LEMUR NEWS

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EDITORIAL

Some time has passed since *Lemur News* Vol. 2 has been published. Thanks to the Margot Marsh Biodiversity Foundation, who is providing funds for *Lemur News* Vol. 3 and 4, we are now able to resume publication of this newsletter. Conservation International was instrumental in securing this support.
The time since publication of *Lemur News* Vol. 2 has been eventful with exciting news such as the creation of Masoala National Park, the beginning of the second part of the Environmental Action Plan (Program Environemental II), or the organization of the 20th Congress of the IPS in Antananarivo. Madagascar's politicians, conservationists and primatologists are on the move and developped a strong momentum that give hope for the future.
As already announced in *Lemur News* Vol. 2, the editorial office has been handed over to Jörg Ganzhorn, Berthe Rakotosamimanana and Michael Schwibbe. We thank Bill Konstant and Russ Mittermeier for their initiative to get *Lemur News* off the ground, and for compiling the first two issues of this newsletter with great skills. Both continue to support our efforts. Stephen Nash will stay on board to help whenever needed with his outstanding drawings. Heike Klensang, Brigitte Raharivololona, Klaus Rupp and Birgit Thede will solve any technical problems. They are in charge of the layout, publication and getting *Lemur News* in the Internet. The team has been newly assembled and, except for Michael and Heike, none of us has produced a journal before. We will try, we will do what we can, but we need your help. Any journal can only be as good as the contributions it receives. We had the impression, that people were hesitant to send in their contributions since publication of Lemur News had not been secured due to lack of funds. We hope that this will change and that we will be able to achieve some continuity and regularity. In particular we would like to urge Malagasy students and researchers to submit short articles or summaries of their work.
To reduce the cost of production and mailing, we would like to make *Lemur News* available in the Internet. It should be available under: http://www.dpz.gwdg.de/lnews/lnews.htm. Those of you, who are on our mailing list but think that they can do with the electronic form, please let us know. We will then remove your name from the mailing list.

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NEWS and ANNOUNCEMENTS

Activités du G.E.R.P (Groupe d'Etude et de Recherche sur les Primates de Madagascar) dans la préparation du XVIIè Congrès de l'IPS (International Primatological Society)

L'Université d'Ambohitsaina Antananarivo, Madagascar, abritera le 17è Congrès de l'IPS (International Primatological Society) du 10 au 14 août 1998. Environ 300 Congressistes venant de différents pays du Monde seraient attendus dans nos murs à ce moment là.
Le G.E.R.P ou Groupe d'Etude et de Recherche sur les Primates de Madagascar prend la responsabilité exclusive pour la réalisation de ce Congrès. Pour cela, les membres du G.E.R.P se sont intégrés dans le secrétariat du Congrès et se sont divisés en trois cellules avec comme Coordinatrice, Madame le Secrétaire Général de cet O.N.G. qui est le Professeur Berthe Rakotosamimanana et qui est même le Secrétaire Général du 17è Congrès de l'IPS.

Ces trois cellules sont:
- la Cellule Scientifique
- la Cellule Communication
- la Cellule Logistique

Chaque cellule est composé d'un chef, un assistant et des étudiants.
La Cellule Scientifique assure la réception et l'acceptation des actes à présenter au Congrès. La Cellule Communication est la responsable de la demande de sponsoring pour le Congrès et la transmission de toutes les informations. La Cellule Logistique intervient dans l'accueil des Congressistes, ainsi que de la préparation de toute la logistique nécessaire pour accueillir le Congrès (réalisation de la pochette bleue, réservation d'hôtel, repas,... etc. Elle organisera aussi un concours de jardin pour l'amélioration du cadre à l'Université et supervise la réhabilitation de ce dernier.
Pour ce Congrès, le G.E.R.P a recruté un staff exécutif: une secrétaire traductrice, une secrétaire de traitement de texte, un comptable et un coursier. En quelque sorte, il était comme un petit créateur d'emploi.
Un tour pré-congrès aura lieu dans le Parc National de Ranomafana et organisé par l'ICTE (Institute for the Conservation of Tropical Environments). Il sera réservé aux Congressistes venant des pays en voie de développement. Des démonstrations des techniques d'études sur terrain seraient la base de cet tour. Des tours post- congrès sont aussi organisés par Cortez Travel & Expeditions dans différentes aires protégées et sites touristiques.
Vous serez donc tous les bienvenu(e)s à Madagascar: l'île aux mille visages de par sa biodiversité si précieuse et si menacée.

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Madagascar creates its largest protected area on the Masoala Peninsula

On October 18 and 19th, the Malagasy government officially inaugurated the Masoala National Park, culminating efforts since 1988 to establish a park on this northeastern peninsula.

The park is an important step for the Malagasy Republic; it may be Madagascar's — and the world's — best chance to preserve species rare on the island and nonexistent elsewhere. Consisting of 2 300 km^2 of primary rain and littoral forests, the new park is triple the size of the largest pre-existing rain forest reserve, and is one of Madagascar's only reserves that protects significant tracts of lowland and coastal rain forest. It also contains three marine reserves that will protect the peninsula's fringing coral reefs.
Except for limited floral and faunal surveys, this area's biodiversity was little known until systematic surveys were carried out in 1993-1994 as an essential component of the reserve design phase. Researchers from the Université d'Antananarivo, Wildlife Conservation Society, Peregrine Fund, Natural History Museum (London), Parc Botanique et Zoologique de Tsimbazaza, Center for Conservation Biology,

Kew Gardens, Missouri Botanical Gardens and many other institutions, confirmed what had been suspected for some time: the Masoala Peninsula was indeed exceptional for its high levels of local endemism — and for the presence of species known to be extremely rare elsewhere in Madagascar. One of the most exciting discoveries was the observation of the Madagascar Serpent Eagle (*Eutriorchis astur*), a species feared extinct in Madagascar until it was sighted in several localities on Masoala by the Peregrine Fund. Their avian inventory also revealed the rare Madagascar red owl (*Tyto soumagnei*) and showed that a number of rain forest birds considered rare elsewhere are found ubiquitously across the forests of Masoala (e.g. Short-tailed and Scaly Ground Rollers, Helmet Vanga).

Masoala was already known as the only locality of the red-ruffed lemur (*Varecia variegata rubra*); in their surveys, researchers also discovered the rare hairy-eared dwarf lemur (*Allocebus trichotis*) on Masoala. New species of butterflies, fish and a gecko were also documented, and exceptionally high levels of local endemism and diversity in palms and Bignoniaceae have since been recorded. Not only is the forest rich in biodiversity, but so is the marine zone, with its lagoons, mangrove swamps, and some of Madagascar's most pristine coral reefs. Sea turtles, dolphins and dugongs are reported to occur around the Peninsula, and a recent study found that the humpback whale breeds in the Baie d'Antongil.

Designing the new national park

The new park was designed on the basis of extensive biological and socio-economic data. Created within the context of the „integrated conservation and development" model, this park was designed to meet criteria for ecological, economic and social sustainability. The park design team, led by Claire Kremen, was part of an international consortium, the Projet Masoala, that included ANGAP, DEF, Wildlife Conservation Society, Care International and the Peregrine Fund, with additional technical support from the Stanford University Center for Conservation Biology and the United States Geological Survey.

On the ecological side, the park was designed so as to protect the diversity of species found on the peninsula and to maintain species that depend on multiple habitat types. Boundaries were drawn to ensure that the species of greatest concern – those that are rare and sensitive even to mild levels of habitat disturbance – would be protected. The design also included corridors to provide for migration of animals between large blocks of forest. A large area was included to ensure that significant populations of area-demanding species can be maintained on Masoala. For example, the park is estimated to support a population of red-ruffed lemurs on the order of 15 000 adults. Studies of the area requirements of the serpent eagle are still in progress, but early work suggests that the park might harbor several hundred individuals at most. Although this Masoala population is not large, the recent discovery of this species in the Anjanaharibe Reserve to the north means that hope can be held out for the recovery of this species, particularly if the intervening forest corridor between the two reserves can also be protected.

On the social side, the park delimitation team took local concerns into account at every stage of the design process, under the principle that a park must be supported by local people to be sustainable. First conservation agents (recruited locally from the Peninsula and then trained to use Global Positioning Systems and maps) mapped villages and their surrounding forest and agricultural lands across the Peninsula. They held meetings with villagers to explain the integrated conservation and development concept and to find out local concerns. Although villagers were initially suspicious of the Masoala Project's goals, the fact that the Project's very ambassadors came from among their own

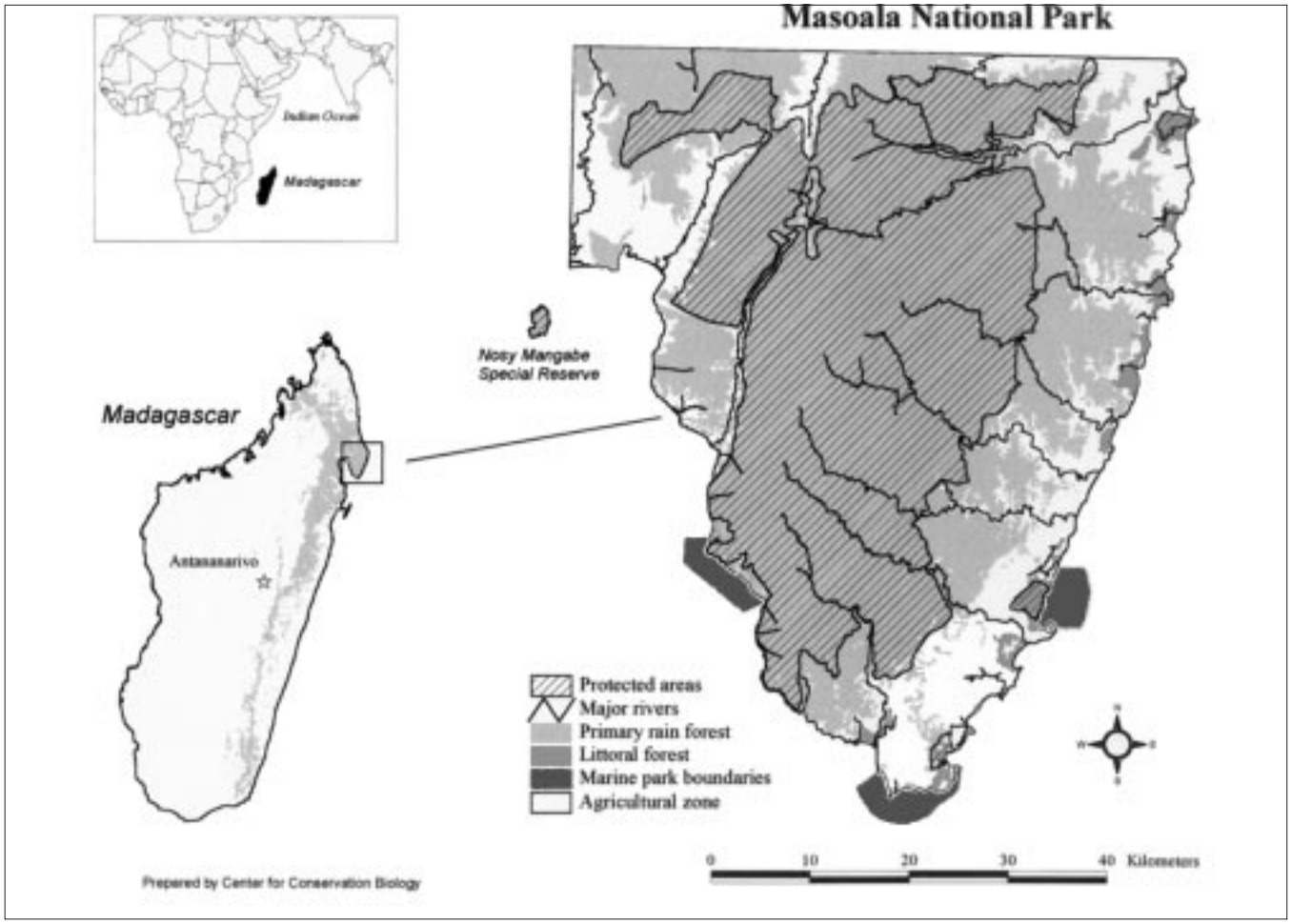

Fig. 1. Location of the Park National on Masoala

ranks soon won over many people. After entering the maps of village territories into the Masoala Project's Geographic Information System (created by the Stanford Center for Conservation Biology in ArcInfo), the design team then used this information to develop park boundaries that would minimize conflicts between villagers and the park. Usually, this involved keeping the park boundaries well away from the main population centers. However, when village territories came unavoidably close to the park limits, buffer zones were designated within the park, where local people would still have the right to collect forest products for subsistence use. Once preliminary plans were developed, conservation agents and government officials walked the proposed boundaries, convening with local leaders along the way to negotiate on specific points. The project's rural development staff took village leaders to see the devastating effects of deforestation in the lowlands near Tamatave, convincing people who previously believed that the forests of Masoala were unlimited, of the value of finding more sustainable farming methods.

