confirmed.

Although there had been some rumors relating to the possibility of a private animal collector, a Dr. Quinque, having some *chrysomelas* at his predominantly bird collection outside Paris, this was not firmly established until December 22, 1983, when the JWPT was informed by a totally reliable source that Dr. Quinque had approximately 13 individuals of *chrysomelas* in his collection. Further investigation carried out by JWPT disclosed that the majority of the *chrysomelas* had arrived at Dr. Quinque's between October 1982 and March 1983.

When the above information was related to the French CITES authority via the IUCN Cambridge Wildlife Trade Monitoring Unit and the CITES Headquarters in Switzerland, the French authorities had stated that they were already aware of the specimens of *chrysomelas* at Dr. Quinque's. However, when they had queried the latter as to how he had obtained these specimens, they had been told by Dr. Quinque that he had imported them prior to the French government signing CITES in 1977. Although this possibility, in the light of evidence to the contrary, is considered to be highly unlikely, according to the French authorities, someone would have to establish that they saw the animals arriving in France after 1977 if they are going to satisfactorily prove Dr. Quinque to be in the wrong. This matter is still to be thoroughly investigated.

Japan/Hong Kong. In September, 1983, Dr. K. C. Searle, Honorary Curator of the Hong Kong Zoological and Botanical Gardens, received the offer of a trio of *chrysomelas* from an animal dealer in Japan. After consultation with the International golden lion tamarin studbook holder, it was considered prudent to acquire the specimens on offer, so that their genes would not be lost to the captive breeding program for the species, at present under way at the Rio de Janeiro Primate Center. The animals arrived safely in Hong Kong during November 1983, and the presence of such available stock has been communicated to the Brazilian conservation authorities.

Summary. We can deduce from the data presented that, at a very conservative estimate, some fifty *chrysomelas* have been illegally taken from Brazil during the last twelve months, which represents a substantial percentage of the world population of this critically endangered species. Recent reports from Brazil record that there is a considerable increase of the species being both illegally owned and exported, and the future of the suitable remaining habitat to guarantee their survival in the wild is becoming more precarious by the month. The fine work of the Rio de Janeiro Primate Center in establishing breeding programs for the three species of lion tamarins, under its far-sighted director, Dr. Coimbra-Filho, is internationally acknowledged. However, if the *chrysomelas* species is going to be saved, a more concerted effort will have to be made in order to secure the specimens that recently have been illegally taken from Brazil.

It is the author's opinion that it is of the utmost importance for the title to these contraband *chrysomelas* to be returned to the conservation authorities of Brazil as quickly as can be arranged. Also, in a similar fashion to the highly successful Common Management and Cooperative Research Agreement for the Golden Lion Tamarin, that the species come under the management of an International Management Committee, which in turn would come under the auspices of the Golden Lion Tamarin Committee and so benefit from the track-record, research background and integrity of the International Studbook for *Leontopithecus*.

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Geographic Distribution and Status of the Black Howler Monkey

Until 1970, when Smith (1970) discovered two distinct populations of howler monkeys in Mexico, *Alouatta pigra** was considered to be a subspecies of *A. palliata*. Smith noted differences in cranial morphology, dentition and pelage between these species. Horwich (1983) has since noted additional morphological and behavioral differences: 1) troop size is extremely small for *A. pigra*, averaging 5-6 individuals, while troops of *A. palliata* are generally between 15-20 animals; 2) in *A. pigra* males are easily recognized by white descended testes at a very young age, whereas in sympatric *A. palliata* it is difficult to distinguish the sexes; 3)

* Note that some authorities consider the correct name for *A. pigra* to be *A. villosa*. See Napier (1976) and Mittermeier and Coimbra-Filho (1981) for a discussion of this nomenclatorial problem.

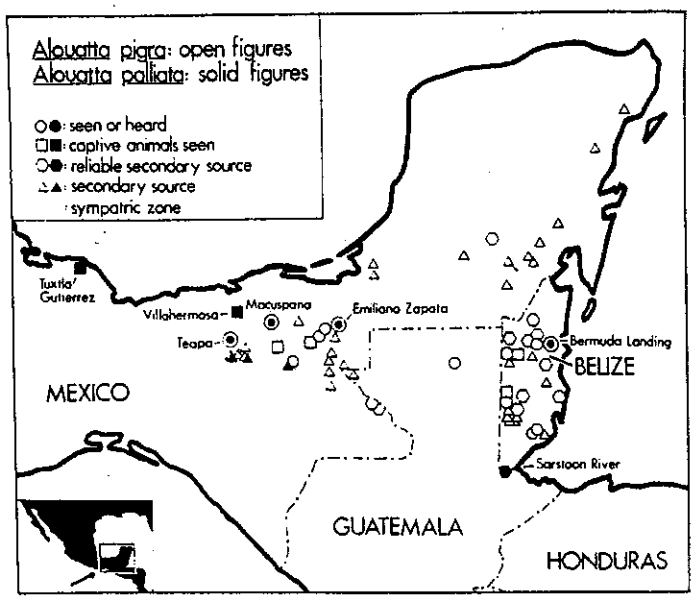

Fig. 27: Reported occurrences of *Alouatta pigra* and *Alouatta palliata* in Mexico, Guatemala and Belize. Solid figures refer to *Alouatta palliata* and open figures to *Alouatta pigra*. Circles represent wild monkeys seen or heard, whereas squares designate captive individuals seen. Hexagons denote information from reliable secondary sources and triangles information received from other secondary sources.

A. pigra shows a marked tendency toward one male grouping; and 4) the roaring sounds of the two species are auditorially distinct in accordance with the larger hyoid apparatus of *A. pigra*.

From mid-January through mid-April, 1983, we travelled extensively through southern Mexico and Belize studying howler monkeys. Since we covered a large area in a limited amount of time, much of our locality data was based on secondary sources. However, we did see or hear *A. pigra* at 7 locations and saw captive animals at 4 more locations (Fig. 27). Our journey covered 9,660 km within the range of *A. pigra*, throughout which we made frequent observations of existing vegetation. No evidence of howlers was found in the reported area of overlap of *A. pigra* and *A. palliata* near Macuspana, Tabasco (Smith, 1970). However, 40 km southwest near Teapa, we found possible evidence that the two species may overlap in some low hills. The only other evidence of possible overlap was on the southern Belize-Guatemala border. We heard a believable report of *A. palliata* seen across the Sarstoon River in Guatemala, where presumably *A. pigra* may occur as well.

In general, the range of *A. pigra*, as noted by Smith (1970), closely follows the limits of tropical forests (Toledo, 1982) and it is specifically found in areas where the average annual temperature is above 25°C and the average annual precipitation level reaches 1,000 mm or above. An additional limitation that we noted was that in almost all the sites recorded in Fig. 27, the elevation was below 330 m and the few sites above that were still below 400 m. If altitude is a limiting factor, then *A. pigra* is probably restricted from expanding its present range by the Chiapas highlands and the Guatemala mountains which curve around close to the southern border of Belize.

One characteristic of the habitat was surprising to us. Smith (1970) noted *A. pigra*'s affinity for undisturbed, mesic tropical forest, whereas *A. palliata* exists in subclimax or secondary forests. The two most populated areas we observed for *A. pigra* near Zapata, Mexico and Bermuda Landing, Belize were both low areas of short riverine growth, which sometimes flooded during the rainy season. Other highland areas were tropical forests similar to the habitat of *A. palliata* at Los Tuxtlas, Mexico (Estrada, 1983).

As described by Estrada (1983), we found Mexico's rain forests to be disappearing rapidly. We saw much evidence of logging and consequent cultivation and cattle pastures. The Lacandon Forest in Chiapas is the only large, lowland rain forest remaining in Mexico. Due to the poor condition of the roads we could not survey this particular area. However, informants indicated that lumbering rights were given to the indigenous Lacandon people, who have since leased them to the Mexican government, presumably making the status of that area insecure as well.

In Belize the status of *A. pigra* is better. The species ranges widely throughout the country, unmolested by the Creoles who do not hunt or eat them, but in some areas even claim a distinct affinity towards these monkeys. Informants did say, however, that Mayans eat howlers and other primates in Belize. We encountered animals being kept as pets, yet never saw or heard of any for sale. At present, the low human population level and amount of cultivation pose no immediate threat to these primates, and the population has increased in the last few years. This increase follows a supposed major population reduction in the 1950's due to a serious yellow fever outbreak. However, the Belize government currently welcomes Latin American immigrants and we expect that the slash and burn cultivation rate will increase in coming years. Counteracting this, the government, with the help of the local Audubon Society, is pursuing an active conservation policy by beginning to designate specific areas as wildlife reserves. Informants have also noted that the government has been working with both private individuals and organizations in these directions, and should be commended for its conservation consciousness.

In Mexico, we recorded instances of *A. pigra* being sold as pets and for consumption. Monkey meat is listed on menus in this country. There are two captive (free ranging) breeding groups of *A. palliata* in Mexico which we observed at Parque La Venta, Villahermosa and in the State Zoo of Chiapas at Tuxtla Gutierrez (Mittermeier, 1979). Both troops have the free run of the park and are monitored, but not provisioned. The troop in Tuxtla Gutierrez was established with excess animals from Parque La Venta. Besides having a healthy breeding troop of *A. palliata*, the zoo at Tuxtla Gutierrez is an extremely fine zoo with conservation underlying its very being (Mittermeier, 1979).

Tikal National Park was the only site we visited in Guatemala. We found that the park is being managed quite well both in regard to the archeological structures and the wildlife. The howlers and their habitat are in very good shape and we found some park employees interested in howler ecology actively gathering information on the plants they eat.

In summary, we found *A. pigra* to exist in the tropical evergreen and semi-evergreen forests in Mexico, Belize and Guatemala, below 330 m in altitude. They particularly seem to thrive in the riverine areas. In Mexico the situation is bleak for howlers and their habitat, and we feel effort should be made to curtail the hunting and live capture of howlers there. The area of overlap of the two species around Teapa should be explored in depth with an attempt made at convincing the government to preserve such areas. However, more realistically, in Mexico the strongest conservation efforts should be directed towards preserving the largest remaining rain forests in Chiapas. We found the Bermuda Landing area of Belize to be unique in numbers of howlers. Despite the use of habitat for farming and cattle the monkeys seem to be doing quite well. We feel that documentation of howler ecology and the successful human-howler relations in this area might prove interesting. We also feel that a community based reserve for the howlers could be a distinct possibility to be worked on with residents of that area.

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Population Estimate for *Brachyteles* at Fazenda Barreiro Rico, São Paulo State, Brazil

The woolly spider monkey, or muriqui (*Brachyteles arachnoides;* Fig. 28) is currently regarded as the most endangered New World primate. Once estimated to number perhaps as many as 400,000 individuals (Aguirre, 1971), the present population of this species may now consist of no more than 200 or 300 animals living in remote montane areas or in protected forests on private land. Between August 1982 and July 1983, I carried out an intensive field study on the population size and ecology of this rare species at Fazenda Barreiro Rico, a large cattle ranch in the state of São Paulo, Brazil, located in a juncture between the Tietê and Piracicaba Rivers (Fig. 29). I was assisted in this work by Carlos de Lucca, a zoology student from Rio Claro. There are 3,259 hectares of forest at Barreiro Rico, divided into five patches (Fig. 30). During the study, all five patches were repeatedly surveyed for *Brachyteles*, which was encountered in three. Censusing activities were repeated each month to try to accurately document the number of individuals in each of the three forests.

One small population, estimated at 13 individuals, was lo-

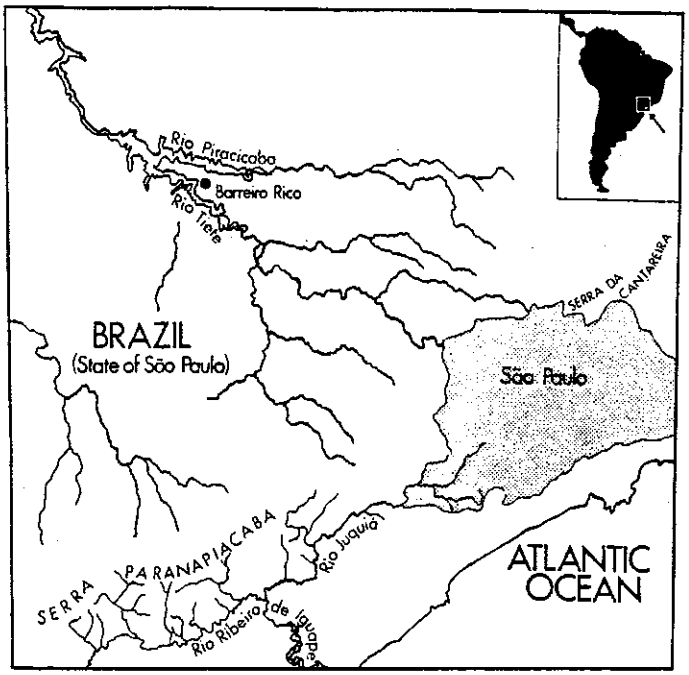

Fig. 29: Location of Fazenda Barreiro Rico in relation to the city of São Paulo, in the State of São Paulo, Brazil.

Fig. 28: The muriqui at Fazenda Montes Claros, Minas Gerais, Brazil (photo by Andy Young).

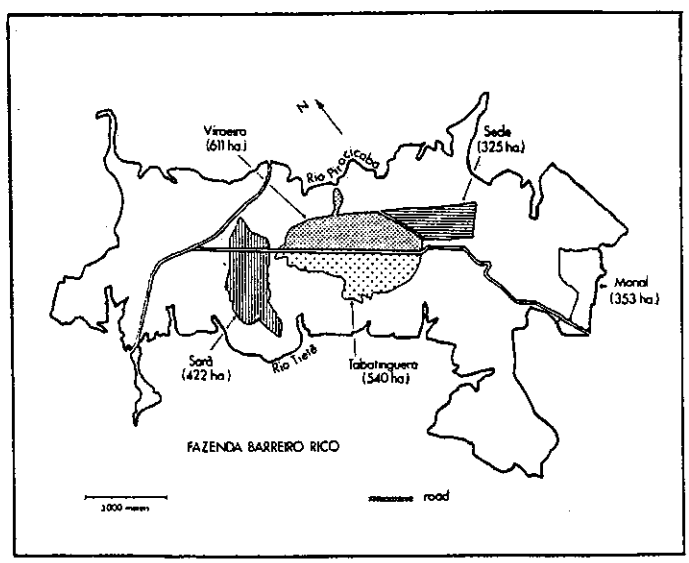

Fig. 30: Map of Fazenda Barreiro Rico showing locations and sizes of the five forested areas on the ranch.

cated in Monal, a highly degraded forest consisting primarily of low second growth and widely separated from the other four forest areas on the ranch. Within Monal there is an area of taller forest adjacent to a small stream with several individuals of *Xylopia brasiliensis* Spreng (Annonaceae), a tree species whose leaves are a major dietary component for *Brachyteles* at Barreiro Rico. The animals appeared to use this forest section as their core area. The *Brachyteles* population in Monal consisted of 3 to 5 adult males, 3 to 5 adult females, at least one of which had a dependent, body-carried infant, and two or more juvenile animals.