Indeed, laying all of this footwork proved an effective strategy for gaining local support for the park proposal. When the time came to gather official objections to park limits from each of the Masoala Peninsula's Fokontany (townships), only several objections were officially listed, amazing even the most sanguine members of the design team!

Economic considerations played a large role in selecting the park's boundaries. The central tenet of the integrated conservation and development strategy is that sustainable, environmentally sound land use practices must be provided to local people living adjacent to protected areas — to allow them to abandon unsustainable techniques that otherwise threaten biodiversity. The Masoala Peninsula is rich in natural resources, but these are being destroyed by slash and burn farming. Thus a principal strategy for the Masoala Project was to come up with economic incentives that would encourage local people to abandon slash and burn farming in favor of harvesting products that can only grow within a rain forest environment. In this way, a strong link between conservation and economic development is forged.

Part of this strategy shaped the park design itself. Elsewhere in Madagascar, local people have invaded nature reserves time and time again out of sheer necessity. Fortuitously, the park design team found that the forest areas best-adapted for harvest of rain forest products coincided with the areas that appeared less important from a biodiversity standpoint, and highly threatened due to their proximity to villages and topography. This area, then, was the logical area to leave outside of the park as a support zone for local people and as a large external buffer to the core protected area. Extensive economic analyses then showed that local people could in theory make much better revenues from sustained natural forest management than from slash and burn farming.

The Masoala Project is now working on a pilot project with one community to harvest forest products sustainably and to bring them to the green-stamp market. Revenues from forest products will go directly to a village association, which will pay the wages of local woodcutters and then use the remainder for community projects such as building a school or clinic. The community thus can win twice – through employment and an empowering form of community development. This natural forest management scheme is in an experimental stage and also involves extensive biological monitoring – both of the plant species being harvested, and of the impacts of harvesting on the avian community and the two diurnal lemur species, the white-fronted and the red-ruffed lemurs.

A big step for biodiversity conservation...and a big commitment for the Malagasy government

„The approval of the Masoala National Park ... represents a huge commitment by the Madagascar government, done against all odds" said Lisa Dean, Director of CARE Madagascar. Indeed it is extraordinary that a country as poor as Madagascar would choose to set aside such a large area for conservation, an act often considered a luxury by First World countries. What advantages to Madagascar lie therein? In fact, projections show that the potential benefits of this integrated conservation and development approach, from revenue generation by rain forest products and ecotourism, to sustained resource extraction and the „ecosystem services" provided by intact ecosystems, could be substantial. Madagascar can obtain these benefits, but only if the Malagasy and international institutions involved elect to maintain a devoted continuity to the same goal that led the design phase of the Masoala Park project: the search for ecologically, economically and socially sustainable solutions to the conservation of biodiversity and the wise management of natural resources. For now, Madagascar can be proud of taking a big first step to show the world a plausible, well-founded approach to a „park for wildlife and for people".

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New accounts on the natural history of sites completed

For almost a decade the compilation of Nicoll and Langrand (1989) has provided one of the most useful sources for information on the natural history of various sites in Madagascar as well as for Madagascar as a whole. While this book continues to serve as an important reference, more detailed surveys have been completed during the past few years. As lemurs form just part of the information provided in the publications derived from these surveys, the references are not listed among the list of publications at the end of this volume. Given their importance, they are listed below separately. We are aware that more surveys have been carried out at sites not listed below and shown in the figure. This is because the results of these surveys have not been published and are available only as „unpublished reports" that are problematic to cite.

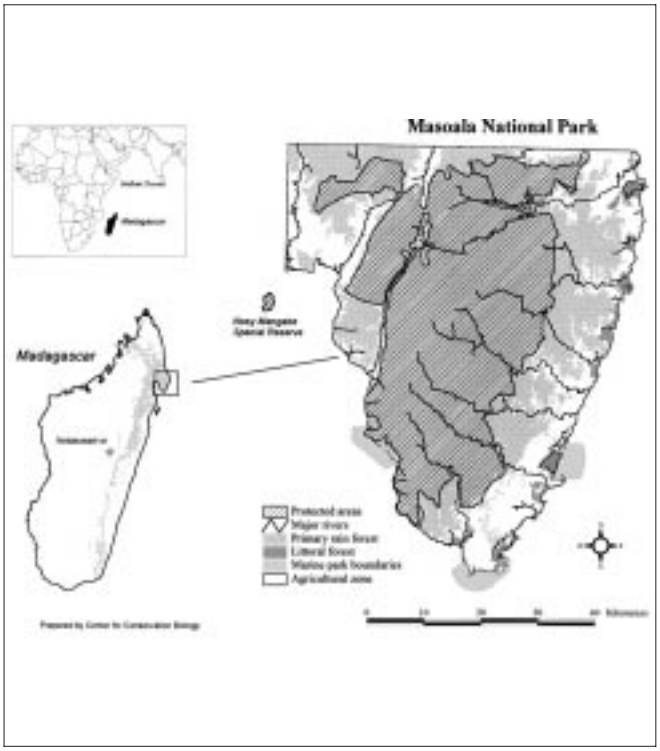

Fig. 1. Sites for which comprehensive accounts on their natural history have been published.

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Call for information on lemur studies

Some time ago, J.M. Casperd compiled a list of the „Current primate field studies". *Primate Eye* 58 (Suppl): 1-28, 1996. For studies on lemurs we would like to update this list periodically in *Lemur News*. Please send appropriate information to B. Rakotosamimanana (Malagasy researchers) or to J.U. Ganzhorn (foreign researchers).

ARTICLES

Les Lémuriens de la région de Bemaraha: Forêts de Tsimembo, de l'Antsingy et de la région de Tsiandro

Entre mars 1993 et septembre 1993, nous avons dressé un inventaire du peuplement de lémuriens de la région de Bemaraha, située dans l'ouest malgache (18°-19°20'S et 44°-45°10'E). Notre étude faisait suite à quelques études précédentes (Petter *et al.* 1997; Tattersall 1982; Petter et Andriatsafara 1987; Nicoll et Langrand 1989; Harcourt et Thornback 1990; Mittermeier *et al.* 1992) et deux prospections effectuées dans la forêt de l'Antsingy en 1990 et 1991 (Rakotoarison *et al.* 1993). La présente note rend compte également du résultat de ces prospections.

Les trois massifs forestiers que nous avons visités sont (cf. carte, Fig.1):

La forêt de Tsimembo (32 800 ha), située à l'ouest de la zone d'étude, est une forêt dense sèche sur sol sableux ou gréseux. Elle est bordée de nombreuses zones humides au sud (lacs Ankerika, Befotaka et Somalipo), au nord-ouest (lac Bemamba) et au nord-est (lac Bemamba). Elle présente une mosaïque de faciès de végétation différents en fonction de l'humidité des stations, avec une prédominance d'espèces sempervirentes en bordure des lacs et d'espèces caducifoliées à l'intérieur du massif. Une partie de cette forêt (13 000 ha) possède le statut de forêt classée.

La forêt de l'Antsingy (150 000 ha) est une longue bande qui s'étend sur une centaine de km du nord au sud et sur une quinzaine de km d'est en ouest. La majeure partie de cette forêt est comprise dans la Réserve Naturelle Intégrale n°9 (RNI). Cette forêt primaire, dense, sèche et semi-caducifoliée, est particulièrement originale puisqu'elle pousse sur les «Tsingy», qui constituent un monumental réseau de failles, de profondes crevasses et de blocs calcaires sculptés en lames ou en aiguilles acérées. Les espèces qui poussent sur les Tsingy présentent des adaptations poussées à la sécheresse et offrent des spectacles majestueux: plantes crassulescentes, à bulbes, arbres «bouteille», racines de plusieurs dizaines de mètres qui descendent en rideau au fond des canyons. Les Tsingy restreignent considérablement la pénétration humaine et cette forêt reste assez bien conservée.

Les lambeaux forestiers de la région de Tsiandro, situés à la bordure est du plateau du Bemaraha, ont sans doute fait partie de la forêt de l'Antsingy mais en sont complètement séparés aujourd'hui. Ils se situent également sur substrat calcaire et sont relativement bien arrosés par les précipitations (1000 à 1500 mm/an) grâce à l'altitude du plateau (environ 800 m).

Au cours de notre étude, nous avons estimé les densités des lémuriens des forêts de Tsimembo et de l'Antsingy par des comptages sur des transects balisés, parcourus plusieures fois de jour comme de nuit afin d'obtenir des nombres moyens d'individus au km^2 (Tableau 1). Les lambeaux forestiers de Tsiandro ont été simplement prospectés sans comptage. Les observations de Rakotoarison *et al.* (1993) ne concernent que la forêt de l'Antsingy. Ces trois auteurs ont, de plus, réalisé des interviews auprès des habitants des villages de la bordure sud-ouest de la RNI. Par rapport aux listes publiées les plus récemment, ces deux études ont mis en évidence la présence d'espèces non signalées jusqu'à présent dans ces massifs forestiers:

Avahi laniger occidentalis a été observé pour la première fois par T. Mutschler et U. Thalmann en 1990 puis en 1991 par N. Rakotoarison et les deux auteurs précédents. Cette équipe a observé un groupe de trois adultes et un jeune dans la forêt de l'Antsingy, dans la région d'Ankinajao. Pendant les six mois où nous avons prospecté les forêts de la région, nous n'avons jamais observé cette espèce et il est probable qu'elle y soit très rare.

La présence de *Daubentonia madagascariensis* a été confirmée par la capture d'un animal vivant. Sa présence était soupçonnée par de nombreux auteurs car cette espèce possède un nom local («Bekapaky») et parce qu'une queue de *Daubentonia* avait été retrouvée dans la niche d'un chien en 1985 par le garde de la RNI (Petter et Andriatsafara 1987). Le 11 septembre 1993, l'animal est entré dans le village de Sorita, poursuivi par des chiens. Il a alors été capturé par deux villageois qui l'ont apporté à l'équipe du Projet UNESCO basée à Bekopaka pour le vendre. Après l'avoir mesuré et photographié, il a été relâché dans la forêt galerie de la Mirahana, situé à 7 km à l'ouest de la RNI n°9. Cette forêt est composée principalement de *Chrysalidocarpus sp.* et de *Pandanus sp.* à proximité de l'eau, et d'une formation type forêt sèche secondaire très dégradée lorsque l'on s'éloigne de la rivière. Cette forêt est mitée par la

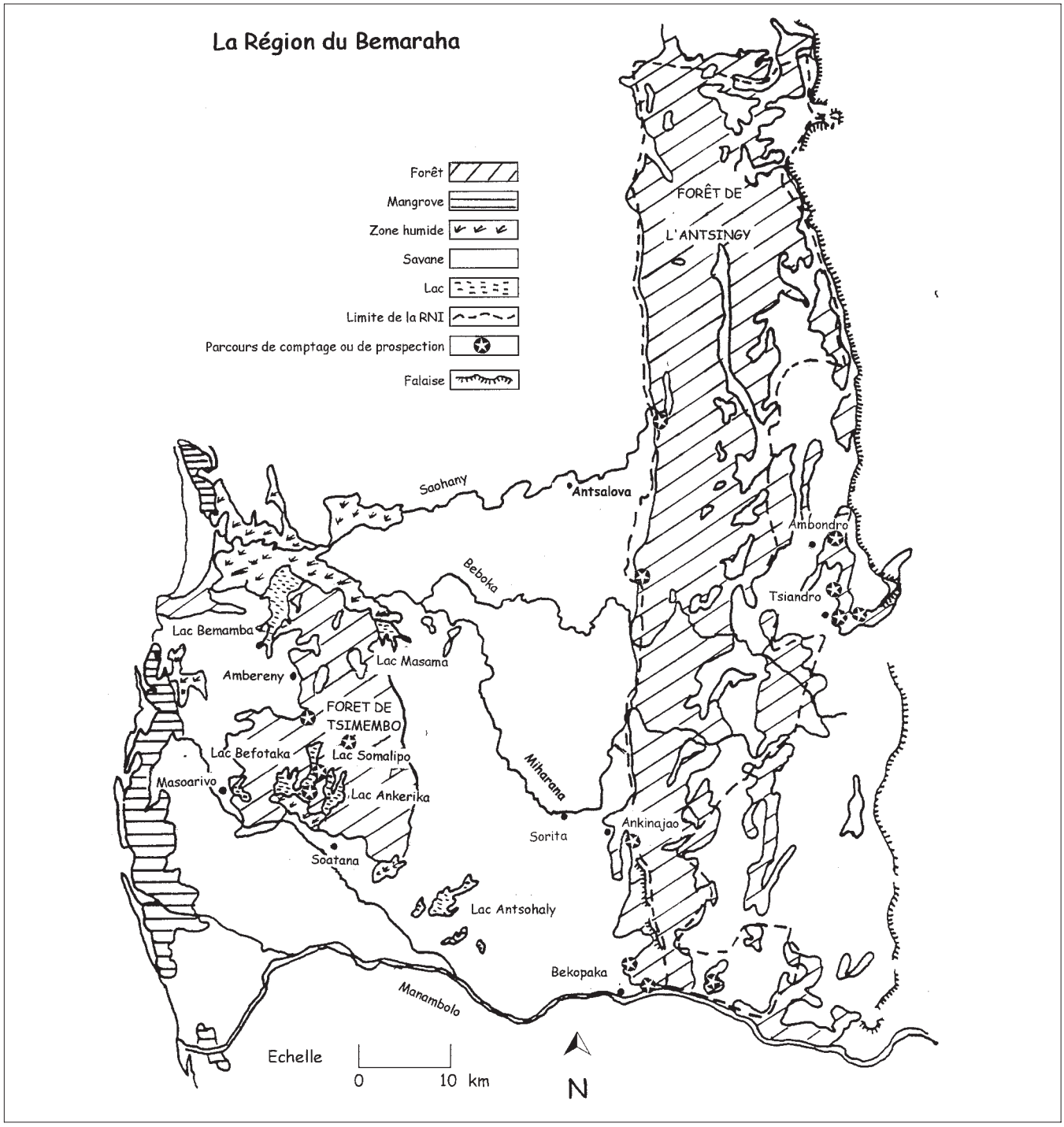

Fig. 1. La région de Bemaraha

riziculture. Les paysans de Sorita ont affirmé voir fréquemment sur les troncs d'arbres des trous coniques montrants des traces de dents sur le pourtour. Déjà, au mois de mars 1993, lors d'un séjour dans la région de Tsiandro, nous avions découvert des traces similaires dans une petite forêt à coté du village d'Ambondro. Notre guide les attribuait à un animal à tête de rat noir, se déplaçant sur le sol et mangeant des poules, ce qui ne correspondait que partiellement à la description d'un *Daubentonia*. De plus, il semble que ces traces puissent être attribuées à un carnivore (*Cryptoprocta* ou *Galidictis*) à la recherche d'une proie cavernicole (O. Langrand, comm. pers.).

Mirza coquereli a été observée régulièrement dans la forêt de Tsimembo. Sa présence n'y avait pas été notée jusqu'à présent bien que Bousquet et Rabetaliana (1992) signalent que les autochtones le connaissent. Sa densité moyenne dans ce massif est d'environ 100 individus au km^2.

Nous pensons avoir observé un *Cheirogaleus major* provenant des forêts résiduelles de la région de Tsiandro. En effet, à la fin du mois de mars 1993, les villageois de Tsiandro nous ont apporté un *Cheirogaleus* en croyant nous faire «plaisir». Cet animal nous a semblé de taille plus importante que les *Cheirogaleus* observés par la suite en forêt. Nous avons pris des photographies et nous les avons montré à J.J. Petter qui l'a identifié comme *C. major*. Néanmoins, il serait nécessaire de confirmer cette détermination par d'autres observations sur le terrain.

Lepilemur ruficaudatus pourrait être présent dans les massifs prospectés mais cela reste une hypothèse car les *Lepilemurs* nous ont posé un certain nombre de problèmes de détermination. Théoriquement, l'aire de répartition de *L.edwardsi* s'étend du nord de la rivière Tsiribihina jusqu'à la baie de Mahajamba (ceci inclue notre zone d'étude). Celle de *L. ruficaudatus* s'étend de Tuléar jusqu'au sud de la Tsiribi-

hina (environ 100 km au sud de notre zone d'étude) (Petter *et al.* 1977; Tattersall 1982; Mittermeier *et al.* 1994). *L. ruficaudatus* a la fourrure du dos grise lavée de roux donnant une impression générale de marron clair. La face, la gorge, le ventre sont gris clair tachés de crème. La queue est entièrement rousse. Les oreilles sont larges et bien visibles. *L. edwardsi* est très similaire, un peu plus sombre sur le dos, selon Tattersall (1982), ou un peu plus clair selon Petter *et al.* (1977). La face est grise foncé ou marron. La queue est marron ou rousse avec généralement une tache blanche au bout de la queue selon Petter *et al.* (1977). Tattersall (1982) et Mittermeier *et al.* (1994) ne font pas mention de cette tache. Par contre, ils signalent une ligne médiane noire le long du dos. Dans notre zone d'étude, les individus que nous avons observés rassemblent les deux pelages: gris foncé sur le dessus, les antérieurs et le dessus des cuisses étant très roux. Une partie des animaux possède une tache blanche très visible au bout de la queue alors qu'une autre partie a la queue entièrement rousse. Ainsi, dans la forêt de Tsimembo, sur 107 contacts visuels, nous n'avons observé qu'un seul individu possédant cette tache (accompagné d'un individu sans tache sur le même arbre). Dans l'Antsingy, nous avons observé partout les deux types de pelages (46% des contacts visuels sans tache, 20% avec tache, 34% qui n'ont pas montré le bout de leur queue). G. Raveloarinoro, qui a travaillé sur la régime alimentaire du *L. edwarsi* dans la forêt de l'Ankarafantsika, précise que dans ce massif, ceux-ci ont quasiment tous une tache blanche au bout de la queue. En fait, il semble que la systématique de ces deux espèces ne soit pas clairement établie. Petter *et al.* (1977) les classent en deux espèces alors que Tattersall (1982) les rassemble en une seule. Mittermeier *et al.* (1994) adoptent la classification de Petter *et al.* (1977) tout en précisant que *L. edwardsi* and *L. ruficaudatus* pourraient être la même espèce. La zone du Bemaraha pourrait donc constituer une zone de transition entre les formes clairement différentiées *L. edwardsi* au nord et *L. ruficaudatus* au sud de la Tsiribihina mais ceci reste à prouver (voir Tomiuk *et al.* 1997).

Rakotoarison *et al.* (1993) rapportent deux témoignages d'habitants de la bordure sud-ouest de la forêt de l'Antsingy qui signalent la présence d'une espèce qu'ils nomment "malagnira". Celle-ci ressemblerait à *Microcebus murinus* mais en plus petit et avec des comportements différents. Il est évident qu'aujourd'hui, on peut penser qu'il s'agit de *Microcebus myoxinus*, redécouvert en 1992 dans la forêt de Kirindy/CFPF (Schmid et Kappeler 1994). De plus, lors de notre étude, nous avons observé environ 80 *Microcebus* et nous avons le net souvenir que certains individus se figeaient et se laissaient approcher de très près lorsqu'ils étaient dans le faisceau de nos lampes halogènes. Cette caractéristique est signalée par Mittermeier *et al.* (1994) comme un critère de distinction avec *M. murinus*. A l'époque, nous ne connaissions pas l'existence de *M. myoxinus* et nous n'avons pas observé assez finement ces microcèbes pour affirmer que nous étions en présence d'animaux différents de *M. murinus*. La diversité des espèces de lémuriens du Bemaraha est donc particulièrement élevée puisque l'on y trouve au moins 10 espèces dont *Daubentonia madagascariensis*. Trois autres espèces pourraient y être également présentes mais restent à confirmer. Néanmoins, il faut garder à l'esprit les menaces qui pèsent sur ces populations, d'une part à cause de la destruction de leur milieu de vie, et d'autre part à cause de la chasse.

La forêt de Tsimembo est sillonnée de pistes et de layons créés par les pétroliers ou les forestiers. Ils permettent une pénétration aisée de la forêt pour les cultivateurs, les braconniers et les voleurs de bois. Si la forêt n'est plus exploitée aujourd'hui, on constate néanmoins l'existence d'une exploi-

Tableau 1: Les espèces de Lémuriens de la région de Bemaraha

Nom scientifique	**Nom vernaculaire**[1]	**Forêt de l´Antsingy (4 parcours)**		**Forêt de Tsimembo (7 parcours)**		**Lambeaux de Tsiandro**	**Statut**[4]
		% parcours[2]	**Ind/km²**[3]	**% parcours**[2]	**Ind/km²**[3]		
Espèces confirmées							
Microcebus murinus	Tsidy/ Tilintilivaha	50	220 (0-786)	100	288 (46-688)	Présent	A
Mirza coquereli	Kifonjitsy	50	66 (0-105)	70	99 (0-307)	Présent	V
Cheirogaleus medius	Kelibehoy	50[5]	81 (35-126)	145	99	Présent	A
Phaner furcifer	Tanta	75	16 (0-31)	100	426 (150-1071)	Présent	V
Lepilemur edwardsi	Boenga	100	430 (140-786)[7]	100	573 (263-1250)[7]	Présent	A
Eulemur fulvus rufus	Gidro	75	213 (0-449)	100	137 (24-427)	Présent	A
Hapalemur griseus occidentalis	Bekola/Kofy	50	16 (0-63)	28	Présent	Présent	V
Avahi laniger occidentalis	Dadintsifaky	Présent[6]	?	Non observé		Non observé	V
Propithecus verreauxi deckeni	Sifaka	100	61 (40-110)	100	98 (44-115)	Présent	V
Daubentonia madagascariensis	Bekapaky	Présent	?	Non observé		Présence suspectée	E
Espèces soupçonnées							
Microcebus myoxinus (?)	Malagnira	Présent[6]		Présent		Présent ?	V
Cheirogaleus major	?					Présent ?	A
Lepilemur ruficaudatus	Boenga	Présent		Présent		Présent ?	A

[1] Supplementé par des noms donnés par E. Sterling; [2] % de parcours où l'espèce a été observée; [3] Densités moyennes (mini et maxi) en individus par km²; [4] D'après Mittermeier *et al.* (1994): A: abondant; V: vulnérable; E: en danger; [5] La majeure partie des comptages a eu lieu pendant l'hibernation de *Cheirogaleus medius*; [6] D'après Rakotoarison *et al.* (1993); [7] Intègre la présence éventuelle de *L. ruficaudatus*.

tation illégale de bois précieux, concernant des arbres de faible diamètre, ce qui compromet la régénération. Des filières clandestines structurées existent et le bois est exporté par boutre vers Morondava ou Mahajanga. De plus, dans tous les massifs, le bois est utilisé d'une manière traditionnelle: pour la construction des habitations et des pirogues à proximité des lacs, pour le chauffage, pour la confection de liens à partir de l'écorce des jeunes arbres, etc...