A larger population, estimated at about 25 individuals, was located in Viraeiro Forest. This forest contains degraded lower growth on the periphery and also encompasses a small area of natural cerrado. The central portion of the forest, however, consists of tall trees, particularly individuals of the Lauraceae, Apocinaceae and Euphorbiaceae families. The *Brachyteles* population in Viraeiro consists of six or more large males, six or more adult females, at least three of which were carrying dependent offspring, and various subadult and juvenile animals.

By far the largest population on the ranch, estimated at 45 individuals, was located in Sarâ, a forest with degraded secondary growth on the periphery and various patches of secondary growth and naturally occurring bamboo in the interior. However, as is the case for Viraeiro, much of the central portion of Sarâ consists of tall canopy trees and it is in these areas of older forest that the animals are most frequently encountered. The *Brachyteles* population in Sarâ consists of 12 to 15 males, including some six subadults, 16 or more adult females and 14 to 16 immature animals. At least nine females in this forest had dependent offspring and in at least seven cases these infants were between 1 and 4 months of age. The unusually large proportion of very young animals at the time of the study suggests that in this geographical region *Brachyteles* may have a birth peak about August-September, just prior to the time of year when heavy rainfall begins.

From all of our censusing work, the total *Brachyteles* population at Barreiro Rico is estimated to be at least 85 individuals, making it by far the largest known population of this critically endangered primate. It should be stressed that this is a conservative estimate and the total population on the ranch may actually exceed 100 animals. After one month of intensive field work on *Brachyteles* in Sarâ, the forest where all systematic behavioral observations were carried out over the course of the study, its population was estimated to be about 25 animals. It was only after various individuals could be recognized that it became clear that this figure was off by a considerable margin. Such evidence for the margin of error which can occur even when the observer is an experienced field primatologist who is dealing with a large and highly visible species, suggests that more detailed work in Viraeiro Forest might have yielded a higher population estimate.

At the present time the entire Barreiro Rico *Brachyteles* population is under the very competent protection of the Magalhães family, owners of the ranch and dedicated conservationists. Four other primate species occur sympatrically with *Brachyteles* in these forests; the southern brown howler monkey *(Alouatta fusca clamitans)*, the southern Brazilian tufted capuchin *(Cebus apella nigritus)*, the southern masked titi monkey *(Callicebus personatus nigrifrons)* and the buffy-tufted-ear marmoset *(Callithrix aurita)*. Of these five species, the least abundant at Barreiro Rico is *C. aurita*, with perhaps no more than 8 to 12 individuals on the entire ranch. The most abundant primate appears to be the brown howler monkey, estimated to be well in excess of 100 animals. In addition to these rare and endangered primates, the forests at Barreiro Rico harbor a rich and varied bird fauna as well as a variety of other mammals, including two species of peccary, deer, agouti, squirrel, ocelot and on the forest periphery, puma. Both Sarâ and Viraeiro Forests are also extremely valuable in terms of conservation in that they represent one of the very few remaining examples of the original forest that once covered large areas of the Brazilian states of São Paulo and Minas Gerais. The presence in these forests of several endangered primate species, as well as a profusion of other animals characteristic of this region, adds to their importance.

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Primate Survey in Proposed Reserve Area in Belize

Belize consists of 12,965 km² located in the southeastern portion of the Yucatan Peninsula, Central America (Fig. 31). A variety of life zones can be found in this area, including tropical-dry, tropical-moist and subtropical-moist forests. Representative species of three New World monkey genera have been documented as inhabiting these forests, i.e., the howler monkey *(Alouatta)*, the spider monkey *(Ateles)* and the capuchin *(Cebus)*. These populations are of particular interest to the author since they occur at the northern limits of the ceboid geographic range and they may inhabit forests at a variety of elevations. In addition, Belize is an attractive site in which to study the ecology and behavior of these monkeys for several reasons: 1) it has a relatively low human population density (approx. 8/km²); 2) broadleaf forests occur on both sides of the Mayan Divide, which rises above 900 meters; 3) the howler monkey *(Alouatta villosa {= pigra})* and the spider monkey *(Ateles geoffroyi yucatanensis)* have been reported in the area during the last ten years; and 4) the newly-independent government is friendly, democratic and stable. There are also good reasons for believing that a conservation effort would be worthwhile, but in 1981, it was not known whether populations of monkeys were still in the area, whether the capuchin *(Cebus capucinus limitaneus)* could be located, and which of the forests support monkeys.

A short visit to Belize in 1982 yielded sightings of *Alouatta*

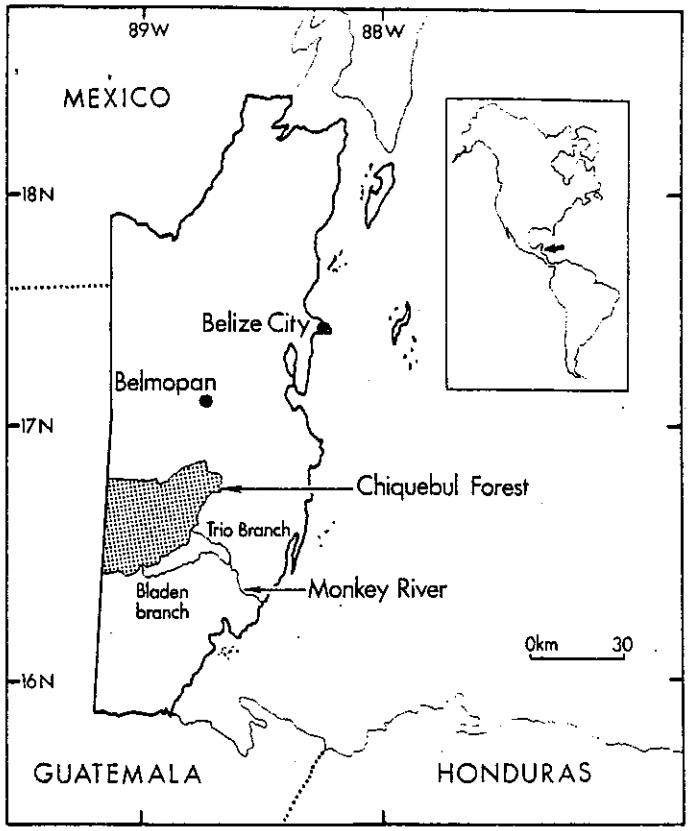

Fig. 31: Belize, Central America, showing the location of field study area and proposed reserve.

and *Ateles* in the vicinity of Chiquebul Forest, and both genera were reported to the south of the Mayan Divide. The two subspecies appear to have survived the double blow of yellow fever in 1958 and destruction of the forest by Hurricane Hattie in 1961; however, the process of recovery has been retarded by current logging operations, and each population remains patchily distributed and dispersed. There was also news of a proposal to make 400 km² to the south of the Mayan Divide into a wildlife reserve. The proposed reserve lies between the Bladen and Trio Branches of the Monkey River (Fig. 31) and includes a variety of forest types at low elevations on the steep southern-facing slopes and on the ridge of the Divide itself. Plans were made to survey this area, and a portion of the work was completed in 1983.

A small group of workers crossed the Divide at approximately 900 meters in March, 1983 and entered the north-central area of the proposed reserve. The characteristics of the forests changed radically after crossing the Divide, but on both sides the forests were uninhabited by humans and comprise a true wilderness. Little time was spent in each of the forest types at high elevations, and no monkeys were encountered. On entering the proposed reserve from the south, however, vocalizations of howlers were heard, and spider monkeys were subsequently seen and photographed in the first of the foothills above the Bladen. A good account of *Cebus* was also obtained north of the Chiquebul, but these monkeys have yet to be reported in either the Chiquebul or Bladen areas. A much greater survey effort is required to obtain sufficient evidence for a complete evaluation of the reserve and other conservation priorities in Belize, but the prospects for conserving these monkeys become more exciting as relevant information becomes available.

Acknowledgements

Thanks are directed to Mr. O. Rosado of the Ministry of Natural Resources, Belmopan, Belize, for permission to conduct work (Permit No. M9/10/83(214)), and to the members of the 1983 team: Norberto Howe, E. G. Jefferson, R. H. Horwich and E. Johnson. The work was supported by the WWF-US Primate Action Fund and by U.S. Public Health Service Grant RR-00165 (Division of Research Resources, National Institutes of Health).

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Primate Conservation Studies at Universidad Veracruzana, Mexico

Agricultural practices, cattle raising and timber extraction are the main factors threatening primate populations inhabiting the evergreen forest near Sierra de Santa Maria (also called Sierra de Los Tuxtlas), a mountainous region with elevations up to 1,300 meters located in the southern part of Veracruz State, Mexico (Fig. 32). Continued expansion of these land-use practices into more remote areas of the state is resulting in considerable damage to the remaining forest habitat of Mexico's native primate species, the spider monkeys (*Ateles* spp.) and howler monkeys (*Alouatta* spp.). The once continuous rainforest is rapidly being reduced to small segments, separated by large tracts of cleared land which eventually become unsuitable for the farming or pasture for which they were originally intended. As well as these large-scale, systematic forms of forest exploitation are others in which local people utilize a variety of plant and animal species for medicines and foods. Combined, these practices have made it urgent to evaluate the present status of primates in the region and gather information on the short- and long-term effects of contemporary forest use. It is likely that *Ateles* and *Alouatta* may be differentially adaptable to conditions of habitat disturbance. To evaluate the potential for survival of these primates over the long-term it must be determined what ecological changes are taking place.

Since March 1983, we have been conducting a survey in

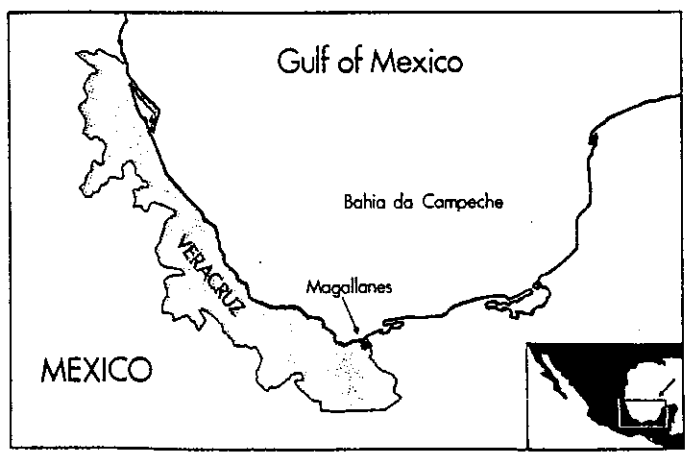

Fig. 32: Approximate location of field studies on *Alouatta palliata* and *Ateles geoffroyi vellerosus* populations in Veracruz State, Mexico.

the state of Veracruz, examining distribution, troop size and composition, habitat preferences and relative population levels of *Ateles geoffroyi vellerosus* and *Alouatta palliata*. Preliminary broad surveys had been conducted in January and April, 1982. The present survey is supported by a grant from the Charles A. Lindbergh Fund, Inc. and support is also received from the Universidad Veracruzana at Xalapa. Our team is gathering additional information on the effects of systematic, large-scale clearance operations, as well as local hunting pressure on primates and other wildlife. Data is currently being gathered from two commercial production units, two municipal urban settlements and five *ejidos* (public land parcels). To date (July, 1983) we have studied several groups of monkeys in 14 forest remnants, most of which are located near the settlements of Magallanes (94° 46'W, 18° 21'N) at an altitude of 100 to 600 meters, and San Fernando (94° 51'W, 18° 18'N) at an altitude of 500 to 1,000 meters (Fig. 32). Most of these forests are located on hillsides and are surrounded by pasture land, crops and secondary growth, two to seven years old. In just a few cases, particularly for the private, commercial production units, patches are surrounded exclusively by pasture.

Preliminary observations indicate that *Ateles geoffroyi vellerosus* and *Alouatta palliata* inhabit forest fragments with a remarkable diversity of plant and animal species and appear to be found in the vicinity of surface water sources (small streams and water holes), which remain in the 2 to 8 hectare fragments. During 69 systematic surveys (552 hrs.) primates were observed for a total of 28 hours. Spider monkeys were encountered most often (12 occasions) and accounted for 72 of the 80 individual primates tallied during the survey. They were contacted primarily in the central portions of forest remnants. Two *Ateles* groups, however, were contacted feeding on the forest edge near areas of secondary growth. Howler monkeys were contacted only twice during the study, a total of 8 individuals being counted. Their calls, however, were regularly heard during the morning and afternoon hours. All spider monkey and howler monkey groups seen were heterosexual, with at least one adult male present. Pregnant females of both species were most often seen during the months of May and June.

The presence of *Ateles* on cultivated land was reported to us by local inhabitants, but was never visually confirmed. Whether these reports are true or not, this species is not considered an agricultural pest by the local farmers.

Research will continue in two areas of extensive forest to serve as comparison with this study. It is a major goal of the Centro de Investigaciones Biologicas of the Universidad Veracruzana to conduct a long-term study on the behavior, ecology and conservation status of wild spider and howler monkey populations inhabiting disturbed and non-disturbed areas in Veracruz State. This project can be considered as the initial part of such a study.

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The Utilization and Conservation of Vervets in Barbados

Barbados is the most easterly of the Windward Islands in the West Indies (Fig. 33). It is a small coralline island (430 km²) emerging from a broad ridge which separates the Atlantic Ocean to the east from the Caribbean Sea to the west. It was colonized by the British in 1627, and in the following fifty years most of the original forest of the interior was cleared. The land was cultivated, wherever topography and soils permitted, with sugar cane becoming and remaining the most economically important crop. Today the landscape is one of undulating hills dissected by deep, wooded ravines or gullies.

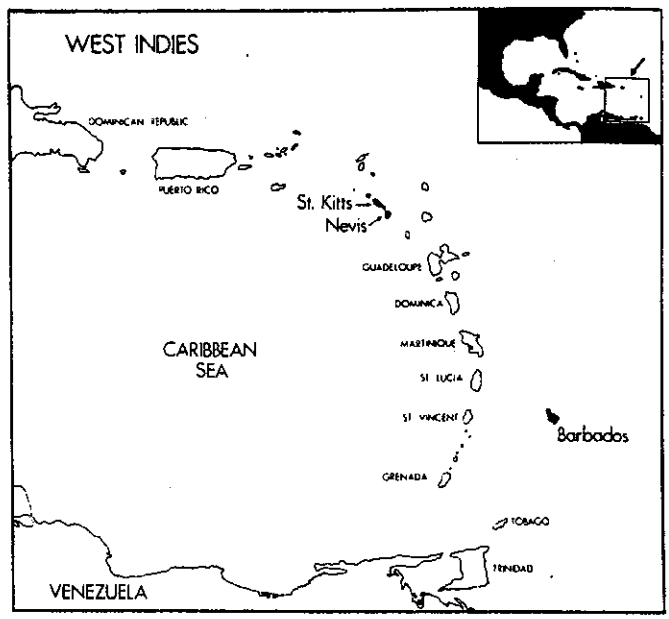

Fig. 33: Location of Barbados among the Windward Islands of the West Indies. Vervets were introduced to Barbados, St. Kitts and Nevis.