Les défrichements sont encore de faible importance sur l'ensemble de la région, sauf sur la bordure nord-est de Tsimembo, à proximité du village d'Ambereny où la forêt est brûlée au profit des cultures sur brûlis. Ces défrichements sont causés principalement par des populations de migrants venant du sud et il est à craindre que les populations qui brûlent actuellement les forêts au nord de Morondava et de Belo sur Tsiribihina remontent vers le Bemaraha dans les prochaines années. Les Tsingy protègent efficacement le sud du massif de l'Antsingy de ce type de problème, même si nous avons pu observer des parcelles cultivées au milieu de la forêt dans les régions de Bekopaka, Ankinajao, etc. Le nord de cette forêt est inexplorable pour des raisons de sécurité.

Les feux de brousse, allumés chaque année pour reverdir les pâturages de saison sèche et pour nettoyer les pistes, constituent la menace principale pour la forêt de l'Antsingy, notamment sur sa bordure est. Ainsi, la piste Antsalova - Tsiandro coupe véritablement la forêt en deux et s'élargit chaque année à cause des feux de nettoyage laissés sans surveillance.

Le bilan de l'impacts de l'élevage sur les forêts est plus difficile à évaluer. Les feux de brousse permettant de reverdir les pâturages grignotent peu à peu les lisières et de nombreux zébus broutent dans les forêts ce qui peut compromettre leur régénération. Mais en contrepartie, les éleveurs Sakalava (ethnie majoritaire du Bemaraha) ont besoin des forêts pour cacher leurs troupeaux aux voleurs de bétail (dahalo), nombreux dans la région et aux autres habitants des villages puisque le nombre de zébus que chacun possède reste secret. En effet, plus un éleveur possède de zébus, plus il est important socialement. Mais il suffit que les autres villageois supposent que il possède plus de zébus qu'eux pour assurer son importance sociale. La forêt joue donc un rôle primordial dans le système social et économique des Sakalava qui est basé principalement sur l'élevage du zébu. Ainsi, dans les régions au sud du Bemaraha, dans le Menabe, on assiste à des conflits de plus en plus marqués entre éleveurs Sakalava et migrants du sud défricheurs de forêt.

Enfin, la chasse des lémuriens pour l'alimentation est amplement pratiquée dans toute la région. Les espèces les plus recherchées sont *Eulemur fulvus rufus*, *Propithecus verreauxi deckeni*, *Lepilemur edwardsi* et *Cheirogaleus medius*. Les techniques de chasse sont nombreuses: fusil, sarbacane, pièges traditionnels, chasse au chien et au bâton lorsqu'un animal est isolé dans une savane, capture au trou pour les *Lepilemur* et les *Cheirogaleus*. Ces derniers, très recherchés pour leur queue grasse en fin de saison humide, sont probablement mangés par aussi les chiens errants qui les déterrent pendant la saison froide.

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Preliminary report on a survey for *Daubentonia madagascariensis* and other primate species in the west of Madagascar, June-August 1994.

From June to August, 1994, a survey was undertaken in four regions of western Madagascar to identify potential sites for long term research on aye-ayes (*Daubentonia madagascariensis*). The four sites included: the Tsimembo forest, Reserve Natural Integral de Tsingy de Bemaraha, a small forest south of the Manambolo river and the Kirindy Forest CFPF. Ancillary data on the presence of other primate species in these areas was also collected. Very little is known about the populations of aye-ayes in western Madagascar (Simons 1993). There are old stories of aye-ayes being found at Ankarafantsika, but none have been found there in the recent past. To the south of the Tsiribihina river, no one has ever documented the extant species of *Daubentonia*, though subfossil remains of a larger species, *Daubentonia robusta* are found in the southwest. For many years scientists believed aye-ayes to be restricted to the eastern forest between Maroantsetra and Mananara. In the 1980s, populations of aye-ayes were discovered in the north (Ankarana, Montagne d'Ambre), south (Andohahela) and west (Manongarivo, Tsingy de Bemaraha) of Madagascar. However, large gaps still remain in our knowledge of their distribution. This information is critical to action plans for the conservation of *Daubentonia*.

Perhaps more than other nocturnal primates, aye-ayes are difficult to find, as they are cryptic, often flee at the sound of humans, and probably live in populations of low density. Several researchers, however, have uncovered proximate signs that can be used to identify presence of a population of *Daubentonia* in a region. These signs include feeding signs in dead wood, in seeds of *Canarium* spp. and *Entada* spp., on bamboo stems, and in a probable fungus on the trunk and branches of *Hintsia bijuga*.

In order to learn more about the distribution of the aye-aye, some sites were surveyed in western dry deciduous forest. In each site visited, local inhabitants were interviewed to find out which species of primates they knew of in the area. Transects were also walked to look for primates and for secondary signs of aye-aye presence. Once primate groups or individuals were sighted, data was taken on the number of animals in the group, height in the tree, morphological characteristics, and whether animals were first noted via sound or sight.

Tsimembo Forest
The Tsimembo forest has been described by previous researchers (see Bousquet and Rabetaliana 1992; Ausilio and Raveloarinoro 1993). During a three-day visit to this region, three trails were walked. Three of the trails were between Lac Soamalipo and Lac Ankerika, and the fourth was in a gallery forest to the north west of Lac Ankerika. Along a total of 4 km of trail, nine uninhabited aye-aye nests were located. No other signs of aye-aye were observed in this region. Observations on other species of primate correspond with those of earlier scientists in the region. No *Cheirogaleus major* individuals were observed, perhaps because the weather during the observation period was still cool. During the observations of the gallery forest trail, two morphs of *Lepilemur* were observed in close proximity. The first individual exhibited normal pelage characteristics for the region. The second individual, however, was all white. It resembled a juvenile *Propithecus* at first sight.

Reserve Natural Intégral de Tsingy de Bemaraha
Four days were spent in different sections of the Tsingy de Bemaraha. These forests have already been described by other scientists (Bousquet and Rabetaliana 1992; Rakotoarison *et al.* 1993). One day was spent at Ambodiriana, where many *Canarium* trees were located. A total of 326 fallen *Canarium* seeds were gathered, of which 82 % had signs of feeding. However, these signs were all those of rodents and not aye-ayes. No animals were observed during this time, but local inhabitants noted the presence of *Propithecus*, *Microcebus*, *Eulemur*, *Lepilemur*, and *Daubentonia*. The aye-ayes are called bekapaka (bekapaky), apparently to mimic the sound they make when they are searching for insect larvae in dead wood.
One day was spent at Bekopaka, prospecting the Ankiririna and Andadoany forests a few kilometers west of the village. Along 3.5 km of trail, no signs of aye-ayes were noted (neither nests nor feeding signs). Two species of diurnal primate were observed (*Propithecus verreauxi deckeni* and *Eulemur fulvus rufus*).
Two days were spent in the limestone forests to the south of the Manambolo river, to the east of the road. Along 10 km of trail, several signs of *Daubentonia* were observed, including feeding signs in dead wood. Ten *Canarium* trees were located, from which we collected 267 fallen seeds. Fifty three percent of these seeds showed signs of feeding by rats, and 18% had sign of feeding by aye-ayes. One group of *Eulemur fulvus rufus* was encountered during the day, and four species of primates were observed during nocturnal surveys.

Manambolo forest
South of the Manambolo river, to the west of Amboalimena and the east of Ankevo is a small patch of forest that is rarely visited by scientists. During a seven day visit to the forest, two trails were chosen that go from Ankevo to Lac Ambondrobe. The first trail, closest to the Manambolo, passes through degraded forest where all the largest trees have been removed. The southern trail goes through forest patches. No primates were located on this trail. This side of Lac Ambondrobe is very degraded in comparison with the western portion of the lake. The latter region is also degraded, but progressively less so as one travels further west. Along 21 km of trail in this forest signs of aye-aye presence were located, including feeding signs in dead wood and in bamboo stalks and seven uninhabited nests. The *Eulemur fulvus* individuals in this forest were gray-maroon with a dark tail. Local inhabitants said that there are two types of "Gidro" in the forest - "Gidrovarika" and "Gidro". The gidrovarika is apparently smaller, with lighter pelage than the gidro. No evidence of two types of *Eulemur* was found in this area. The individuals observed all conformed to *Eulemur fulvus rufus*. Along 4 km of trail, four species of nocturnal primate were observed. Local inhabitants also described an animal larger than *Phaner furcifer* that is called "Sisiba". The animal is apparently maroon-gray with a dark tail that is longer than the body. Unfortunately, no animal that fit this description was observed during this study.

Kirindy Forest/ CFPF
Two km of trails were walked in Block CS7 during the night, but of the eight species of lemurs known from that site (Ganzhorn and Kappeler 1996), only *Lepilemur*, *Phaner*, and two species of *Microcebus* were observed. During the day, six km of trail were traversed in the "Pistes des Lemuriens". Only one possible sign of aye-aye feeding was seen in this area, consisting of feeding signs in dead wood on a dead branch of a live *Tamarindus* tree.
In summary, aye-aye signs were found in three of the four areas surveyed. However, the density of signs in these regions is very low compared with areas where one finds aye-ayes in eastern Madagascar. This could signify several things. *Daubentonia* density could be very low in the region. Alternatively, aye-ayes in this region could have very large home ranges and they might not be spending much time in any one area, thus reducing the total number of impact in the area. It is equally possible that aye-ayes in the west are eating different foods from those in the east, namely foods that do not leave as obvious secondary signs.

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First release of captive-bred lemurs into their natural habitat

On the 10th November 1997 five captive-bred black-and-white ruffed lemurs (*Varecia variegata variegata*) were released into the Betampona Natural Reserve in Eastern Madagascar after seven years of research and planning. In 1990, the Madagascar Fauna Group (MFG) and the Duke University Primate Center (DUPC), in collaboration with Madagascar's Association Nationale pour la Gestion des Aires Protégées and the Ministère des Eaux et Forêts, proposed the reserve of Betampona as a potential site to attempt the first experimental re-stocking of *V. v. variegata*. Surveys of the existing population of *V. v. variegata* in 1990 and 1991 indicated that a maximum of 35 individuals survived in Betampona (Welch and Katz 1992). Betampona is situated at about 17°40'S and 49°3'E on the east coast of Madagascar, about 40 km from the city of Toamasina. The reserve covers 2228 hectares of which approximately 70 % (1569 ha) is undisturbed low altitude rainforest and suitable habitat for *V. v. variegata*. The density of *V. v. variegata* in Betampona (1.5-2.2/km^2) is far lower than that recorded at other sites, e.g. 16.2 animals/km^2 at Valohoaka in Ranomaf-

ana National Park (White *et al.* 1995) and 20-30 animals/ km^2 on the island of Nosy Mangabe (Morland 1991). It is presumed that past hunting within the reserve resulted in the low *V. v. variegata* population that exists today. This is supported by discussions with local people who report that far greater numbers of all the diurnal lemur species existed recently. It was felt that if protection of Betampona could be ensured then the existing population of *V. v. variegata* could benefit from the addition of carefully selected individuals from the captive population.

Further justification for the re-stocking attempt is provided by the likelihood that the *V. v. variegata* in Betampona have been isolated from other populations since the 1950s if not before. Inbreeding depression may already be acting upon the population and the current population size (~35) falls below the figure of 50-500 individuals: the minimum population size assumed for the long term maintenance of genetic diversity in mammals (Franklin 1980). In May 1997, a population viability analysis workshop was held at the Duke University Primate Center to identify and evaluate threats to the *V. v. variegata* population at Betampona and to explore the biological impact of the re-stocking programme. The computer simulation modelling program "Vortex" (Lacy *et al.* 1995) was used to predict population trends considering a variety of interacting deterministic and stochastic processes acting on the Betampona population. Preliminary analyses indicate that the wild population exists on the edge of extinction. When the population was enhanced by the addition of new breeding individuals the simulations showed a positive population growth rate, a lower probability of extinction and a greater retention of genetic heterozygosity.

The project aims to use the release of captive-bred *V. v. variegata* into Betampona as a case study to determine the viability of releasing captive-bred lemurs as a conservation strategy to reinforce small, isolated populations in Madagascar. However, this is only one of the goals of the project. Another goal is to directly improve the level of protection of the reserve through the presence and activities of project personnel and thus improve the conservation status of its other rare and endangered species. It is hoped that *V. v. variegata* can act as a "flagship species" for the conservation of eastern rainforest in Madagascar. Indirect protection of the reserve will be facilitated by public awareness and conservation education programmes in conjunction with on-going programmes at nearby Parc Ivoloina, and in coordination with rural microdevelopment and ecodevelopment projects. A further goal is to develop Betampona as a site for scientific research and to encourage the involvement of Malagasy scientists and local people in project activities.

The captive population of *V. v. variegata*, derived from 21 founders, numbered 674 in 1992 (Porton 1992). The sub-species breeds well in captivity and the population has a history of good management, including a North American Species Survival Program (SSP) and a similar EEP program in Europe. There thus exists a sufficiently large and healthy captive population from which individuals can be selected for return to the wild, also without compromising the viability of the captive breeding program.

A total of twelve months of research were carried out by Britt (1996) in Betampona between November 1993 and August 1995, investigating the behavior and habitat requirements of the wild *V. v. variegata*. Data from Betampona were used as a baseline to compare with the behavior of captive *V. v. variegata* held by the North of England Zoological Society at Chester Zoo.

Botanical surveys comparing regions in Betampona currently supporting wild *V. v. variegata* with regions not occupied, indicated a similar abundance of food source tree species (Andrianarisata 1995). This suggests that these areas were unoccupied due to the low population density, but would be suitable habitat for the species.

Selection of release candidates was undertaken by the Ruffed Lemur SSP Coordinator and was based upon the following initial criteria: 1) Surplus to the international SSP and EEP captive breeding programs 2) Assumed to be genetically appropriate 3) Medically sound 4) Age range 1-12 years 5) Parent reared 6) No behavioral deficiencies 7) Reproductively sound 8) Origin from an institution which cooperates with SSP 9) Logistical factors.

Only captive animals with the same pelage form as that of the wild *V. v. variegata* in Betampona were considered for the release, with the assumption that pelage serves as a reasonable, practical marker of genetic similarity. Although the sub-species shows great variation in pelage pattern, ranging from predominantly black to predominantly white in a north-south cline, most captive *V. v. variegata* are of the same pelage pattern as those in Betampona. Based on old, albeit unspecific, capture records and on the relative accessibility of forests in the Betampona/Toamasina region, it is probable that some of the founders of the U.S. population originated in this area.

DNA sequences from blood samples taken from three wild *V. v. variegata* at Betampona were compared to sequences from 15 individuals in the North American SSP population by Dr. G. Amato (Wildlife Conservation Society) and Dr. R. DeSalle (American Museum of Natural History). Results showed that the Betampona animals and 11 of the SSP animals fall within the same clade, indicating that the the Betampona individuals and the majority of the SSP animals that were examined are not genetically distinct. Similar analysis have been and will be conducted specifically for each release candidate.

Candidates for release are given complete health screening including blood chemistry profiles, fecal cultures, parasite checks, radiographs, TB tests and viral screens. A veterinary protocol, prepared by Dr. R. Junge (St. Louis Zoo and veterinary advisor to the Prosimian Taxon Advisory Group and the Betampona re-stocking project) and other veterinary experts includes complete recommendations for health screens on release candidates pre- and post-release.

The final selection of releasees was a group of five (three males & two females) all born in multi-acre natural habitat enclosures at the Duke University Primate Center. The males were 1.5, 4.5 and 12.5 years old and the females were 6.5 and 11.5 years old at the time of release.

In October 1997 an habituation cage (5x5x3m) was constructed just to the east of the main trail, 1.4 km from the southern reserve entrance. The first release site was chosen for several reasons. The area needed to be currently unoccupied by the indigenous population, and the site selected was at least 0.5 km from the range boundary of the nearest group (Britt 1996). Resource availability at the proposed release site is a similar to the abundance of food tree species in other parts of the forest that are inhabited by *V. variegata* area

Fig. 1. *Varecia v. variegata released in Betampona*

(Andrianarisata 1994). The release site was also close enough to the base camp at Rendrirendry to allow easy monitoring of the group post-release. The date for the release was set for November as resource availability is good at this time, the weather is relatively dry, improving our ability to locate and follow the releasees, and the animals would have several months of adaptation time before facing the potential danger of cyclones.

The group arrived at Rendrirendry on 20/10/97 and was held overnight in a small cage (3x3x2m). After a thorough veterinary examination of each animal, the group was transferred to the habituation cage at the release site on 21/10/97 to acclimate for 3 weeks prior to release. Forest fruits, young leaves and flowers, in small quantities, were provided 4 times a day. The group were also provisioned with commercial monkey chow twice a day - 6 pieces per animal, and initially with commercial fruits, although this was stopped after the first week. During this period the group was weighed and physically examined each week by Dr. Graham Crawford (San Francisco Zoo veterinarian). Observations were made on the group's reactions to the forest fruits etc. and the surrounding environment. The group was guarded and cared for day and night by personnel from Parc Ivoloina. Each individual was fitted with a radio-collar (Telonix) prior to release to enable project personnel to locate and track the movements of the releasees. Project personnel were trained in the use of the radio-receiver in the weeks leading up to the release. Following release the group was monitored intensely for the first month post-release. During this period project personnel attempted to establish visual contact with each individual daily. The intensity of monitoring was reduced during the second month, but visual contact is attempted with each individual at least twice a week. The animals are inspected at close range when possible to assess their physical condition, check for wounds, injuries and ectoparasites. Fecal samples are collected opportunistically and floatations examined for the presence of endoparasites. Veterinary intervention will only be considered in cases of serious injury or disease compromising the welfare and survival ability of an individual.

During the first eight weeks post-release the group were provisioned daily with commercial monkey chow (the major constituent of their diet at DUPC). This was provided in two feeds, at 04:30 hours and 16:30 hours. Initially each animal was given 10 pieces of chow per feed, this was reduced gradually until each animal received four pieces per feed in the 7th week. By mid-January, the lemurs no longer regularly visited the feeding stations and provisioning was stopped. The chow was presented in wire baskets, suspended from branches 10-15m above the ground. Three such baskets were sited in the release area. Each basket was lowered and raised by a simple pulley system. Attached to the baskets were lengths of split bamboo to hold water.

As detailed data analyses are yet to be completed, a purely anecdotal account of the release is all that can be provided at this stage. Prior to release the group's behavior was subdued, with very little activity and only one of the species' characteristic roar/shriek choruses being performed in the entire three-week period, despite being within auditory range of calls from the indigenous population. It is possible that the group was suffering stress as a result of being exposed to their new environment. This is further supported by the results of fecal analysis when *Strongyloides* larvae were isolated from fecal floatations in the third week of the acclimation period. No traces of parasites had been observed prior to shipment nor in the first two weeks post-arrival, but it is accepted that stress can induce the shedding of larvae from apparently parasite-free animals. It is also possible that the animals became infected on arrival at Rendrirendry. All animals were dosed with Ivermectin and Mebendazole and all fecal examinations were negative prior to release and subsequently on post-release exams. The group readily accepted the forest fruits provided and maintained weight and good physical health throughout the acclimation period. The group was released at 08:55 on November 10 and initially took off at speed. The first day was extremely hectic, with two individuals arriving in the territory of the nearest wild group and the other three almost reaching the camp at Rendrirendry before being chased back into the forest. In retrospect we feel that there were too many guests there to witness the release and this may have caused the rapid departure from the release area. During the first week several incidents provided cause for concern. Firstly, three individuals returned to Rendrirendry and had to be captured and transported back into the reserve. Secondly, one of the males was located close to the reserve boundary in an exhausted state. He was recaptured and moved back to the release site. On several occasions all the releasees exhibited signs of heat stress and exhaustion. Thirdly, one female was located in cultivated land outside the reserve, where it was reported that local youths had attempted to kill her. She was captured and brought back to Rendrirendry, where it was discovered that she had a machete wound on her back. This was treated and she was subsequently re-released in the forest and recovered well. After the first week the group became more settled and showed rapid adaptation to their new environment. There were no apparent problems with food location, locomotion in the canopy and the selection of suitable sleeping sites. Individuals would appear at the three feeding baskets regularly each morning and evening. In December the first contact between the releasees and the wild *V. v. variegata* was observed. One of the females was observed often with a young wild male, and the same female fought several fierce battles with two of the wild females. The two mature males were both observed with leg wounds during this month and it is assumed that these resulted from agonistic encounters with the indigenous population (both healed well). This situation has calmed and in March and April no interaction between the releasees and the wild group have been observed.

Both females appeared to come into estrus in December, the time when mating occurs in the northern hemisphere. Mating in Madagascar takes place in June/July. As male *V. v. variegata* exhibit testicular swelling to coincide with female estrus, only the released males should theoretically have been capable of inseminating the females. The young wild male was observed attempting to mount one of the females, and breeding behavior were observed between the releasees. If reproduction was successful, there is some cause for concern, as any infants resulting will be born outside the natural birth season (September/October). *V. v. variegata* transferred from Madagascar to the northern hemisphere have adjusted their reproductive cycles to the reversal in photoperiod changes within 12-18 months. For the second release it is proposed to give females contraceptive injections to delay or prevent estrus in the hope that the animals would then synchronize more quickly to Madagascar breeding and birth seasons. At the beginning of March the project suffered a major setback when one of the females was killed and eaten by a Fosa (*Cryptoprocta ferox*). It is impossible to know whether naiveté on the part of the female caused her to fall victim to the Fosa. Fosa are significant predators on lemurs in many habitats around the island and it is difficult to envisage how release candidates can be prepared to deal with this threat. Despite the loss of one of the releasees, we feel that the project has so far demonstrated that captive-bred *V. v. variegata* can adapt to a wild existence in native forests. The remaining four releasees are exhibiting the same behavior patterns as the indigenous population and are in good health. Ultimately the project will be judged a success if released animals reproduce successfully and integrate with the indigenous population. The second release of 3-5 animals is scheduled for November 1998. A third release is planned for 1999.

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The lemur community of Ambato Massif: an example of the species richness of Madagascar's classified forests

A continuing problem in lemur research, recent detailed field data notwithstanding, is the poor state of our knowledge concerning the geographic distributions of lemur species (Tattersall 1977, 1982, 1988; Petter and Andriatsarafara 1987; Hawkins *et al.* 1990; Mittermeier *et al.* 1994). While the lemur taxa present in Madagascar's National Parks, Strict Nature Reserves (Réserves Intégrales) and Special Reserves (Réserves Spéciales) are fairly well-documented, scarcely any information is available from Madagascar's extensive system of classified forests and forest reserves (Mittermeier *et al.* 1992, 1994). Thus, the composition of lemur communities in these latter (nominally) protected areas is not only of academic interest, but also of biological importance for the future conservation of lemur populations. This report presents data on the lemur community of the classified forest of Ambato Massif (including the notable absence of *Microcebus rufus*), examines these data in light of previously published species distributions, and considers possible reasons why *M. rufus* apparently does not occur at this particular site.