Deforestation and monoculture effectively destroyed much of the native flora and fauna. Only small tracts of native vegetation remain; an area of tropical mesophytic forest and some wooded gullies in the interior and patches of coastal forest and mangrove swamp. Few of these areas are completely undisturbed. Today, less than ten species of wild mammals inhabit the island and most were introduced following colonization.

The exact dates of the introductions of the vervet or green monkeys (*Cercopithecus aethiops sabaeus;* Fig. 34) to Barbados and the islands of St. Kitts and Nevis are unknown, although it is thought that they arrived in greatest numbers during the second half of the 17th century. They were probably carried on slave ships leaving West Africa, as pets or gifts for settlers. Exactly where the founding populations originated from is also unknown, but it seems likely that many came from Senegal and The Gambia.

Historical records suggest that monkeys had become a pest on Barbados by 1682, when an act was passed offering a reward for their tails. Over the last thirty years the population has apparently risen, although the first attempt at an accurate assessment of numbers was not made until 1981 (to-

Fig. 34: Juvenile female vervet monkey, age 10 months (photo by Vivian Kellner).

tal population estimated at 5,000-7,000 individuals). During this period agriculture has diversified. In response to falling sugar prices on the world market, cultivation of fruits and vegetables for a resident population of a quarter of a million, and for an annual visitor population of half a million, has been strongly encouraged. Food available to the vervets has therefore increased. Moreover, since gullies are no longer cleared for firewood, cover is more abundant. These factors are probably responsible for the rise in population size.

The vervets feed primarily on crops, but supplement their diets with leaves, fruits, flowers, insects, birds' eggs and occasional nestlings. In response to farmers' demands, the bounty was reintroduced in 1975, and a humane trapping operation was initiated by the Caribbean Agricultural Research and Development Institute in 1979 under the leadership of Mr. Jean Baulu. To date, the latter operation (now run by Mr. Baulu of the Barbados Primate Research Center) has shipped 1,200 vervets primarily to North America for medical research. Trapping is likely to have had a significant impact on the vervet population because the species has been effectively removed from some areas and because certain sex and age groups are more likely to be eliminated from the breeding population.

The Barbados Primate Research Center presently holds about three hundred vervets in captivity. Since the demand for vervets in the manufacture of polio vaccine has decreased, Mr. Baulu has been seeking new markets for the animals, e.g., one group was recently sent to the Bremerhaven Zoo, West Germany. Some of the animals are utilized locally as educational exhibits, tourist attractions and subjects for medical research into leptospirosis in a project run jointly by Mr. Baulu and Dr. Chris Everard of the Medical Research Council (U.K.).

As a behavioral ecologist my research has primarily involved studying feral troops (Fig. 35). Life history data collected from feral animals, supplemented by the analysis of

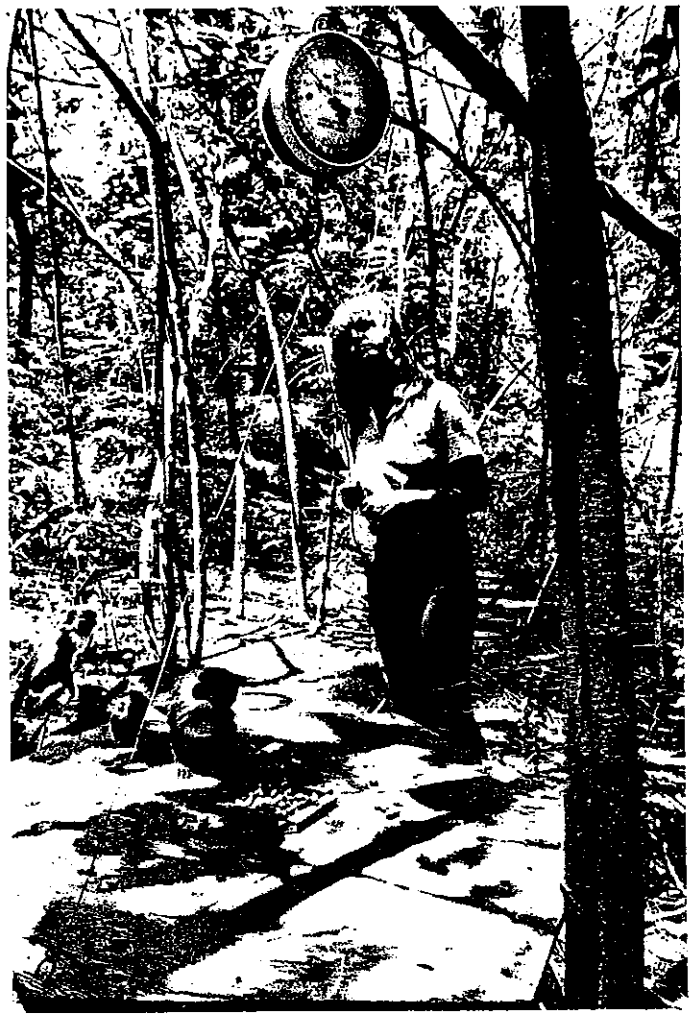

Fig. 35: The author luring feral vervets onto a weighing platform (photo by Vivian Kellner).

catch statistics from the trapping operation, will provide the fundamental information required before an estimate of sustainable yield can be made. The major component of my research is an investigation of the effects of social behavior on the demography of feral troops. The future of the vervet population in Barbados depends on striking a balance between the government's demands for elimination and/or economic exploitation and the ecologists' demands to conserve a thriving population of vervets on what is an island already depleted in faunal diversity.

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Primates of the Kilimi Area, Sierra Leone

The March 1983 issue of the PSG Newsletter contained a preliminary report of the primates and large mammals found in the Kilimi region of northwest Sierra Leone (Fig. 36), one of two areas selected by the government of Sierra Leone for incorporation as the country's first national park. Provided

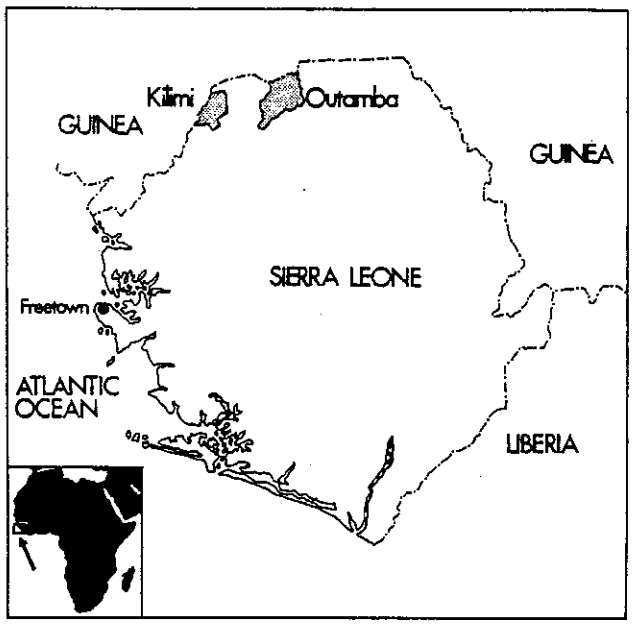

Fig. 36: Sierra Leone, showing the location of both the Outamba and Kilimi areas.

below is a detailed description of the different primate species which were identified during a census by the author which lasted from October, 1981 until June, 1982, and was funded by the WWF-US Primate Action Fund, the Charles A. Lindbergh Fund and the National Geographic Society.

Sooty Mangabey ***(Cercocebus torquatus atys):*** Eight mangabey groups were identified, in sightings which ranged from 3 to 37 animals. There is thus a minimum of 115 mangabeys in the reserve, with a mean group size of 14.4 animals.

Mangabeys are said by the Kilimi villagers to be crop raiders, and the monkeys' reluctance to be approached by humans confirms that they are treated as such by farmers. Because of the animals' shyness, our estimates of group size and overall numbers are probably too low. Mangabeys were seen in association with Campbell's mona monkeys along the Dugaia stream and with both black-and-white colobus and red colobus along the Kolenten River (Fig. 37). Almost all observations were made within forest, although some mangabeys were seen in trees growing in the midst of farm bush. Some of these animals crossed on overhanging branches from the Sierra Leone mainland to an island in the middle of the Kolenten near Kankan village during February and

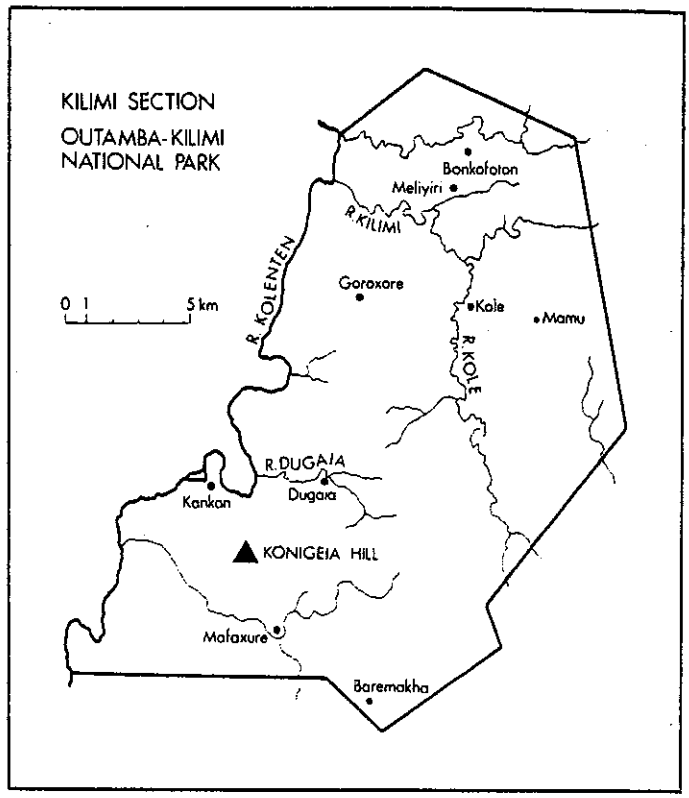

Fig. 37: The Kilimi area of northwest Sierra Leone, showing localities and features mentioned in the text.

March, and it is possible that as water levels dropped later in the dry season, they may have completed the crossing from the island to the Guinea shore.

Campbell's Mona Monkey ***(Cercopithecus campbelli campbelli):*** There are at least 23 groups of mona monkeys in the Kilimi area, plus another seven groups identified by vocalizations only. They were seen in groups ranging in size from 1 to 24, with a mean group size of 7.7 animals, and we estimate a minimum of 176 for the reserve.

Mona monkeys appear to thrive in secondary vegetation, particularly the dense thorn thickets that grow in younger farm fallows. Apart from baboons, they are the most numerous primates at Kilimi, and their characteristic croaking vocalization could be heard in most of the surviving patches of forest in the area, including such disparate habitats as the riverine forest along the Kolenten and the upland deciduous forest atop Konigeia hill in the southern part of the reserve. They were seen in association with mangabeys along the Dugaia stream and in the nearby Mayin forest, and fed together with spotnosed monkeys in Taxure forest adjacent to Goroxore village. Most of these associations were probably brought about by the limited amount of habitat available, however, and did not result from true preference. Their survival in such numbers at Kilimi is doubtless associated in some way with their affinity for secondary vegetation, but just what advantage they derive from this particular habitat remains to be investigated.

Spotnosed Monkey ***(Cercopithecus petaurista buttikoferi):*** Only one group of this species was found in Kilimi proper, although another group was spotted along the Guinea shore on the northern section of the Kolenten. The Kilimi troop, seen on 17 different occasions in the Taxure forest next to Goroxore village, numbered at least 14 animals, and was invariably seen in association with a resident group of mona monkeys. Spotnosed monkeys, basically forest creatures, seem to have adjusted less well than the congeneric monas to the reduction in forest cover that has taken place in Kilimi in the historic past.

Green Monkey ***(Cercopithecus aethiops sabaeus):*** Another of the area's major crop-raiding monkeys, the green monkey was very leery of human beings, and hence our census of these animals undoubtedly underestimates their real numbers. We believe that there are at least 16 groups of green monkeys in the reserve, with a total of 118 and a mean group size of 7.4 (also an underestimate). Sightings ranged between a lone animal and 36, and it is likely that the true mean group size is closer to 36 than it is to 7.4.

Green monkeys were typically found around farms after harvest time and near fruiting orange trees. In keeping with their habits elsewhere in Africa, the Kilimi green monkeys were more terrestrial and more likely to spend their time out in the open than either of the other two *Cercopithecus* monkeys found there. Like mangabeys, green monkeys were seen crossing over to the island near Kankan, and it is possible that during the latter part of the dry season the group's range extended into Guinea.

Red Colobus ***(Colobus badius badius):*** We estimate that a minimum of 30 red colobus still remain in Kilimi, living in four main groups with an average group size of 7.5 and sightings ranging from 1 to 20 animals. To our surprise, one lone red colobus appeared in Taxure forest near Goroxore in March, where it associated with the resident troop of black-and-white colobus. Because Taxure is a very small forest and we visited it regularly, we are quite sure that this animal was a new arrival; however, we were unable to find any trace of its parent troop in the nearest likely forests.

Red colobus were invariably seen in association with black-and-white colobus, although black-and-white groups without accompanying red colobus were common. Both animals have been well studied elsewhere in Africa, and it is known that their social organizations and diets differ considerably; as a result, they do not normally associate closely and so this finding was unexpected. It is noteworthy, however, that with the exception of a large group inhabiting the riverine forest just north of the point where the Konsilika stream flows into the Kolenten, the red colobus groups were much smaller in size than is usual elsewhere in Africa. It is thus likely that reduced forests have forced the few remaining red colobus to associate with their black-and-white congeners wherever they are found, while the latter animal's ability to rely more heavily on a leafy diet allows them to survive where red colobus cannot. Finally, red colobus were only seen in areas where both year-round water and tall trees could be found.

Black-and-White Colobus ***(Colobus polykomos polykomos):*** Eighteen groups of black-and-white colobus were identified, living in groups with a mean size of 3.3 animals, making a minimum of 71 colobus of this species for the Kilimi area. Sightings ranged from a lone animal to 10.

Black-and-white colobus groups were distributed in much the same way as their red cousins — tall trees and permanent water sources seem to be a *sine qua non* — but, as pointed out above, their ability to make a greater use of leafy material enables them to survive where red colobus cannot. On the other hand, the Kilimi black-and-white colobus also live in smaller than normal groups, indicating that they, too, are not immune to the effects of reduced forest cover. We were told by a villager that the black-and-white colobus of Mayin forest, adjacent to Dugaia, migrate seasonally through the trees along the Dugaia stream down to the Kolenten River. We were and remain skeptical of this assertion because farming has destroyed the tree cover along sizeable portions of the stream, thus interrupting the alleged aerial pathway. Yet on a day when we were investigating a portion of the Dugaia streambed near the Kolenten where the trees are no taller than 10 m, we startled a black-and-white colobus, which then leaped to the ground and ran off. This information is reported simply to show that these animals may well be more mobile than they are usually thought to be.

Guinea Baboons ***(Papio papio):*** Baboons are among the most frequently seen primates in the Kilimi area, but because of their mobility, the large size of their troops, and the amount of farm bush in the areas they frequent, it is extremely difficult to get a complete troop count each time they are encountered. Nonetheless, we estimate that there were 9 different troops that include Kilimi in their range, with another 3 troops which we saw so fleetingly that a count was not possible. Including what were undoubtedly partial censuses, sightings ranged from 20 animals to 134, resulting in a mean group size of 78 animals. Because we know that some of our censuses were incomplete, and because the counts of which we were most confident produced higher numbers, we feel that the mean baboon troop size at Kilimi is probably well over 100 and possibly closer to 150. If that is the case, then the baboon population at Kilimi must be somewhere between 700 (a minimum figure, treating each partial count as if it were a full troop) and 1,350 (assuming 9 troops with a mean size of 150 animals each).

Baboons, in any case, are thriving at Kilimi. As quintessential omnivores, they eat growing crops, threshing floor remnants from rice farms, and both cultivated and wild fruits. They are in competition with farmers, green monkeys, and mangabeys for the cultigens, and with every other primate (but principally chimpanzees) for the fruits, but still survive handily. No evidence of baboon predatory behavior, common elsewhere in Africa, was seen. Finally, baboons were among those primates observed crossing to the island near Kankan toward the end of the dry season, and thus the troop involved may have a range which extends across the border into Guinea.

Chimpanzee ***(Pan troglodytes verus):*** Because of their great mobility, tendency to fragment into smaller groups, and ex-

treme shyness, the chimpanzees at Kilimi were the most difficult animals of all to census. Our estimate of total chimpanzee numbers at Kilimi follows:

	Group A	Group B	Group C	Group D	Total
Maximum	30	29	27	12	98
Minimum	12	22	10	5	49
Best Estimate	30	25	15	5	75

To err on the side of conservatism, then, the probable number of chimpanzees with all or part of their range in Kilimi during the dry season lies somewhere between 60 and 75 animals.

During the dry season, chimpanzees in Kilimi appear to frequent and move along wooded ridges and streambeds, whether or not there is water in the streams. These areas provide them with cover for movement, water from time to time, sleeping sites, and most importantly food. Their movements are heavily influenced by the availability of specific foods, particularly the fruits of *Parinari excelsa, Dialium guineense,* and *Chlorophora regia.* The groups proposed here are not necessarily closed or their members unknown to one another. On the contrary, if field studies on chimpanzees elsewhere in Africa can be taken as models, exchange of individuals and small parties between these "groups" is probably frequent. The population of chimpanzees in Kilimi may in fact represent one or possibly more of the larger groupings called "communities" by researchers at Gombe National Park or "unit-groups" by Japanese workers in the Mahale Mountains of Tanzania. Only a study in-depth over a several year period could answer this question.

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Update on the Pygmy Chimp in Zaire

The Lomako Forest Pygmy Chimpanzee Project proceeds at the present time with funding from the National Science Foundation and the World Wildlife Fund — U.S. Our work on the ecology and behavior of *Pan paniscus* (Fig. 38) continues with present focus by Stony Brook graduate student Frances White on feeding ecology and its effect on social dynamics and population structure. In addition, another Stony Brook graduate student, Suzanne Zeeve, is looking at the synecology and comparative interactions of black mangabeys *(Cercocebus aterrimus),* red-tail *(Cercopithecus ascanius),* mona *(Cercopithecus mona;* Fig. 39) and black-and-white colobus *(Colobus angolensis)* in the Lomako Forest study site (Fig. 40).

Meanwhile information continues to accumulate on the illegal hunting and trapping of pygmy chimpanzees throughout the Equateur region of central Zaire. On a visit to Zaire last spring and summer, first hand information was obtained on the illegal shipping of pygmy chimpanzees to individuals and animal dealers in Europe. In March of last year we received a reliable report (from an American scientist visiting ape colonies in Europe) that there were 12 pygmy chimpanzees illegally for sale in Belgium. Other documents con-

Fig. 38: A female pygmy chimpanzee with infant at the San Diego Zoo (photo by Andy Young).

Fig. 39: Mona monkey *(Cercopithecus mona),* one of several primate species included in a synecological study at the Lomako Forest Pygmy Chimpanzee Project (photo by R. A. Mittermeier).

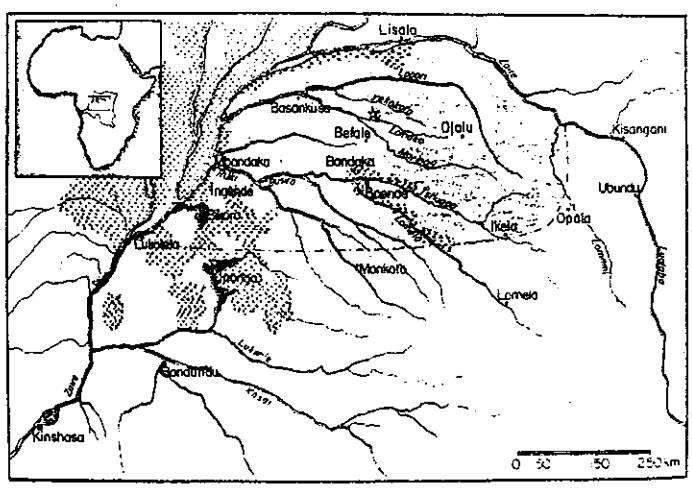

Fig. 40: The location of the Lomako Forest Pygmy Chimpanzee Project study site (indicated by star) in the Equateur region of central Zaire.

firming the smuggling of common and pygmy chimpanzees to Brussels were provided last summer by the International Primate Protection League. In conversations with customs officials at N'Djili airport in Kinshasa it was learned that, in mid-June of 1983 five young chimpanzees were shipped out of N'Djili to Europe even after their seizure by customs agents.

Many people in Zaire are making an effort to enforce the restrictions on the illegal exportation of *Pan paniscus* and other animals. Stopping the traffic in apes is particularly difficult, however, due to the comparatively high prices that common, and especially pygmy chimpanzees, bring in Europe and the East. Moreover, there is no program for confiscating and housing primates either at N'Djili or elsewhere in Kinshasa at the present time. Exactly what happens to contraband animals that are confiscated by authorities is unclear. We suspect that most die in confinement. A program for the housing and care of contraband chimpanzees is urgently needed. If a program and facility to house confiscated animals were in place we are certain that officials would be more receptive to dealing with the problem of illegal trafficking.

We reported in 1981 that threats to the future of natural populations of pygmy chimpanzees in the Equateur were principally from hunting, human encroachment (habitat destruction) and logging (large scale foreign operations) (Susman, et al., 1981). Little has changed since our last report with regard to the first two, but with regard to the logging problem we are encouraged by initial efforts to remove an area of undisturbed rainforest from exploitation by commercial loggers. The area in question is one of roughly 50,000 ha bordered by the Lomako and its watershed to the north (Fig. 41). This is an area where our research group, under the auspices of the Institut de Recherche Scientifique (Kinshasa) has been working since 1980. Another area to the southeast, where a Japanese team has been working since the mid-1970's, appears to be safe from the threat of deforestation for the time being.

Hunting continues to exert significant pressure on pygmy chimpanzees throughout their range. Last summer, as on all

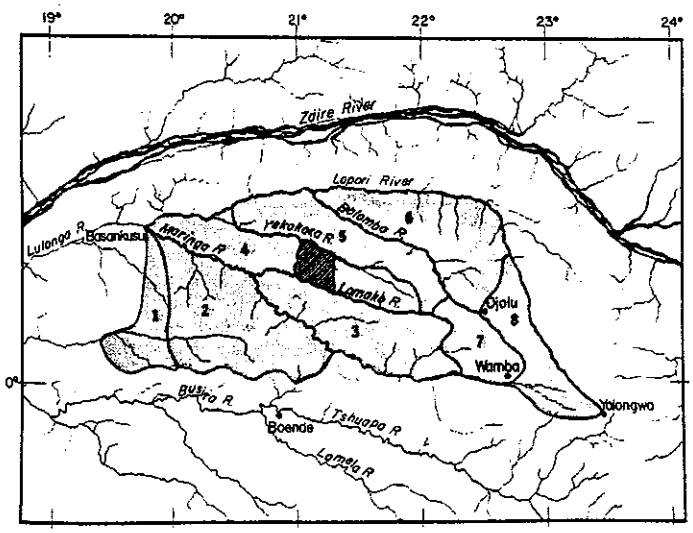

Fig. 41: Location of the Lomako Forest study site in relation to a major logging concession (area 4) and other tracts which have been surveyed by lumbering companies.

our previous visits to the study site, an infant pygmy chimpanzee was brought to our camp for sale by hunters. It soon died, as have all animals that we have known to be captives for pets or for sale. Hunting of *Pan paniscus* is seemingly even more widespread in lower Equateur. Kabongo reports that at Botwali, Nkoso and elsewhere in the Lake Tumba area, the hunting and killing of pygmy chimpanzees is uncontrolled (Kabongo, in press). The hunting of *Pan paniscus* in the lower Equateur is a very profitable activity, especially for the middle-men who buy the animals from the poachers. The middle-men then sell the infants and juvenile apes to foreigners for resale to individuals who market them to zoological gardens, laboratories (in Europe and Asia), and to the pet trade (mostly through Belgium). As is the common practice elsewhere in Africa in the great ape trade, mothers are usually killed and their dependent offspring are taken.

There are three principal reasons for pygmy chimp predation (Kabongo, in press). The first involves the local practice of eating pygmy chimpanzee meat by the Ntomba people in the area around Lake Tumba; the second is the use of pygmy chimpanzee bone for religious practices, as it is felt that these bones provide super-human strength; and third, young pygmy chimpanzees bring high prices from foreign traders (a young *Pan paniscus* can bring 500 Zaires, approximately $16 US, where a month's wages might be only 120 Zaires). Kabongo reports that the illicit pet trade is the fastest growing source of exploitation by the Ntomba.

In the Lomako, pygmy chimpanzees are also hunted. The scale of the depredation is lessened by the relative remoteness of the area compared to the more populous and accessible Lake Tumba area. Nonetheless, the economic hardships wrought by the present economic situation throughout Zaire encourage the exploitation of all of Zaire's wildlife. Elephants are fast disappearing, large mammals such as the okapi are being depleted in the eastern part of the country, the northern white rhinoceros is all but gone, and many other species of Zaire's wildlife are in peril.

The present conservation situation for *Pan paniscus* is bleak. No survey exists at present to indicate the number of pygmy chimpanzees left in the wild. Many people have speculated on the actual numbers of pygmy chimpanzees left, but few have had the courage of Kano or Nishida, who actually traveled the difficult roads of Equateur to try and determine the facts. People still feel that museum collection localities can provide the necessary information even though these records often provide little more than a record of where local hunters met museum agents along the roads as the latter made rounds purchasing specimens for museum collections. We do know from our experience in Zaire and that of others, that hunters and fishermen may take their products great distances in order to sell them in the local market centers. One thing we do know about the distribution of *Pan paniscus* is that their range has been shrinking at a steady and continuing rate. We know from people living in the area between Boende and Befale that up to and including the 1930's pygmy chimpanzees were not uncommon in the forests around the Zonal Center of Befale, some 80 km north of Boende. It is interesting to note that the type specimen of *Pan paniscus* was collected at Befale in 1927 (M.R.A.C. 3228). Today the forests in the vicinity of Befale are deplet-

ed and no reliable reports of pygmy chimpanzees have been received. From what little information we have, it is unlikely that a significant pygmy chimpanzee population remains between the Maringa and Lomako Rivers in the area north of Befale.

Although there is a competent and hardworking core of scientists and students in Zaire who are studying natural history and encouraging foreign research projects, officials in Kinshasa are hamstrung by a lack of funds. Outside interest in Zaire's vast natural resources, including timber and precious wood, continue to exert pressure on the natural environment. There can be little doubt that given present trends, pygmy chimpanzees, like other large mammals, will be depleted and relegated to patchy breeding isolates and finally wiped out. The opportunity to gather meaningful data in a "naturalistic" setting will vanish even sooner. Where once pygmy chimpanzees ranged from Angola to the left bank of the Zaire River (perhaps as late as the mid-17th century; Reynolds, 1967), they today occupy only a small percentage of this range.

The time seems ripe for a concerted effort to save the pygmy chimpanzee. Our own experience in Zaire at Lake Tumba and in the Lomako Forest gives us some cause for optimism that with modest financial backing a meaningful conservation effort could be made. We hope that financial support for protecting the pygmy chimpanzee will be forthcoming before it is too late.

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Conservation of the Virunga Gorillas

Zaire, Uganda and Rwanda all share the Virunga conservation area (Fig. 42). In 1976, Rwanda removed all livestock from its section, the 120 km² Parc National des Volcans. In 1978, the Park's guard force was tripled. In 1979, a major conservation program for the Park, the Mountain Gorilla Project (MGP), was initiated in Rwanda and is still continuing. Over the same period, the contiguous 225 km² Parc National de Virunga-Sud of Zaire experienced no comparable improvement of protection, initially because of lack of funds. Neither has there been any improvement in Uganda's adjacent 30 km² Gorilla Game Reserve. Obviously, a major

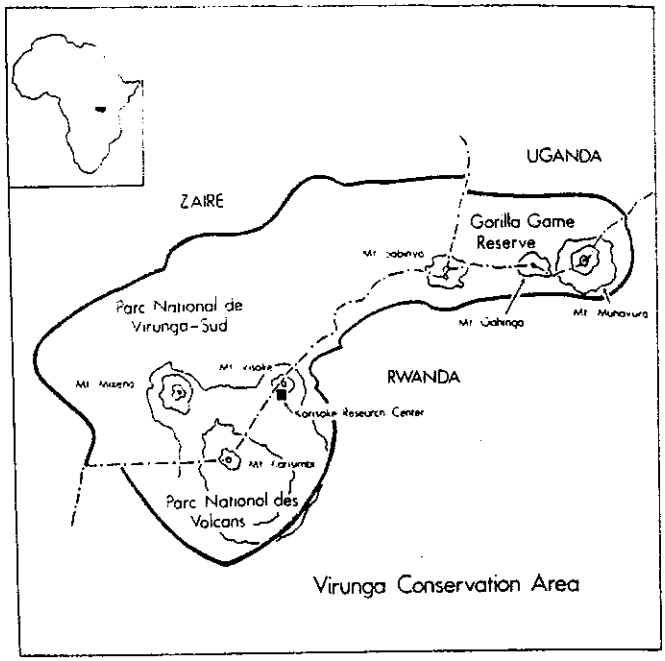

Fig. 42: Virunga conservation area on the borders of Rwanda (Parc National des Volcans), Zaire (Parc National des Virungas-Sud) and Uganda (Gorilla Game Reserve).