The "classified forest" (Forêt Classée) of Ambato Massif (13°27' S, 48°34' E; summit = 461 m), is a nominally protected area of approximately 700 ha about 30 km north of Ambanja and within sight of Nosy Be and Nosy Komba (Fig.1). A socioecological study of the black lemur *(Eulemur macaco macaco*) in differing forest habitats was conducted at Ambato between July 1991 and October 1992 (Colquhoun 1993). During this long-term study, the first at Ambato, all observations of any lemur species were noted. The occurrence of five lemur species (*Eulemur macaco macaco, Hapalemur griseus occidentalis, Mirza coquereli, Lepilemur dorsalis, and Cheirogaleus major)* were confirmed through sightings. The presence of a sixth species (*Daubentonia madagascariensis*), while not confirmed by direct sighting, was indicated by feeding damage characteristic of the species. A seventh species, *Phaner furcifer (parienti?),* may have also been present at Ambato; vocalizations attributable to *Phaner* were heard. The composition of the lemur community at Ambato is consistent with being a nested subset of lemur communities in the evergreen rain forests of eastern Madagascar (Ganzhorn 1998), with the addition of *M. coquereli*, the possible presence of *P. furcifer*, and the notable absence of *Microcebus rufus*. Also, the lemur community of Ambato represents a perfectly nested subset of the lemur community found in Manongarivo Special Reserve, approximately 50 km south of Ambanja (Mittermeier *et al.* 1992, 1994; Ganzhorn 1998).

The black lemur was the most numerous day-active lemur at Ambato. The study population consisted of four social groups, numbering in total between 38 and 41 individuals during the study period; mean group size was 9.75 (range = 5-14), and mean home range size was 5.0-5.5 ha (range = 3.5-7.0). The adult sex ratio approximated 1:1. The black lemur population density in the study area was two animals per ha; this translates to roughly 200 animals per km^2. The black lemur population density is not uniformly distributed, however, because of the pronounced habitat heterogeneity on the massif. Black lemurs were sighted from sea level to about 300 m; they were not observed in the bamboo forest that carpets the massif from about 300 m to the summit. The local population to which the study population belonged was estimated to number between 300 and 1000 animals.

The western subspecies of the gray gentle lemur was the only other day-active lemur at Ambato. *H. g. occidentalis* occurred at a relatively low population density — only about 0.35-0.4 animals per ha in the study area. This translates to a maximum population density at Ambato of only 35-40 animals per km^2. As with the population estimates for Ambato's black lemurs, habitat heterogeneity also seemed to affect the distribution of *H. g. occidentalis. Hapalemur* was observed from sea level to about 100 m; although thick bamboo forest covers the upper portions of the massif to the summit, *Hapalemur* was not sighted there during two surveys.

While no population density estimates were made, both *Mirza coquereli* and *Lepilemur doralis* were locally abundant at Ambato (at least on the basis of forest edge observations). Individuals of *L. dorsalis* that were sighted at day-resting sites were notable for the dark median dorsal stripe they exhibited — a trait, apparently, not previously described for this species (Tattersall 1982; Buettner-Janusch and Tattersall 1985; Mittermeier *et al.* 1994).

Cheirogaleus major was also present, but was rare. Only a single sighting (November 1991) was recorded in 15 months at Ambato. The individual appeared somewhat larger than, and differed in colouration from, *Mirza* — the fur of the dorsum and tail was reddish (Tattersall 1982). Several previously published distributions for *C. major* do not include Ambato (Petter 1962; Petter and Petter-Rousseaux 1979; Wolfheim 1983), and there is even one report (Mittermeier *et al.* 1994:109) that, "... it does not occur sympatrically with *Mirza*.". This sighting verifies those published distributions

which include Ambato and the Nosy Faly Peninsula within the range of *C. major* (Tattersall 1982; Harcourt and Thornback 1990). *Daubentonia madagascariensis* was not observed directly, but evidence indicating its presence was found. A branch bearing damage characteristic of *Daubentonia* feeding behaviour was found within the study area in a patch of relatively disturbed riparian forest. Local villagers also reported that "hai-hai" occurred on Ambato Massif. While the species would appear to be rare at Ambato, this "circumstantial sighting" is consistent with other recent observations that the aye-aye is more widespread and abundant than was previously thought; several sightings across the Sambirano region and other locations in the northwest are now on record (Tattersall 1988; Hawkins *et al.* 1990; Harcourt and Thornback 1990; Andrews 1990; Mittermeier *et al.* 1992, 1994; Colquhoun 1993; Simons 1993).

A seventh species, *Phaner furcifer (pariente?)* may also have been present, although rare, at Ambato. Vocalizations attributable to *Phaner* were heard during June 1991 and May 1992. *Phaner* was observed on the outskirts of Ambanja, on the north bank of Sambirano River, in a cacao plantation (utilizing the tree canopy above the cacao trees in the understorey). This follows the observation by Andrews (1990: 39) of *Phaner*, ".. in a timber plantation close to Ambanja". These observations would appear to represent a range extension of *P. furcifer (parienti?)* compared to several published distributions (Petter 1962; Tattersall 1982; Buettner-Janusch and Tattersall 1985; Harcourt and Thornback 1990; Groves and Tattersall 1991; Mittermeier *et al.* 1994), to include at least the northern bank of the Sambirano River in the vicinity of Ambanja (cf. Tattersall 1988), and perhaps continuing north as far as Ambato and the Nosy Faly peninsula (Petter and Petter-Rousseaux 1979; Wolfheim 1983; Colquhoun 1993).

Several published range maps show the geographic distribution of the rufous mouse lemur (*Microcebus rufus*) as including Ambato Massif and the Nosy Faly Peninsula (Petter and Petter-Rousseaux 1979; Tattersall 1982; Wolfheim 1983; Harcourt and Thornback 1990). *M. rufus* and its congener the gray mouse lemur (*M. murinus*), are generally described as the most widespread and most abundant of all the lemuriformes (Martin 1972, 1973). For example, Mittermeier *et al.* (1994: 83) state, "Only a few Malagasy forests do not contain one of these species". Yet, in 15 months at Ambato I did not record a single observation of *M. rufus*. Further, local residents reported with surety that "tsidy" or "tsitsihy" did not occur at Ambato. In fact, two recent publications (Mittermeier *et al.* 1994; Schmid and Kappeler 1994) suggest that the limits of the distribution of *M. rufus* in the Sambirano region are not precisely known; the range map for *M. rufus* provided by Mittermeier *et al.* (1994) does not include Ambato Massif or the Nosy Faly Peninsula. Confounding the picture, however, is the survey report by Andrews (1990) that residents on Ankify Peninsula (NW of Ambanja), in the village of Antsakoamanondro (19 km north of Ambanja, on Route Nationale 6), and in the village of Anjiamanoro (down the Nosy Faly Peninsula from Ambato Massif), all indicated that "tsitsihy" occurred in their vicinities; it was reported as "rare" around Anjiamanoro. Given this report by Andrews, and the fact that *M. rufus* is known to occur in Lokobe Reserve on the off-shore islet of Nosy Be

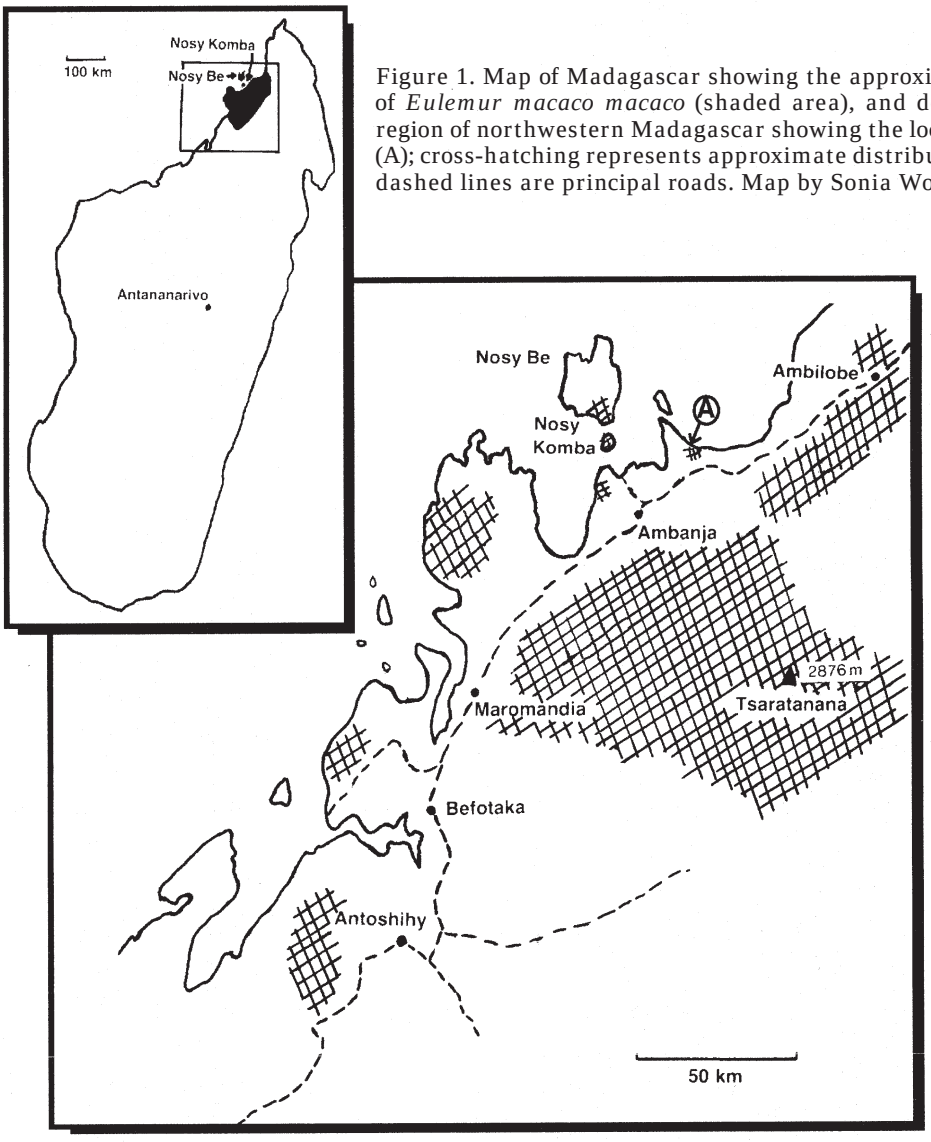

Figure 1. Map of Madagascar showing the approximate geographic range of *Eulemur macaco macaco* (shaded area), and detail of the Sambirano region of northwestern Madagascar showing the location of the study area (A); cross-hatching represents approximate distribution of forest cover and dashed lines are principal roads. Map by Sonia Wolf.

(Tattersall 1982; pers. obs.), it is not readily apparent why the species should not also occur at the nearby Ambato Massif. This seems doubly perplexing in light of the fact that Ambato, despite being a relatively small tract of forest, contains a diverse flora (Meave *et al.* 1991) and harbours several mammalian, avian and reptilian taxa that are considered "vulnerable" or "endangered" (Jenkins 1987; Langrand 1990; Harcourt and Thornback 1990; Hawkins *et al.* 1990; Colquhoun 1993; Mittermeier *et al.* 1992, 1994).

Botanic data from Ambato indicate that the heterogeneous forest formations (Meave *et al.* 1991) on the massif would provide a suitable habitat for *M. rufus* in terms of offering an extensive "fine branch econiche" (Martin 1972, 1973), as well as the presence of numerous fruit tree species, both endemic and introduced (Colquhoun 1993). As determined by multiple measures of plant diversity (Colquhoun 1997), Ambato can be described as an environment exhibiting floristic richness. Recent research has shown that the species diversity of lemur communities is tied more closely to the number of tree species present than to the structural diversity of the habitat; higher lemur species numbers and population densities can be found in relatively less-disturbed secondary forests, such as Ambato, than in undisturbed primary forests (Ganzhorn 1995a,b,c).