Fig. 43: Mountain gorilla mother and infant (photo by A.H. Harcourt).

question is whether Rwanda's efforts have improved the prospects for survival of the Parc National des Volcans, and particularly its gorillas (*Gorilla gorilla berengei;* Fig. 43).

Comparison of the 1981 census of the Virunga gorilla population with the three censuses of the early seventies shows with little doubt that Rwanda's efforts for increased protection have improved the health of the gorilla population of the Parc National de Volcans, and therefore of the Virungas. Since the early seventies the whole Virunga population appears to have remained stable within the limits of accuracy of the censuses. However, if the 7% drop from 275 to 255 animals is real, then a significantly greater proportion of the decrease occurred in Zaire than in Rwanda. The difference is demonstrated by the change in the number of immatures: Zaire showed a 22% decline, while in Rwanda immatures *increased* by 17%. Analysis of the immature section of the pop-

ulation indicated that the increase began in Rwanda around 1976. In 1981 the countries differed little with regard to the proportion of subadults (born between 1974 and 1976) in their respective populations: 14% in Rwanda and 10% in Zaire. However, Rwanda's juvenile and infant representation (born from 1976 on) of 34% was nearly twice that calculated for Zaire, 18.5%, constituting a significant difference.

The finding that within the separate populations the level of protection was positively correlated with the proportion of immatures in the population (the measure of population health used here) substantiates the claim that the improved protection given to the Rwandan population is the cause of the differences seen.

In the three divisions of the Rwandan sector and the two of the Zaire sector, the extent of poaching (measured by % of area surveyed in which snares were found) was inversely related to the percentages of immatures in the region, a correlation that cannot be explained by habitat differences between the divisions (Table 1).

Table 1: Relationship of percentage of immature gorillas in the population to degree of poaching in an area

	% Poaching	% Immatures
Rwanda		
Division 1	71.2	33.0
Division 2	47.7	43.6
Division 3	16.7	50.85
Zaire		
Division 1	70.2	25.4
Division 2	19.4	39.0

Protected groups (those monitored almost daily in Rwanda; in Zaire, those that range near guard posts) contained more immatures than did unprotected groups (Table 2).

Table 2: Relationship of percentage of immature gorillas in a population to the status of gorilla groups (protected vs. unprotected)

	% Immatures	
	Protected Groups	**Unprotected Groups**
Rwanda	47.1 (n = 7)	39.1 (n = 5)
Zaire	43.3 (n = 3)	30.3 (n = 13)

The Rwandan conservation program, the MGP, was not exclusively concerned with the protection of species. Two other major projects were conservation education and tourism development. The effects of the education program, because of its nature, are difficult to quantify. Park receipts, however, give an immediate measure of the success of the tourism Program (Fig. 44). Since the MGP began in September 1979, park receipts have increased dramatically. Of course, tourism has many disadvantages, but the MGP is tightly controlling tourist visits to the gorillas and the Karisoke Research Center is monitoring the effects of tourism on the park.

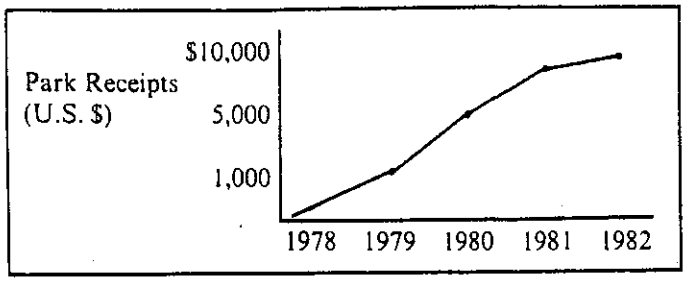

Fig. 44: Park receipts at Parc National des Volcans, Rwanda, since 1978.

The successes in Rwanda do not mean that the Virungas or their gorillas have been saved. In the first place, gorillas are still being killed — something that is going to be impossible to eradicate until the buyers of gorilla infants and skulls are themselves eradicated. Secondly, the burden of saving the gorillas cannot be Rwanda's alone. Happily, the Zaire government has now initiated steps to start a conservation program in the Kivu Province, which includes the Virungas. As always, though, money is needed to get the project off the ground. The aid will have to be on the scale provided for Rwanda's Mountain Gorilla Project, and it needs to be provided rapidly before the drop in immature numbers in the Zaire population causes a bottleneck in the number of breeding females, a problem from which the population will not be able to recover.

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Progress Report on Mahale National Park

A plan to construct a new national park in the Mahale Mountains, on the eastern shore of Lake Tanganyika (Fig. 45), is making slow progress. In 1979, the Director of the Tanzanian Wildlife Division stated that Mahale would soon be gazetted as the country's 11th national park and that, along with Gombe National Park, it would be a splendid sanctuary for wild chimpanzees. In 1980, specialists of the Land Office of Kigoma District began surveying the area and in the succeeding year they finished field work (including cutting boundaries), assisted by a British volunteer, Mr. Steven Homewood. In 1982, the surveyors submitted the report to the Wildlife Division. At last, the due formalities for gazetting have begun in Dar es Salaam.

The name of Mahale is still unfamiliar to ordinary tourists in Tanzania, but is well known among field primatologists for its chimpanzees and long-term research. The junior author initiated the chimpanzee research projects in Mahale in 1965. Since then, Japanese scientists have been collecting vast amounts of data, not only on chimpanzees, but also on the other fauna and flora, climate and ethnography present. Their findings show that east and west African biogeographic zones meet in Mahale making a unique mixing of flora and fauna. The topographical diversity created by high mountains and Lake Tanganyika is responsible for producing a peculiar series of vegetation types. Both tropical rain forest and dry woodland, which is generally referred to as Miombo

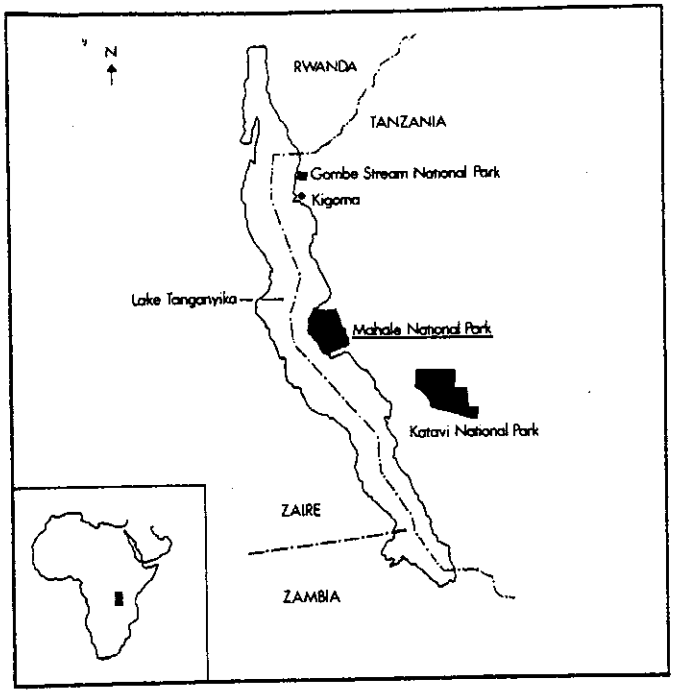

Fig. 45: The location of the proposed Mahale National Park in Tanzania in relation to Gombe Stream and Katavi National Parks.

woodland, exist and the highlands, which are 2,000-2,400 meters above sea level and about 50 km in length, are covered with montane forest, grassland and Alpine bamboos. In this setting live approximately 700 chimpanzees, constituting the highest population density to be found in Tanzania.

Deciding to protect about 1,600 km² at Mahale as a new national park, the government of Tanzania requested that the Japanese government formulate a master plan and an implementation program. In compliance with this request, Japan International Cooperation Agency has been sending primatologists to Mahale since 1975, along with a study team of ecologists, park planners and civil engineers in 1979. This team submitted its final report to the Tanzanian government in 1980. The implementation program provided for park infrastructure, construction of a ferry, a head office, a museum, staff housing, and so on. The project's cost was estimated at 4 million US dollars. If the plan is realized, the proposed Mahale National Park would have one of the best facilities and management systems of any of Africa's national parks.

However, a financial problem has arisen. A recent economic deadlock in Tanzania prohibits development of Mahale. Although the Tanzanian government has requested aid and grants from Japan and other countries for such things as road construction, harbor construction and food importation, it does not consider nature conservation and the Mahale project urgent, and therefore has not made formal requests for aid in this regard. Even though over 50 primatologists worldwide wrote letters to the Japanese Prime Minister in 1980 recommending that Japan offer assistance for Mahale National Park, this reluctance on the part of the Tanzanian government to formally request such assistance has been a major obstacle.

Preparation for opening the new park is, however, proceeding gradually. Legal formalities for gazetting this area are expected to be completed within the year. For the time being, the staff of Mahale Mountains Wildlife Research Center (MMWRC) are engaged with protection of wildlife in this region. Moreover, thanks to donations by the Japanese people and private companies (ca. $52,000), a liaison office of MMWRC was built at Kigoma and an airstrip at Mahale is under construction.

Poaching and illegal exportation both have been responsible for diminishing wild populations of West Africa's chimpanzees in recent years and it is important that every effort be made to protect those that remain. Mahale, with a large and healthy chimpanzee population, represents a priority area for primate conservation in Africa.

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The Status of De Brazza Monkeys in Kenya

The De Brazza monkey *(Cercopithecus neglectus)* is one of the handsomest but least known of the African forest primates. In kiSwahili the animal is known as *Nyani ya Ndefu*, the bearded monkey, because of its most striking feature, a long, white beard that is accented by the bright reddish-orange forehead (Fig. 46). The De Brazza lives in small groups and travels within a very small home range. It is a heavily built animal, males being larger than females. When undisturbed, the species moves slowly and silently through the forest, and when trying to escape humans, prefers to

Fig. 46: The De Brazza monkey *(Cercopithecus neglectus)* (photo by R. A. Mittermeier).

climb down to the ground rather than jump across to nearby trees. It is an incredibly shy animal whose overall strategy is to avoid attracting attention. Undoubtedly, the scarcity of information from the wild is due to this species' secretive nature.

The condition of wild De Brazza populations is not well documented, although Kenya is the first country to make any attempt to determine the status of its De Brazza population. In this country, the species is now restricted to the isolated swamp forests in the Trans-Nzoia plains, near the city of Kitale (Lat: 01° 00'N, Long: 35° 00'E).

De Brazza monkeys in Kenya were first reported to be rare and in need of protection in 1966, by Osman Hill. Despite his warning, however, no conservation efforts were ever made to ensure their survival, and only in 1983, with support from the WWF-US Primate Action Fund, and under the sponsorship of the Institute for Primate Research, National Museums of Kenya, was a survey of this population conducted to determine its present status. The aims of my study were to determine the number and distribution of the species, and to document the extent of the pressures threatening its survival.

A census of the Trans-Nzoia area located only 54 remaining De Brazza, although several other sites were identified where local people reported that the species still lives nearby. All the animals I found inhabited riverine forests along swampy banks of rivers or streams. My data suggest that the total De Brazza population in Kenya may now be only 100 to 150 animals.

Within Kenya, De Brazza are legally protected at one site, Saiwa Swamp National Park. Saiwa is a small park of 191.7 ha, of which only 78.8 ha are suitable habitat for the De Brazza monkey. Because of this fact, this area was studied intensely to evaluate its conservation value. A total census and habitat evaluation of the Park determined that the current population of De Brazza within the Park is 28, while the carrying capacity for this area is estimated to be 31. Thus Saiwa may already contain the maximum number of De Brazza that this habitat can support. Furthermore, it is believed that Saiwa may be too small an area to support a genetically viable population of De Brazza and therefore does not represent a long-term conservation site.

The major threat to the De Brazza throughout the Trans-Nzoia is deforestation. With the exception of the few De Brazza found within Saiwa Swamp, all the remaining animals are located in isolated forest pockets amidst expanding farmlands. Remnant forests are either being cleared or, according to development schemes, scheduled for clearing. The riparian forests are being lost as their undergrowth is cut away or grazed out, and what remains quickly becomes unsuitable habitat for this species. The clearing of these forests has now served to isolate groups of De Brazza into small forest islands, where they have little chance of reproducing.

Thus the results of this work indicate that the Kenyan population is threatened by the loss of habitat, reproductive isolation, and decline in numbers due to predation by humans who kill them either as agricultural pests or as a source of food. It is believed that if the current trends continue and no attempt is made to try to conserve the remaining De Brazza and its habitat, the species faces certain extinction in Kenya.

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Primate Conservation and the Gunung Leuser National Park, Indonesia

The variety of tropical rainforest ecosystems of northern Sumatra harbor a tremendous abundance and diversity of flora and fauna. Most of the region, however, has been converted to agriculture or exploited for timber, and what remains of the prime lowland areas is continually under pressure for timber and agricultural development. Much of the mountainous interior of Aceh and North Sumatra provinces remain unexploited, and it is here where forest and wildlife conservation efforts are the most feasible. A faunal boundary marking changes in species composition occurs across northern Sumatra at the Simpangkiri and Wampu rivers north of Lake Toba. North of this line lie most of the approximately 946,000 hectares of the Gunung Leuser National Park (Fig. 47), which is administered by the Department of Nature Conservation of Indonesia's Ministry of Forestry.

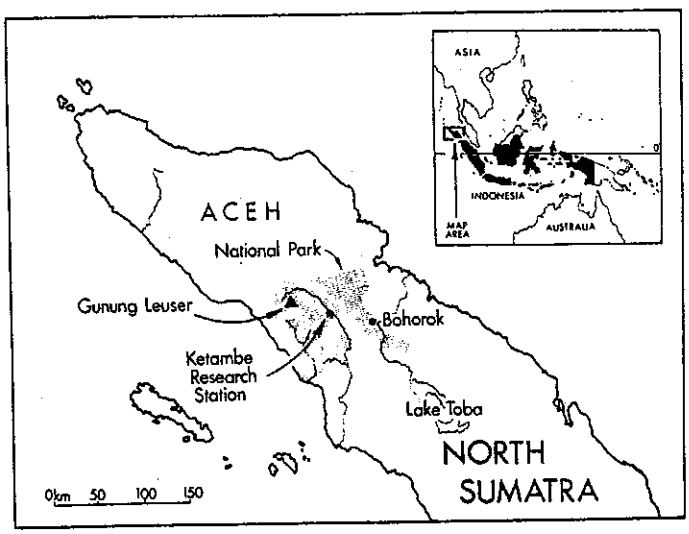

Fig. 47: Gunung Leuser National Park, North Sumatra. Taken from a map by H.D. Rijksen, *Meded. Landbouwhogeschool Wageningen* 78-2 (1978).

Established in 1934, the complex of reserves that formed Gunung Leuser grew in size until 1980 when the area became one of Indonesia's first national parks. It is one of the largest and most important conservation areas in southeast Asia. The Park consists of a wide variety of habitat types ranging from coastal mangrove and lowland rainforest to sub-alpine elfin woodland and *"blang"* (grasses and sedges with dwarf shrubs). Four broad altitudinal zones indicate gross changes in rainfall, temperature, forest structure and floristic composition: 1) below 600 m (Tropical Lowland), 2) 600-1500 m (Tropical Upland), 3) 1500-2500 m (Montane Zone), and 4) more than 2500 m (Sub-Alpine Zone). These altitudinal zones represent approximately 12%, 48%, 35% and 5% of the park respectively. Sumatra's second highest mountain, Gunung Leuser (elev. 3,500 m), is located in the north-western sector of the Park. Most of the area is very steep and deeply intersected by rivers; and, next to the rich but threatened lowland areas, the Kapi Plateau, Blangbeke Trench and Bengkong Plateau are most likely the best areas for wildlife.

The fauna is closely allied to that of the Malay Peninsula; and some of the larger mammals of the Park are the Sumatran rhinoceros, elephant, tiger, clouded leopard, sun bear and dhole (wild dog). Over half of all Sumatran vertebrate species have been found within the Park (approximately 105 mammals, 315 birds, 76 reptiles and 20 amphibians) but much of the reserve is poorly known. About three-quarters of these species are probably dependent on zones below 1500 m. The Gunung Leuser National Park may be considered as the last stronghold for the Sumatran orang-utan (*Pongo pygmaeus abelii*; Fig. 48), and since 1971 much publicity has been given to rehabilitation now centered at Bohorok on the eastern park boundary. Seven other primate species are also known within the Park: two gibbons, the siamang *Hylobates syndactylus*) and the white-handed gibbon *Hylobates lar*); two langurs, Thomas' leaf-monkey *Presbytis thomasi*)

Fig. 48: The Sumatran orang-utan is endangered and the majority of the population are dependent on the forests of Gunung Leuser National Park.

and the silvered langur (*Presbytis cristata*); two macaques, the long-tailed macaque (*Macaca fascicularis*) and the pig-tailed macaque (*Macaca nemestrina*); and a nocturnal prosimian, the slow loris (*Nycticebus coucang*). In addition to these eight, two more primate species may exist within the Sibayak Range south of the Wampu River: the dark-handed gibbon (*Hylobates agilis*) and the banded langur (*Presbytis melalophos*). The Gunung Leuser National Park must be considered one of the highest primate and forest conservation priorities in southeast Asia.

Ketambe Research Station is located in the Park at a 1500 ha study site at the confluence of the Alas and Ketambe Rivers. Since the station's establishment in the early 1970's, investigations have been made by several researchers on wild primates, most notably the orang-utan. The forest at Ketambe is an ideal site for primate studies due to the abundance and relative ease of habituating the six resident species. It also has great potential as a training center for Indonesian students of wildlife and forest ecology. The research station, consisting of a main building (Fig. 49) and several small houses for field workers, was formally opened in 1979.

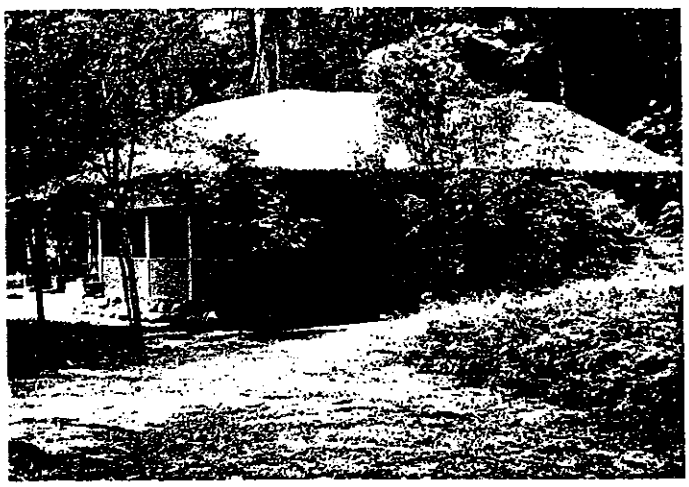

Fig. 49: The Ketambe Research Station's building was completed in 1979. Funds are needed for repairs and annual maintenance.

Fig. 50: Shifting cultivation is a constant pressure to the borders of the Park. The needs of the villagers will have to be reconciled with forest protection.

Since then, deterioration has proceeded rapidly and all buildings are in need of repair and annual maintenance. Surveys to determine the distribution and abundance of primates elsewhere in the National Park are needed. A categorization and mapping of habitat types throughout the Park, an assessment of their relative importance to the eight species of primates and identification of trends that are endangering each habitat and primate will become increasingly important for management.

Severe threats to the Gunung Leuser National Park include shifting cultivation (Fig. 50) and unregulated hunting in some areas. Assistance to the National Park staff is needed in order to improve relations with people living in the Alas Valley and in villages surrounding the Park. Revival of a public awareness program, active in the 1970's, would involve the development of a mobile unit that periodically visits villages and schools of people living near the Park. In addition to promoting good relations between villagers and Park staff (which is vital for Park management and protection), the mobile unit team would be responsible for assessing local attitudes and the extent of land-use threats to the Park in each area visited. Assessments of local impacts on wildlife, such as hunting and pest control (e.g. crop-raiding by macaques and other animals), will be needed to identify the main problem areas. Also useful for primate conservation in northern Sumatra are studies that assess the impact of habitat alteration on primate abundance, distribution and ecology. Commercial forests are vital to primate conservation since most of the forests of northern Sumatra have been or soon will be logged. The area of forest left undisturbed in reserves, however, will be extremely small by comparison. How logged forests are managed will have important implications for primate survival. Support is needed for Indonesian graduate students in forest ecology to conduct research on how different species respond to alterations of their habitat, most importantly selective logging. The results of this research will be useful for identifying factors in selectively logged forest that either enhance or endanger primate populations. Recommendations could thus be made for the management of wildlife in commercial forests that largely surround the Gunung Leuser National Park.

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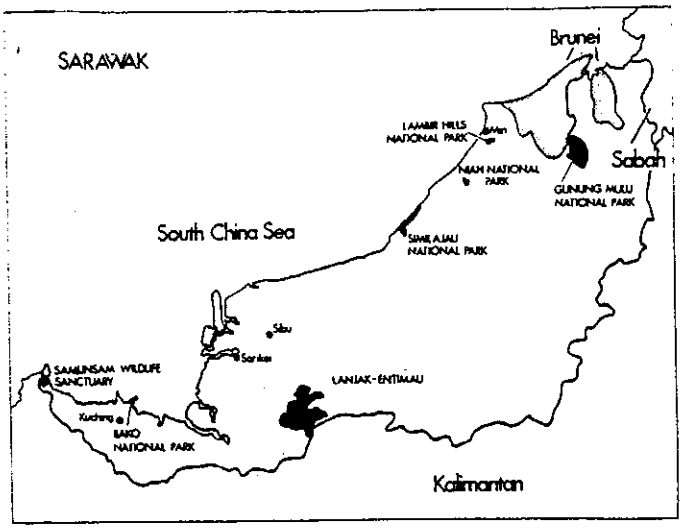

Fig. 51: Location of parks and sanctuaries in Sarawak, Malaysia.

Sarawak's Lanjak-Entimau Wildlife Sanctuary Gazetted

In the first and second issues of the PSG Newsletter reports were published on surveys conducted in the proposed Lanjak-Entimau Wildlife Sanctuary, a 168,755 ha tract of upland forest in Sarawak, East Malaysia (Fig. 51). The sanctuary covers rugged hill country in the 2nd, 3rd, 6th and 7th Divisions of Sarawak, between Lubok Antu District and the Julau-Kanowit-Song area. On March 3, 1983, by order of the Yang di-Pertua Negeri Sawawak in Council, this sanctuary, the largest in Malaysia, was gazetted. It becomes the seventh park or sanctuary to be gazetted in Sarawak.

Lanjak-Entimau is one of the last strongholds for the orangutan *(Pongo pygmaeus pygmaeus)* in Sarawak. The animal was once found throughout this Malaysian state, but now it is reduced to a few diminishing forest pockets in the peat swamp area between Batong Sadong and Batang Lupar in the first and second Divisions, and to the hills in and around the new sanctuary. This area was selected by the National Parks and Wildlife Office of the State Forest Department, which received assistance in 1981 from World Wildlife Fund — Malaysia in planning for its long-term management.

In addition to the orangutan, Lanjak-Entimau will also protect sizeable populations of other animals that are typical of Borneo's primary forest, such as Sarawak's state emblem, the rhinoceros hornbill *(Buceros rhinoceros)*, or *kenyalang* and at least 42 mammalian and 165 other bird species. The sanctuary will also play a vital role in protecting the headwaters of eight major rivers which drain into the Lupara and Rajang Systems. These rivers are vulnerable to problems of silting up if there is any major forest clearance in the area. Such silting would destroy the forests' natural ability to reduce and control wet season flooding.

Sarawak's Parks and Sanctuaries

Name	Gazetted	Km²	% of State Area
Bako National Park	1957	27	< .1
Gunung Mulu National Park	1974	529	0.4
Niah National Park	1974	31	< .1
Lambir Hills National Park	1975	69	< .1
Similajau National Park	1979	71	< .1
Samunsam Wildlife Sanctuary	1979	61	< .1
Lanjak-Entimau Wildlife Sanctuary	1983	1,688	1.4
		2,476	2.0

The Iban people who live adjacent to the Sanctuary have legally hunted, fished and collected such jungle products as enkabang in the area for many years. The National Parks and Wildlife Office of the State Forest Department will permit some of these practices to continue in specified areas, based upon recommendations provided by the Commission of Inquiry.

Throughout 1983, the World Wildlife Fund has been conducting a major international fund-raising campaign on behalf of the world's tropical forests and primates. It is therefore particularly appropriate that WWF — Malaysia is continuing its association with the new sanctuary by employing a wildlife biologist to work with the Sarawak Forest Department, one of his jobs being to assist in the management of Lanjak-Entimau.

For further information on Lanjak-Entimau, the reader may wish to consult the Lanjak-Entimau Management Plan, M. Kavanagh, 1982, published by WWF — Malaysia, Kuala Lumpur, IUCN/WWF Project 1995. Copies are available from WWF — Malaysia, P.O. Box 769, Kuala Lumpur, Malaysia for a small charge.

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Status of the Crab-Eating Macaque on Angaur Island, Palau, Micronesia

Angaur Island, on the southern tip of the Palau island chain (Fig. 52), is a coral platform island; a raised limestone reef of 830 ha. It is relatively isolated and the human population numbers between 250 and 300. Dense forest covers much of the island, much of it secondary forest having been repeatedly destroyed by severe typhoons and intense bombing during World War II. Extensive caves and craters make much of the interior difficult to penetrate.

Crab-eating macaques *(Macaca fascicularis)* were introduced to Angaur in the early 1900's. There is no indication in Spanish mission records that monkeys existed on Angaur prior to 1900. They were apparently introduced during the period of German rule from 1900-1914. One informant remembered that two animals were introduced by German phosphate mining engineers. The present population may be descendants of this pair introduced either from Indonesia or Mindanao. Some of the Angaur monkeys have subsequently been introduced to Babelthuap, Koror; the adjacent island of Pelilu; and Guam. Attempts have been made to prevent further export of Angaur monkeys and it is now illegal to introduce females to other islands.

During Japanese occupation of Angaur from 1914-1945 many soldiers killed macaques for sport, food and medicinal

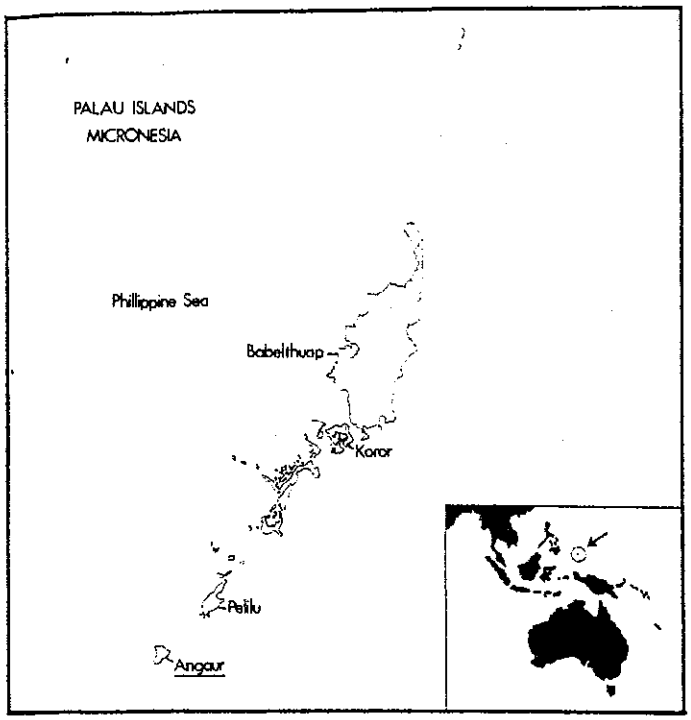

Fig. 52: The location of Angaur and several other islands in the Palau chain, Micronesia where crab-eating macaques have been introduced.

use. Intensive mining, lumbering and new human settlements also adversely affected the monkeys during this period. In the Second World War Angaur possessed a prized airfield and was the site of large Japanese and American troop installations and supply depots. For almost three months prior to the American invasion, Angaur sustained saturation bombing, which probably obliterated most of the forest cover. This raises a number of questions. Where did the monkeys go during the bombing; did they live in caves like the natives? What did they eat? Did feeding patterns change in the new forest? What happened to the population's size and structure? The answers to these questions remain unknown, yet it seems obvious that the macaque population must have declined drastically because of military activities. In addition, following the war, two major typhoons (the last occurring in 1964) destroyed vast sections of forest habitat on Angaur.

Three times within a 30 year period the Angaur macaque's environment was all but destroyed, its numbers depleted, and its food supplies reduced. Yet, this introduced population survived and must genetically exhibit the results of one or all of the following: genetic drift, the bottleneck effect and the founder effect. The Angaur population of *M. fascicularis* thus represents a "natural" experiment for study of these genetic and evolutionary principles.

Currently, the gravest threat to the survival of these macaques is hunting. Some of the island's current inhabitants have guns and regularly hunt the monkeys. Females with infants are hunted predominantly, so that infants can be captured and sold as pets in Koror.