The occurrence of *M. rufus* has been shown to be strongly associated with the availability of fruiting shrubs and trees (Ganzhorn 1987, 1988, 1989). At Ranomafana National Park, Atsalis (1996) found that *M. rufus* relied heavily on the fruit of *Bakerella* (=*Taxillus, Loranthaceae*) year-round. *Bakerella is an endemic* hemi-parasitic epiphyte (i.e., a "mistletoe"); 16 species and several sub-species and varieties are found across Madagascar (Balle 1964; Mabberley 1987). In the Sambirano region, *Bakerella clavata* is known to occur: *B. clavata var. clava*ta has been gathered on Nosy Be (Lokobe Reserve), and *B. clavata var. aldabrensis* is known from Nosy Komba (Balle 1964). While the presence of *Bakerella* at Ambato has not been verified through collections, there seems no reason why it should not be found there given its occurrence at sites nearby. Historic events at Ambato and a model of time-delayed, deterministic extinction due to habitat destruction proposed by Tilman *et al.* (1994), might account for the absence of *M. rufus* at this site. Records indicate that a major fire occurred on Ambato Massif in the early 1920s (Andrews 1990). Tilman *et al.* (1994) recently modelled multi-species coexistence in patchy environments resulting from habitat destruction. They found, to their surprise, that if a competitively superior species was also a poor disperser, even moderate habitat destruction was likely to cause the time-delayed, deterministic extinction of that species in the remnant habitat patches. If the species also occurred at relatively low population densities it was more vulnerable to deterministic extinction, even as the result of low levels of habitat destruction. The quality of remnant patches (Meave *et al.* 1991) did not ameliorate the likelihood of extinction (Tilman *et al.* 1994). While a recent trap/retrap study of *M. rufus* (Harcourt 1987) suggests that some individuals might range over several hectares, even this might not represent a sufficient dispersal ability in the aftermath of a major habitat destruction event, such as a forest fire. It is suggested that *M. rufus* may have been present (though not necessarily abundant), at Ambato in the recent past, but that it experienced a deterministic, local extinction due to habitat destruction earlier in this century. The same historic process might account for the apparent rarity at Ambato of *Cheirogaleus major*, a generalist species (Ganzhorn 1987) that may also lack high dispersal abilities. Higher population densities and/or superior dispersal abilities among the remaining species of the Ambato Massif lemur community could have been sufficient for them to avoid deterministic extinctions due to habitat destruction.

The classified forest of Ambato Massif is clearly a locally important forest ecosystem and watershed; specifically, Ambato is a major stronghold for the black lemur, as well as for *Lepilemur dorsalis* and *Mirza coquereli*. Madagascar's other classified forests are also likely to be important reservoirs of biodiversity. In light of ongoing high rates of forest loss across the island, surveys of these nominally protected areas deserve to be made a research priority. Future surveys of Madagascar's classified forests are likely to necessitate amendments to published geographic distributions for many lemur species.

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Predation on the Eastern Woolly Lemur (*Avahi laniger*) and other vertebrates by Henst's Goshawk (*Accipiter henstii*)

In recent years it has become clear that predation is a major factor effecting lemur demography and in the evolution of lemur social behavior (Goodman *et al.* 1993a; van Schaik and Kappeler 1996). Analyses of carnivore scats and owl pellets and direct observations of predation have been important in revamping primatologists' views on the level of predation of lemurs (Goodman *et al.* 1993a,b; Rasoloarison *et al.* 1995; Wright and Martin 1995).

To date much of the information available on lemur predation by birds of prey has been based on owl pellets, which perhaps has disproportionately emphasized predation on nocturnal prosimians. Little quantitative information has been available on the food habits of large diurnal birds of prey. Herein we present information on the food remains found in or near an occupied nest of the Henst's Goshawk (*Accipiter henstii*), a large forest-dwelling raptor.

The study was conducted by Rene de Roland and Thorstrom in the Masoala National Park from August 1996 to February 1997 near the Andranobe Field Station on the western coast of the Masoala Peninsula (15°43'S, 49°58'E). This area of the Masoala Peninsula is roadless and composed of a mosaic of slash-and-burn clearings, secondary growth, and primary forests. The lowland rain forest of the Masoala Peninsula has a canopy height less than 30 m with few emergent trees, high floristic diversity, and steep mountainous topography. Elevations on the peninsula range from sea-level to 1 200 m. Average annual rainfall recorded at the field station between 1992 and 1996 was 6 106 mm. Monsoon rains and cyclones occur between December and April, whereas rain falls steadily between May and August (Donque 1972). September through November are the driest months.

Prey remains were collected from several sites where the female Henst's Goshawks cached and dumped carcasses. The bone remains recovered from the Henst's Goshawk's nest were identified by Goodman using the comparative osteology collections of the Laboratoire de Paléontologie, Université d'Antananarivo. Paired bones of any taxon were separated and the largest number of elements from either the left or right side was considered the minimum number of individuals (MNI) among prey items.

Five bird and two mammal species were identified from the bones recovered in or near the *Accipiter henstii* nest (Table 1). At least 19 individuals were identified among the prey remains, composed of 63 % birds and 37 % mammals. On the basis of a relatively small number of bone remains, the Eastern Woolly Lemur *Avahi laniger* and the Blue Coua *Coua caerulea* make up the vast majority of the prey consumed by *Accipiter henstii* in both terms of their representation and total biomass. The other species were less frequent and comprised a small percentage of the species consumed.

Within the genus *Accipiter* there is substantial sexual dimorphism in body size, with females being larger than males. The body mass of two female *A. henstii* was 960 g and 1150 g and one male 620 g. The size difference between the sexes is sufficient enough that they can be visually differentiated. During his observations of the nest, Rene de Roland was able to identify which individual of the pair brought the *Avahi* remains back to the nest. The sub-adult *Avahi* was captured by the male and adults by the female. On two occasions the female *Accipiter henstii* was observed preying upon White-fronted Brown Lemurs *Eulemur fulvus albifrons*. The bird was observed dismantling the carcass at the site the animal was dispatched and sometimes transported a portion of the animal to the nest. No bone material of this lemur was recovered from the collected prey remains. The male *A. henstii* was not observed predating on *E. fulvus*. Given the predation information presented in this note, we can roughly establish the maximum prey size taken by the different sexes of *A. henstii*. The maximum-sized prey taken

by male *A. henstii* was a subadult *Avahi* which weigh approximately 750 g. The female was able to dispatch and carry back to the nest adult *Avahi* weighing about 1175 g. Further, female *A. henstii* are also capable of dispatching adult *Eulemur fulvus albifrons*, weighing about 2.3 kg (Mittermeier *et al.* 1994), but unable to transport the whole carcass.

Table 1. Bones remains identified from the *Accipiter henstii* nest.

Species	MNI	mean mass (g)	% representation	% biomass
Coua caerulea	8	235	42.1	18.5
Coua cf. *serriana*	1	~170	5.2	1.7
Centropus toulou	1	189[1]	5.2	1.9
Canirallus kioloides	1	172[1]	5.2	1.7
Accipiter henstii	1	910[2]	5.2	9.0
Setifer setosus	1	190[3]	5.2	1.9
Avahi laniger				
adult	5	1175[4]	26.3	58.0
subadult	1	~750	5.2	7.4
total	6		31.5	65.4
Total	19		99.6	100.1

Sources of mean mass data: [1] Goodman *et al.* 1997; [2] Lily Rene de Roland (unpubl.); [3] Goodman (unpubl.); [4] estimate of combined sexes based on Glander *et al.* 1992

ADDED NOTE: During the 1997 breeding season two pairs of *Accipiter henstii* studied in 1996 reoccupied nests. On 30 December 1997 an adult female *A. henstii* was observed carrying an adult *Avahi laniger* to three young fledglings. Bone remains recovered during the 1997 breeding season from the nests included:

Avahi laniger MNI = 2 (1 adult and 1 subadult)

Lepilemur microdon MNI = 1 (adult)

Coua caerulea MNI = 8

Streptopelia picturata MNI =1

Accipiter henstii was not usually observed in the act of preying on *Avahi*. This raptor is diurnal and the lemur nocturnal. *Avahi* often rest during daytime hours in a relatively exposed vertical clinging position on tree trunks and large tree branches. In such a position they might be accessible to hunting *A. henstii*, which often rests still on relatively exposed branches in the forest and carefully scans the surrounding habitat (perch hunting) for potential prey.

On the basis of the data presented here and a few other small data sets from diurnal birds of prey (e.g. Goodman and Langrand 1996), it is becoming increasingly clear that diurnal birds of prey feed regularly on nocturnal prosimians. The hunting strategies used by these raptors is unknown, but presumably the nocturnal primates are either taken from their daytime resting places or the raptors are actively hunting at dawn or dusk when several nocturnal primates are active.

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Lemurs of the Comoro Archipelago: Status of *Eulemur mongoz* on Mohéli and Anjouan, and of *Eulemur fulvus* on Mayotte

The lemur populations of the Comoro Islands have witnessed a steady contraction of their habitats (e.g. Tattersall 1983, 1992) ever since their status was first surveyed in 1974-5 (Tattersall 1977). In view of this, ongoing monitoring of these rather neglected wild-living populations, the only ones of their kind outside Madagascar, is an essential component of any effort to assure their conservation. Brief surveys were thus conducted of the mongoose lemur, *Eule-*

mur mongoz, on the independent islands of Mohéli and Anjouan in July and August, 1994, and of Mayotte brown lemur, *Eurlemur f. fulvus,* on the French dependency of Mayotte, in February, 1977. Results are summarized below.

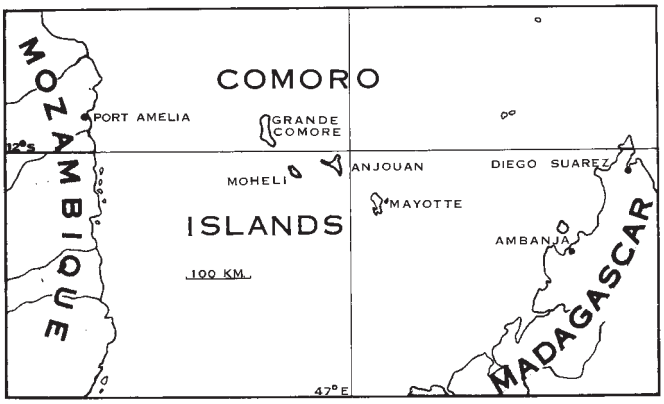

Fig. 1. The Comoro Islands

Mohéli (Moili)

The human population of Mohéli, 12 000 (20/km^2) in 1975, has more than doubled in recent years, with an increasing component of immigration from the larger neighboring island of Anjouan. These new arrivals have had a particularly deleterious effect on Mohéli's vegetation, having been forced by existing settlement to establish themselves high on the slopes of the long central ridge that forms its backbone. Slopes of (sometimes well) over 50%, totally inappropriate for cultivation of any kind, are now being planted with bananas, taro, cassava and so forth, and mature humid forest has been cleared in many areas to the top of the ridge, although some pristine remnants persist along the ridgeline to the east, above about 450 m altitude. Mass soil erosion is widely evident at all altitudes, while stream activity on the lower slopes has been greatly reduced. In the lowlands, large trees are becoming sparser, though secondary formations that provide good lemur habitat still persist in many places along the courses of the larger (and now intermittent) streams. No lemurs were sighted either by day or by night in the pristine forest of the ridge's eastern end, and the frequency of sightings in the lower-lying areas was greatly diminished compared to earlier surveys. The mongoose lemur population of Mohéli is clearly much lower than it was two decades ago; and as forest clearance brings the lemurs into more widespread and more intense competition with farmers, their prospects will almost certainly diminish yet further.