During a 10 week period in 1973, F. E. Poirier and E. O. Smith spent 254 hours locating and studying these monkeys and in 1980-81, D. Farslow spent ten and a half months studying them. When Poirier and Smith began work on Angaur they were told of efforts to eradicate the monkeys. The justification for hunting was that the monkeys ate or otherwise destroyed taro and tapioca plots, main food sources of the Angaurese. Poirier and Smith investigated reports of intensive human-monkey competition for food and concluded that there was no substance to reports of extensive cultigen damage. During his study, Farslow analyzed agricultural plots for taro crop damage. As high as 90% of the plants in some plots sustained at least some damage by the monkeys, though the macaques appear to keep to the uncultivated taro around the edges of a village.

Although food is seasonally plentiful on Angaur, it is limited during the dry season. Our combined studies recorded over 50 varieties of plant foods consumed, the majority of the macaques' diet consisting of fruits. Farslow estimates that over 75% of the diet consists of products from only 9 plant species. The macaques have been observed to eat termites, dragon flies and grasshoppers, and have also been reported to scavenge dead crabs and lizards, but this was not confirmed. They were never seen searching the tidal pools for crabs, which abound. Cultigens are also taken and the Paluan apple *(Eugenia javanica)*, for example, is a favorite food during the fruiting season. Crop-raiding is more often a trait of animals living in the southern part of the island. They are the most hunted monkeys and their behavior reflects this increased pressure.

Eradication plans were delayed until 1975 when legislation to "effectively control the population of monkeys to the point of extinction" was introduced. This attempt at eradication, however, did not succeed; still, the situation on Angaur continues to be precarious.

Angaur macaques are unique subjects for a genetic study of micro-evolutionary change. It would be most interesting to investigate the possibilities of genetic drift or the bottleneck effect in this isolated population. The population warrants continual monitoring, and efforts by the inhabitants to eradicate them must be prevented. Instead, programs to control crop-raiding and perhaps utilize culled animals to supply research needs and provide incentive for maintaining this unique primate population should be investigated.

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A Status Report on the Taiwan Macaque

Little is known concerning the behavior, habitat and status of the Taiwan macaque (*Macaca cyclopis*). In 1978, I spent 22 weeks in Taiwan, of which 31 days were spent surveying habitats frequented by this monkey. I also interviewed animal dealers and aboriginal trappers to determine predation pressure.

Macaque populations were surveyed in four major forest types with the following results:

1. Bamboo forests contain scattered monkey populations. Although macaques feed on bamboo shoots, destruction of natural forests to be replaced in bamboo adversely affects the monkey population by decreasing the natural foods available to the animals and forces it into less disturbed, higher forests.
2. Conifer forests contain scattered monkey populations. The cypress type of conifer forest may be a refuge zone, while fir, spruce and pine conifer forests appear to be secondary habitats.
3. Mixed conifer-hardwood forests are frequently inhabited by macaques.
4. Temperate hardwood forests hold the highest concentrations of monkeys with the least disturbed macaque groups seeming to be in the least developed eastern part of the island.

It is difficult to measure the impact of human activities on the Taiwan macaque. The major threat is habitat destruction. The monkey's main habitat seems to be the primeval hardwood forests, which have suffered considerable destruction in this century. Although logging is restricted in some tracts, past destruction has forced the macaques higher into the mountains. Logging has disrupted movement up and down the mountains, restricting the macaque's food supply. In some areas logging policy favors retention of small belts of "protection forest", but these areas are of little benefit to the macaques because of their small geographical size. Extensive human activity, in some regions, results in dislocation of local macaque populations leading to colonization of what may be secondary or substandard habitats. This shift in habitat probably restricts population growth in most areas and may have led to overpopulation in others, which ultimately also results in lower reproductive rates. Occasionally, overpopulation has led to competition between monkeys and squirrels, seemingly to the monkeys' disadvantage.

Hunting has been banned on Taiwan and animal specimen shops were closed in 1973. Despite the law, however, trapping is prevalent. Earlier estimates of the number of monkeys taken yearly, 200-960 animals, are probably low. I estimated that a total of 1,000-2,000 macaques were trapped or hunted annually, either to be eaten, to be sold live or as bones locally to animal shops, or to be exported, primarily to Japan.

Animal dealers in Taiwan sell all forms of wildlife. Conditions in most animal shops are deplorable; animals are crowded into very small cages with little consideration for their size or health. Predators and prey are often placed side by side. The demand for monkeys exceeds the supply so imported, as well as domestic monkeys sell briskly. Most of these monkeys are either bought to be eaten or made into local medicines, or juveniles are bought as pets. The highest priced monkey is the local macaque, the price apparently reflecting its declining status. A number of captured animals had one of their hands missing as a result of the use of iron leg-hold traps. A pair of orangutans was seen in one shop.

While human activity has restricted the Taiwan macaque's natural food supply, cultivation has supplied the macaque with new food items. Vegetables and fruits are now available to certain local macaque populations, some of which have changed their food preferences and appear to have benefited from human intrusion. Still, crop damage due to raiding seems to be minimal, and only some populations face retaliation from irate farmers.

In recent years Taiwan has made commendable efforts towards furthering wildlife preservation. In some circles there is a favorable attitude towards efforts to conserve the indigenous monkeys. Preliminary steps for preservation of the Taiwan macaque include the protection of hardwood forests. Efforts are being made by several agencies to either stop or control deforestation. However, at present there is no available data concerning effective space and food requirements for this species. I recommend that "Protection Areas", as designated by the logging industry, should be made larger and should include vertically distributed mountain zones, ensuring a greater variety of seasonal food sources and permitting migration. Effective management of Taiwan's wildlife must acknowledge competing interests, e.g., the logging industry, the animal trade, aboriginal hunting patterns, and greater export opportunities (which are being actively explored at this time). Finally, trained law enforcement personnel must be made available to ensure that game laws are not breached. Many of the laws are currently not enforced and the few violaters caught are dealt with quite leniently.

On the basis of my observations, Taiwan's macaques seem to have few, if any, unique behavioral patterns or social organizational features. This statement is tentative, however, until a long-term study is undertaken. The incidence of albinism among Taiwan macaques is intriguing and might warrant further study.

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NEWS FROM CAPTIVITY

The National Zoo's Role in an International Primate Conservation Program

The long-term survival of some endangered species will require not only the conservation and management of critical habitats, but also scientifically managed propagation programs by zoos. Zoos will undoubtedly have primary responsibility for the survival of genetically diverse captive populations, but they can and should also contribute to the efforts of foreign governments and international conservation organizations in the preservation of critically endangered species within their natural habitats. This paper describes efforts by the National Zoological Park to prevent the extinction of the golden lion tamarin (*Leontopithecus rosalia;* Fig. 53) through captive breeding and reintroduction, and through management of the species' natural habitat.

The golden lion tamarin is endemic to the southeastern coastal forests of Brazil and is critically endangered. Inter-

Fig. 53: Golden lion tamarin *(Leontopithecus rosalia)* at the Rio de Janeiro Primate Center (photo by Russell A. Mittermeier).

national cooperative efforts by zoos and related institutions to manage and to breed golden lion tamarins have essentially saved the captive population. This conservation program was initiated in the early 1970's when the Wild Animal Propagation Trust, sponsored by the National Zoological Park, the Minnesota Zoological Gardens and the New York Zoological Society, convened a conference entitled Saving the Lion Marmoset. The purpose of this conference was to define what we knew of the species and related callitrichids in captivity and to establish research needs for future population management. Subsequent to this conference, the first International Studbook for the golden lion tamarin was published by Marvin Jones.

At the National Zoological Park, a major research program into the behavior and reproduction of the species was developed. Resulting management recommendations led to increased breeding success and beginning about 1976, the captive population ceased its downward trend. From a population size of approximately 70 animals in a dozen zoos in 1972, golden lion tamarins have now increased to nearly 400 individuals in 50 zoos. As the population began to grow the need developed for a set of management standards. Thus, a Cooperative Research and Management Agreement was drafted and signed by all major owners and holders of this species. Signatories also voted on the creation of and elected an international Management Committee, responsible for making all major decisions regarding management of the captive population. Species management now emphasizes stabilization of the population size and equalization of the genetic contribution of the founder stock.

Some gains have also been made in Brazil to protect the few remaining wild golden lion tamarins. The Poço d'Anta Biological Reserve was established in the state of Rio de Janeiro in 1977, largely through the efforts of Dr. Adelmar F. Coimbra-Filho, Director of the Rio de Janeiro Primate Center (CPRJ-FEEMA) and by officials from the Brazilian Forestry Institute (IBDF). A 1980 survey of the reserve by K. M. Green (unpublished) indicated that *L. rosalia* still occurred there, but that there were major problems to be solved before this population could be considered viable and protectable. For example, a dam is being constructed which will eventually flood perhaps 20% of the reserve. Also, within its 5,000 ha there is considerable cattle pasture, as well as scrub and secondary forest. Little of the available land contains primary tropical forest. Additional problems included inadequate transportation for guards monitoring its boundaries. Green estimated that fewer than 100 golden lion tamarins were likely to be present in Poço d'Anta.

In November 1981, I initiated discussions with IBDF and Dr. Coimbra-Filho, concerning the possible development of a reintroduction program, using genetically surplus captive-born golden lion tamarins to develop and to test techniques of rehabilitation and release. Currently, the program's goals are more than just the return and release of golden lion tamarins to their native habitat in Brazil. They encompass 1) a stabilization of the captive population's size and equalization of founder contribution, 2) a field study of this species' behavioral ecology, 3) restoration and reforestation of the Poço d'Anta reserve, 4) an education effort to sensitize Brazilians to conservation needs and issues in their country, as well as to provide professional training to those Brazilians ultimately charged with the long-term management of *L. rosalia*, and 5) a test of techniques for rehabilitating and releasing golden lion tamarins that might be generally applicable for future release programs.

Studies of the behavioral ecology of *L. rosalia* were initiated in June 1983 by Dr. James Dietz, in order to decide whether it is even feasible to consider releasing captive-born animals. The required data will be obtained through a trap,

,mark and release program, radiotelemetry of individuals marked with transmitters, periodic censusing of the reserve, and close observation of the behavior and activities of individuals and groups.

The Poço d'Anta Reserve restoration program involves a number of separate projects, including efforts to link existing forest patches by developing corridors, planting preferred trees and improving soil quality of converted pasture. All the above should serve to increase the current carrying capacity of the reserve for this species. Zoos holding or owning golden lion tamarins have been asked to contribute to this reforestation and restoration, and several have responded positively. World Wildlife Fund — US has also provided funding for this aspect of the program.

The first part of a rehabilitation program for captive-born specimens involves the return of animals to a captive condition in Brazil where they can adapt to altered climatic, light and dietary regimes. In November 1983, we transported 15 golden lion tamarins to the Rio de Janeiro Primate Center. A rehabilitation program, especially involving training of foraging techniques, is being developed by Dr. Benjamin Beck of the National Zoological Park. The essence of this effort, which was initiated prior to the shipment of the animals to Brazil, is to train them to forage and search for food in widely scattered sites, as well as crevices and under objects. Currently, most captive tamarins are fed once or twice a day from a pan which is easily visible to group members. Once in Brazil, habituation to natural foods will be a priority since most captive tamarins in North America are fed with a commercially prepared diet, as well as with fruits, insects and other foodstuffs. Since there are wild-caught golden lion tamarins maintained at the Rio Primate Center, it should be possible to compare the responses of the captive and wild-born animals in a series of experimental tests. Thus the effects of training may be measured.

If it is determined that there is available habitat for additional tamarins, and that the captive-born specimens are free of diseases, these individuals will be transferred to cages within the Poço d'Anta Reserve. Further habituation and adaptation will occur, and social groups proposed for release will be established. We may release captive-born intact family groups as well as newly established pairs, composed of two captive-born or one captive-born with a wild-caught animal. Individuals to be released will be fitted with transmitters and followed closely via radiotelemetry. We will then compare movements, behavior and foraging strategy of free-ranging wild-born animals with their captive-born counterparts to determine whether there are basic behavioral differences that may have a major impact on survivorship.

The scientific studies and restoration of the Poço d'Anta will be accompanied by an educational effort by L. A. Dietz, the purpose of which is to formulate an information program that will result in local community support for this endangered primate and its habitat, and to determine the effectiveness of various educational strategies, including posters, slide-tape shows, films and lectures. Public support of this program will also be solicited through the media. We will attempt to gain national (in Brazil) and international attention for this conservation effort, and as a result, increase public interest in and support for environmental protection in Brazil and captive breeding programs of zoos.

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Primate Propagation at Riverbanks Park

The potential for zoological parks to expand from the exhibition of the more "traditional" primates like squirrel monkeys (*Saimiri sciureus*), capuchins (*Cebus* spp.), tamarins (*Saguinus fuscicollis* and *S. oedipus*), hamadryas baboons (*Papio hamadryas*) and macaques (*Macaca* spp.), is a relatively recent phenomenon. Until recently, many zoos in North America were limited to primates which possessed minimal husbandry requirements, thrived and reproduced when kept in pairs, and periodically could be imported from the wild if breeding was unsuccessful. With changes in protective measures and research interests, this outlook has changed over the last 8-10 years, and more of the "delicate" species are finding their way into captive collections, surviving, reproducing into successive generations, and providing primatologists with research opportunities previously not available.

Fig. 54: Black and white ruffed lemur (*Varecia v. variegata*) at Riverbanks Park (photo by Jakki, courtesy of Riverbanks Zoological Society).

In 1974 a new municipally governed zoological park, Riverbanks Park, was opened in Columbia, South Carolina. By virtue of its newness, the Park was able to incorporate many of the advances in exhibit design, husbandry techniques, nutrition, and the increased understanding of the social needs of many otherwise poorly understood primates. This last area has been especially important for zoos and research facilities trying to initiate propagation programs for rare and endangered species.

Five years ago, the Riverbanks staff developed a "wish" list of species felt to be suitable for the exhibits available. At this point, all these objectives have been met and 100% of the 13 species maintained at the Park breed on a regular basis. The primate collection includes 1-3 groups of the following species: ring-tail lemur *(Lemur catta)*, ruffed lemur *(Varecia v. variegata;* Fig. 54), white-faced saki *(Pithecia pithecia)*, Bolivian dusky titi *(Callicebus moloch donacophilus;* back cover), black howler monkey *(Alouatta caraya;* Fig. 55), golden lion tamarin *(Leontopithecus rosalia)*, cotton-top tamarin *(Saguinus oedipus)*, De Brazza guenon *(Cercopithecus neglectus)*, lion-tailed macaque *(Macaca silenus)*, hamadryas baboon, mandrill *(Mandrillus sphinx)*, siamang *(Symphalangus syndactylus)*, and white-cheeked gibbon *(Hylobates concolor leucogenys)*. Great apes and colobines are not included at the present time, but future exhibits are planned.

Fig. 55: Female and young black howler *(Alouatta caraya)* at Riverbanks Park (photo by Jakki, courtesy of Riverbanks Zoological Society).

We attribute the success of this collection to several factors. All primates are kept in social groupings appropriate for the species. While it may seem obvious that gibbons and siamangs, sakis, titis and tamarins do better when kept in pairs, in the past many collections have tried to develop groups containing several adult females per male, usually to the detriment of the beta female(s). Similarly, social species such as lion-tailed macaques and baboons do better in large groups that provide opportunities for hierarchies to develop and a chance for offspring to mature in the presence of a functioning troop.

Potential breeders are selected which are unrelated to each other. While this has been standard procedure in domestic livestock management for many years, primates and other exotic animals have only been subject to genetic screening over the last decade. In the case of our lion-tail macaques and golden lion tamarins, all our animals are registered in their respective international studbooks. The tamarins are now managed by a committee representing the owners and holders of the animals to further ensure their genetic integrity.

Most of the primates in the collection are born elsewhere in captivity. Regardless of their origin, all are parent-reared to insure normal imprinting. Barring unusual circumstances, all young born at Riverbanks are kept in their group at least through the weaning of the next infant. Young of some species, tamarins, macaques and howler monkeys, for instance, can remain in the presence of their parents for 2-4 years. Our experience indicates that other species such as sakis and titis expel their young from the group at an earlier age. Ultimately, all young are dispersed to other zoos or introduced to different groups maintained in the park.

Most wild primates eat a seasonally diverse selection of fruits, seeds, buds and young shoots, and/or small animals and insects. Although duplication of these foods is impractical in captivity, we feel a dietary regime that contains numerous different naturalistic foods is another contributing factor to this collection's success. Commercially prepared diets are used to insure adequate nutrition, as are vitamin and mineral additives, but these are not overly emphasized, especially in the case of the delicate species. Typically, chipped fruits and vegetables, sunflower seeds, peanuts and pecans, and lettuce are used as the basis of their diets, with changes being made according to seasonal availability.

These species were selected because of the staff interest, exhibit value, status in the wild, and the potential for placement of young. While it is likely that some of the zoo's visitors do not appreciate the scope of the collection, many others have become aware of the collection's uniqueness. From a propagator's viewpoint, the collection has been successful, with second generation sakis and howlers becoming commonplace. All this has not been lost on the research community, and several primatologists have spent weeks to months here gaining insight into behaviors not visible in the field. A number of papers have been based on the howlers and sakis, and hopefully this interest will continue.

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Regional Joint Management of Species Group — British Isles and Ireland

An increasing number of zoological collections now have well recognized that, with the lack of importations from the wild, if they are going to continue to have various species represented in their zoos in the future, they must make a much fuller utilization of the captive population. As a result of this, a considerable number of animals are now loaned to

other institutions. As an example, the Jersey Wildlife Preservation Trust has over 200 specimens belonging to 23 species placed in some 34 zoos. Similarly, the Trust has some 20 species on loan from other organizations.

In 1981, it became clear that transfers of animals in Britain and Ireland from one collection to another aimed at achieving the best breeding and management results in the interests of both the zoos and the species concerned, should be more formalized. The Director of the Zoological Society of London, Mr. Collin Rawlins, advocated that meetings should take place at regular intervals of all I.U.D.Z.G.* members in Britain and Ireland, with the specific purpose of working more closely together towards the ultimate aim of common management of some of the more important species kept in the respective zoos. Such regularly quarterly meetings have now been established and it is hoped that aspects of this type of common management will eventually extend to all other quality zoos within this quarantine area.

Amongst the many discussions that have taken place, the management of primates has featured high on the list of priorities. During 1982, Dr. Miranda Stevenson (Curator of Edinburgh Zoo) produced a comprehensive list of the primate species held in the zoos represented, with evaluations as to whether the relative numbers were of viable status.

It was advocated that the Management Group should establish which species should take priority in the requirement of organization and overall management. It was suggested that certain institutions should take responsibility for monitoring the status of the primates listed and make positive suggestions for the captive propagation of these species. It was recognized that the Management Group should be influenced by the general world status of the captive populations, and consider whether some zoo space could be better utilized to establish more viable captive populations of the primate species concerned.

At the September 1983 meeting of the Management Group, Dr. Brian Bertram (Curator of Mammals, Zoological Society of London) presented a series of recommendations for some ten primate species: lesser mouse lemur *(Microcebus murinus)*, fat-tailed dwarf lemur *(Cheirogaleus medius)*, slow loris *(Nycticebus coucang)*, slender loris *(Loris tardigradus)*, thick-tailed bushbaby *(Galago crassicaudatus)*, silvery marmoset *(Callithrix argentata)*, cotton-topped tamarin *(Saguinus oedipus)*, white-faced saki monkey *(Pithecia pithecia)*, sooty mangabey *(Cercocebus atys)* and mandrill *(Mandrillus sphinx)*, all of which are represented at the London Zoo. Mr. N. Ellerton (Curator of Primates, Chester Zoo) circulated a brief report on the 24 lion-tailed macaques *(Macaca silenus)* held by four collections in the Group, while Mr. J. Mallinson (Zoological Director, Jersey Wildlife Preservation Trust) reported on the status of golden lion tamarins (*Leontopithecus rosalia)* and Goeldi's monkeys *(Callimico goeldi)*.

Among the many topics discussed were the problems concerning the correct identification of sub-species when the original location of the importation is not known (e.g. thick-tailed bushbaby), the importance of keeping sub-species separate (e.g. colobus monkey; *Colobus* spp.), the potential for arranging joint importation of new blood, and the scientific investigation of non-breeding females. Species coordinators were established as follows:

Institution	Species
Bristol Zoo	Patas monkey *(Erythrocebus patas)*
Chester Zoo	Lion-tailed macaque
	Barbary macaque *(Macaca sylvana)*
	De Brazza Monkey *(Cercopithecus neglectus)*
Dublin Zoo	Langurs *(Presbytis* spp.)
Jersey Zoo	Silvery marmoset
	Golden lion tamarin
	Goeldi's monkey
	Celebes macaque *(Cynopithecus niger)*
London Zoo	Slow loris
	Slender loris
	Thick-tailed bushbaby
	Cotton-topped tamarin
	White-faced saki
	Sooty mangabey
	Mandrill
Twycross Zoo	Colobus monkey

The Management Group acknowledged the fine work of the Anthropoid Ape Advisory Panel of the British Isles and Ireland, who since 1976 have published annual regional studbooks which have been presented at their yearly meetings. Miss M. Badham (Twycross Zoo) is responsible for the studbooks for both gibbons and chimpanzees, Mr. G. Greed (Bristol) for orangutans, and Mr. J. Mallinson (Jersey) for gorillas. In 1982, Dr. Georgina Mace was employed by the panel in order to establish a comprehensive report on the present status and future management of populations of great apes in the British Isles and Ireland. Both the report and future management recommendations were presented to the panel at a special meeting held at the Zoological Society of London on November 23, 1983.

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Jersey Wildlife Preservation Trust
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*International Union of Directors of Zoological Gardens.

Conservation at Duke University Primate Center

The Duke University Primate Center is located in the heart of a mixed pine and hardwood forest just outside the town of Durham in the Piedmont region of North Carolina. Its origin was a collection of lemurs and bushbabies initiated at Yale University in 1958 and brought to Duke University in 1966 to be used in studies on the biochemistry of blood proteins and on maternal behavior and development. The original buildings, built in 1968, have been greatly expanded by the construction of nearly a hundred large out-

door runs and enclosures surrounding the original structure.

The present Director, Dr. Elwyn Simons, came to the Center in 1977 from Yale where he had established a career as an authority on primate biology and evolutionary history. Since taking over the Center, Simons has promoted captive propagation, recognizing the destructive onslaught on prosimian species in the wild. His efforts have also doubled the diversity of genera and species, while sponsoring a marked increase in the number of scholarly studies carried out at the Center.

The Center has thus become the world's largest conservation center for prosimians. It now houses 20 species, representing ⅔ of the full number of living prosimian species, a total of 566 animals, and its captive breeding program for these primates is the world's most successful. In addition, another 95 lemurs and lorises are on breeding loan to other institutions. All species kept in the colony for any length of time have reproduced and many individual animals are directly descended from the original wild-caught founders of the late fifties and early sixties. Today, approximately 80% of the colony is captive-born. Continuously maintained and detailed health and life history records for each individual animal offer an opportunity for scientists to observe prosimian biology and behavior in relation to long-term genealogies. At present the oldest captive-born lemur housed at Duke is 17 years of age, with a few surviving wild-caught animals estimated as being between 20 and 30 years old. A female *Lemur fulvus collaris* thought to be 25 or older recently successfully gave birth to a 27 gram infant.

All major groups of prosimians kept in captivity are represented at Duke. These include two species of tarsiers (*Tarsius syrichta* and *Tarsius bancanus*) from southeast Asia. The African and Asian loris group is represented by 4 genera, *Loris*, *Perodicticus*, *Nycticebus* and *Galago*, and there are 7 genera and 13 species of Madagascan lemurs.

One hundred and ninety six animals out of the total colony (approximately 30%) are housed in large outdoor runs. The two largest are natural habitat enclosures of 0.5 ha and 3.4 ha built in tracts of Duke forest near the Center. In these two enclosures are about thirty semi-free ranging lemurs of four species: ring-tailed lemur (*Lemur catta*), ruffed lemur (*Varecia variegata*), brown lemur (*Lemur fulvus*) and mongoose lemur (*Lemur mongoz*). These animals, all of which are captive-born, have demonstrated that captive lemurs can easily adapt to a forest environment. Owing to the temperate North Carolina climate, the animals pass the winter months in excellent condition. When it is cold they use, at will, heated sleeping boxes which are provided in every enclosure. Even during the coldest days lemurs are active outside during daylight hours. Almost every species is given a different diet adapted to its needs. Many animals receive a balanced diet including specifically formulated chow complemented by a variety of fruits and vegetables. Insectivorous animals are fed a combination of crickets and high pro-

Fig. 56: Adult female black lemur *(Lemur macaco)* (photo property of Duke University Primate Center).

Fig. 57: Adult male sifaka *(Propithecus verreauxi coquereli)* (photo property of Duke University Primate Center).

tein chow. The diets of the more herbivorous lemurs are enriched by bamboo (for *Hapalemur griseus)* or by mango and sweetgum leaves (as in the case of *Propithecus verreauxi coquereli).*

Many of Duke's prosimians have propagated in large numbers at the Center. The 1983 birth season produced a total of 126 surviving animals, an increase of 28.6%. There have been recent awards from the American Association of Zoological Parks and Aquariums (AAZPA) for propagation of about 100 individuals each of ruffed lemurs, brown lemurs and red-fronted lemurs. In recent years the colony has also produced more than fifty individuals each of the black lemur *(Lemur macaco;* Fig. 56), white-fronted lemur *(Lemur fulvus albifrons),* ring-tailed lemur, thick-tailed bushbaby *(Galago crassicaudatus)* and dwarf lemur *(Cheirogaleus medius).* The rarest captive species with which the Primate Center has achieved breeding success are: *Lemur coronatus, Lemur fulvus collaris, Hapalemur griseus, Propithecus verreauxi coquereli* (Fig. 57), *Cheirogaleus medius, Microcebus murinus* and *Mirza coquereli.* New breeding colonies of two species of *Tarsius* were established in 1983.

The Center also houses the largest group of galagos in the world, and has the largest populations of tarsiers, pottos, slow and slender lorises in the United States. All these animals provide a singular opportunity to observe almost every aspect of lemur, tarsier, galago and loris reproductive behavior and biology. For many of these species vaginal smears are taken twice weekly and palpation to determine pregnancy is conducted on a monthly basis in order to monitor all stages of the reproductive cycle. Cyclical changes in testicular dimensions are recorded for males. In both sexes research has commenced on characterizing the endocrinological changes that accompany reproductive function. Dr. Kay Izard, supervisor of the *Galago* breeding colony, believes that these tests will be invaluable in establishing reliable, consistent data for the reproductive biology of the *Galago.*

At present, approximately 40 scientists from all over the United States are working with the colony as their primary source for prosimian studies. This research includes studies on mutation genetics, protein and DNA evolution, aging research, nutrition, vitamin biochemistry, vision research, metabolic rates, thermoregulation, and hibernation. The common denominator of these diverse topics lies in their benign utilization of the animals or their tissues (e.g., skin cell lines grown *in vitro,* or blood) or fresh material from cadavers on the rare occasions that animals die.

Dr. Kenneth Glander, Duke University Associate Professor of Anthropology, is observing two species of lemur housed in a 0.5 ha area of natural pine forest. This enclosure provides a unique opportunity to examine captive lemurs in a semi-free-ranging environment, as well as to study reintroduction techniques of captive-born animals to the wild. Dr. Glander is especially interested in the animals' response to novel food sources and the relationship between food selectivity and plant secondary compounds. Since their release in August of 1981, no lemur has been observed eating a poisonous plant.

Dr. Montrose Moses, Duke University Professor of Anatomy, is currently studying prosimian chromosomes. Investigations of phylogenetic relationships are being conducted to illuminate the genetic mechanisms influencing prosimian evolution and to determine criteria for defining the species/subspecies classification.

The largest collection of fossil apes in the U. S. is housed at Duke's Primate Center. Collecting expeditions led by Dr. Simons have been conducted in Egypt since 1961, and for Duke since 1977. Graduate students are now comparing the bones of present day lemurs with those of primates living 50 million years ago and have found a number of similarities. The lemurs can truly be considered living fossils.

As widespread forest destruction in Madagascar makes survival of all twenty species of lemur more precarious, conservation at the Duke Primate Center becomes more crucial. Observations in captive primate colonies afford the best opportunity to scrutinize many of the finer details of social interaction that are difficult to detect in the wild. A better understanding of group cohesion mechanisms and their evolutionary significance can be gained. This growing body of knowledge concerning behavior, captive management, and reproductive biology is critical to the survival of all seriously endangered prosimian primates.

Duke's role extends to conservation-oriented research programs in the animals' countries of origin. The immediate goal, however, is to create self-sustaining captive populations of the rarest prosimians and pursue strong research lines in the direction of conservation biology, social organization, space utilization, reproductive behavior, and physiology and nutrition. Simultaneously, programs embracing both pure and applied aspects of zoological and medical research utilizing benign techniques are actively being pursued. In this way conservation and breeding accompany a progressive approach to expand our understanding of prosimian biology through the medium of federal science funding in a university environment.

The importance of education in conservation extends not only to the enlightenment of those living in countries with wild populations of primates, but to encourage and stimulate awareness of nature, the threats, and the future of such animals to the public here at home. By offering educational and research opportunities to students and scientists as a university institution, the Duke University Primate Center is attempting to fulfill this double role.

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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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