Anjouan (Ndzouani)

Widespread destruction of the formerly abundant humid forest of the high-altitude interior was already evident by 1983, and the trend has if anything accelerated since then, with a doubling of human population since 1975. Mongoose lemurs are still locally plentiful at the higher altitudes, but only in the few places where pristine forest remnants survive. Most such remnants cling to close-to-vertical slopes, and so far it has been impossible to determine lemur densities – or even presence – under such conditions. In the lower coastal lowlands there is still a fair amount of secondary habitat suitable for lemurs, though vegetation cover has drastically decreased over the past two decades, especially on the Sima peninsula to the west and in the east around Domoni, and soil erosion is much more widespread than before. Locally, then, lemur populations in the lowlands seem fairly healthy (though in substantially fewer locales than before); but there is a new concern in that farmers are beginning to blame lemurs (unreasonably) for damage to the coconut crop, and (more reasonably) to the breadfruit and jackfruit crops. This adversarial view of lemurs is something new, and requires prompt reaction since several locals interviewed were considering the use of poison to discourage perceived lemur depredations, and these animals are already threatened by the widespread recreational use of slingshots by children.

Mayotte

Since Mayotte became a "territorial collectivity" of France in the 1980s, development in this island has proceeded apace. In the mid-nineteenth century Mayotte was largely covered by sugar plantations, but a hundred years later had been regrown by secondary forest formations that supported substantial populations of brown lemurs. With the recent explosive development of the island (paid for by the French taxpayer and grafted on to an inappropriate economic and social infrastructure) has come a substantial road network that has opened up almost all areas of Mayotte to exploitation by commercial agriculture and, more importantly, by peasant farmers. More importantly because, while the latter still employ old methods of shifting agriculture, with human population increasing at an annual rate of up to 5.8% (sic) they are no longer able to shift. Villages, now with a much more complex and expensive infrastructure than before, are staying in the same place and growing, and the villagers are devastating the surrounding landscape in ever-widening circles. Soil erosion is increasing by leaps and bounds, and the lagoon, formerly famous for its marine life, is being choked with mud as well as by construction debris. This catalogue of environmental woes could be expanded almost indefinitely, but the message for primate conservation is simple: vegetation cover, and consequently lemur habitat, is diminishing severely in almost every area of the island, and at an alarming rate. It is too early to suggest that the brown lemurs are in immediate danger of disappearance, but it is clear that lemur habitats and populations, are in fairly steep decline. Brown lemurs are unquestionably eurytopic, and can handle a certain degree of habitat transformation; but wholesale habitat disappearance is another matter.

Discussion

The Federal Islamic Republic of the Comoros, which embraces Mohéli, Anjouan and the lemurless large island of Grande Comore, has recently been in turmoil. Anjouan effectively seceded from the federation toward the end of 1997, but it is too soon to say what kind of polity will result. On Mohéli, which has thus far remained with its much larger neighbor, Grande Comore, immigration from Anjouan will presumably slow, but how much effect this will have is hard to say. During the 1994 survey, the principal complaint of dedicated agricultural officials was that they were not given the political support they needed to discourage villagers from destructive agricultural practices: offenders taken into custody were immediately released on political instructions. Indeed, with the government effectively bankrupt, there is little that the authorities can offer impoverished villagers other than the freedom to destroy their environment. The soils and hydrology of Mohéli – and thus its human inhabitants – are thus as much at risk at the lemurs themselves (see also Ehrlich 1997).

On Anjouan the situation is a little different if only because, although the problems are similar to those on Mohéli, and officialdom faces the same basic difficulties, there are private individuals and organizations dedicated to the protection of nature on the island. The "Association Faune Flore Comores" is led by Anjouanais, and has been vigorously distributing a poster (Fig. 2) that is aimed at discouraging peasants from persecuting lemurs in the belief that these animals are crop pests. Additionally, the English group "Action Comores" has been actively working with another local conservation group, Ulanga, to mount an educational and poster campaign aimed primarily at the protection of the endangered Livingstone's fruit bat, *Pteropus livingstoni,* but which emphasizes the necessity of maintaining forest habitats for economic as well as conservation purposes.

Further, the Saidali family has been investigating the feasibility of turning its property at Choungui/Pomoni, which contains one of the last remnants in the island of pristine littoral forest, into the core of a nature reserve which will extend high into the interior along the Choungui river valley. Until the political situation has stabilized it will be impossible to predict the outcome of these initiatives, but the presence in Anjouan of active individuals who care about the island's ecological future is a good augury.

Fig. 2. Poster, designed at the American Museum of Natural History and funded by the Richard Lounsbery Foundation, that is being distributed in Anjouan and Mohéli islands by the Association Faune Flore Comores. In the dialect of Anjouan (close to that of Mohéli) and French, it urges protection of the lemurs and of the forest that supports them.

The principal problem in Mayotte is not one of political instability or even of any lack of resources or concerned individuals, rather, it is one of the absence of political will. As I have been urging ever since my initial report submitted to the Comorian authorities in 1975, simple application of existing rules banning forest clearing on steep slopes and along watercourses should be enough to preserve both lemur habitat and Mayotte's hydrological integrity. However, although the forestry authorities on Mayotte are highly competent, they lack the political backing they need to enforce rules of this kind; local politicians buy votes by protecting villagers from enforcement. Habitat apart, a threat to lemurs throughout the Comores has been the capture of infants as pets, usually through killing the mother. In Mayotte the burgeoning expatriate community became a large consumer of pet lemurs, but through the educational efforts of the volunteer organizations "Terre d'Asile" and SEPANAM this demand has been largely quashed. Efforts by Terre d'Asile and another group, "L'Arche," to rehabilitate captive lemurs and to reintroduce them into the wild have met through mixed success, partly through a lack of enthusiasm on the part of the authorities, which have, for instance, failed to back a move to convert an uninhabited islet into wildlife sanctuary.

The lemurs of the Comoros thus face huge difficulties in each of their three island habitats. In the independent islands, efforts to ameliorate the situation will depend largely on the re-establishment of effective political systems and on the setting of environmental protection as an economic as well as a conservational priority. In this, international aid organizations such as the FED could play a critical role, as they could in the direct support of the local volunteer organizations already in existence. Mayotte presents a different case in that while the French administration appears to have economic means, it exhibits little desire to intervene in local political affairs to ensure that existing laws are observed, or to expend effort in supporting the efforts of private groups to ensure the protection of Mayotte's endemic wildlife – goals to which domestic French pressure groups could lend particularly effective assistance.

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Organisation de la recherche forestière dans les zones sèches: un cas concret dans l'ouest de Madagascar

La recherche dans les zones sèches est le parent pauvre de la recherche forestière tropicale

Dans les zones à climat alterné, parties sèches comprises, le processus de déforestation - l'un des signes de la dégradation des ressources naturelles - se poursuit au rythme de 0,9-1,0 % par année, supérieur à la moyenne de 0,8 % donnée pour l'ensemble des régions tropicales, selon les plus récentes sources disponibles (FAO 1995). A cet égard, Madagascar se situe dans la moyenne, bien que d'autres sources établissent des chiffres plus élevés, au moins pour la zone des forêts ombrophiles (Green et Sussmann 1990).

Les causes de cette situation sont résumées par Fries (1991) ainsi que par Fries et Heermans (1992). Elles tiennent, en un mot, dans le relatif désintérêt manifesté par les pouvoirs politiques, les administrations et aussi les coopérations pour les régions à longue saison sèche et, en particulier, pour les populations qui y habitent.
Une preuve supplémentaire du statut de «parent pauvre» de la recherche dans les zones tropicales sèches figure dans l'inventaire des organismes de recherche sur la forêt et les produits forestiers compris dans l'ouvrage de Gregersen *et al*. (1990). Leur nombre atteint à peine le tiers de celui des institutions de recherche actives dans les zones tropicales humides.
Dans le monde, les activités de développement - donc également la recherche, qui est au service du développement - connaissent depuis plus d'une décennie une phase de profonde remise en question, dont les populations constituent l'enjeu. La coopération nord-sud se veut beaucoup plus proche des préoccupations des populations, rurales notamment. Dans ces zones, où la densité de la population rurale est nettement plus élevée que dans les régions à régime pluvial, la vision du développement s'est radicalement transformée. La discussion n'est certes pas close; dans certaines régions sèches, particulièrement en Afrique, elle est encore menée avec une certaine dose de passion (voir p.e. Deneve 1994). La recherche participe assez peu aux débats et ne s'adapte pas toujours facilement aux nécessaires mutations.
Si l'on admet qu'un programme de recherche doit être défini par les trois types de critères suivants:

- les besoins identifiés
- les moyens disponibles
- les activités de recherche en cours ou achevées, désignées aussi, dans les phases de planification et d'évaluation, par le terme d'«héritage»,

force est de constater que parfois, une place trop grande est accordée à l'«héritage», au détriment de l'identification de nouveaux besoins (ou de besoins considérés sous un angle nouveau). Nul doute aussi que l'interaction entre les décideurs et les chercheurs laisse souvent à désirer.
La présente contribution s'inscrit dans une telle approche. Dans une zone sèche de l'ouest de Madagascar marquée par une importante dégradation de l'environnement, différents programmes de recherche sur la forêt et l'arbre sont en cours. Par rapport aux conditions données (débats au niveau international, expérience locale marquée du sceau de l' «héritage», besoins accrus et reconnus des populations périforestières), quelle peut être l'orientation future de la recherche forestière au sens large du terme?

Un programme de recherche intéressant se déroule dans l'Ouest malgache

Dans la partie centrale du Menabe, autour de la petit ville côtière de Morondava, s'étendent de vastes espaces de forêt dense sèche, de formations secondaires, de brousses et de savanes parsemées de petits villages éloignés les uns des autres. La densité de la population est peu élevée. La riziculture irriguée, des cultures sèches, l'élevage ainsi que la chasse et la cueillette dans les formations forestières constituent l'essentiel des activités de la population rurale. Une interface intensive caractérise les relations entre les populations villageoises et les formations forestières (Favre 1990).
Il convient de rappeler qu'à Madagascar, le niveau d'endémisme de la flore et de la faune est particulièrement élevé et attire de ce fait l'attention des milieux nationaux et internationaux attachés à la conservation de la biodiversité. Dans cette région, la recherche, forestière notamment, n'est pas un parent pauvre, ce qui mérite d'être signalé. Bénéficiant de circonstances, de financements, de modes d'organisation, d'appuis intérieurs et extérieurs très différents, divers programmes de recherche ont alimenté et continuent d'élever un niveau de connaissances aujourd'hui déjà considérable. Des organismes malgaches établis à Morondava, appuyés par la coopération suisse au développement, en constituent tout à la fois le catalyseur et l'ancrage et assument une bonne part de la réalisation. Par ordre chronologique de la mise en oeuvre, les recherches s'inscrivent dans les disciplines suivantes:

- dans une première étape, l'écologie forestière, la sylviculture, l'aménagement et l'exploitation de la forêt
- dans une seconde étape sont ajoutées l'agroforesterie et les etudes concernant la faune dans l'écosystème forestier
- la troisième étape, qui a débuté, s'attache à l'organisation de la population rurale et à la gestion villageoise des ressources de la forêt et de l'arbre.

Le plus important volume de connaissances, sur les plans quantitatif et qualitatif, a été accumulé en sylviculture, en aménagement et en exploitation de la forêt et, dans une certaine mesure, en écologie forestière et ce depuis près de 20 ans. La quasi-totalité des recherches concerne les espèces locales (reproduction, plantation, régénération naturelle, phénologie, accroissement, production, sols, végétation, climat). Un ouvrage récemment paru fait le point des recherches dans ces disciplines, fournissant résultats, réflexions et références bibliographiques (Ganzhorn et Sorg 1996).
Dans le domaine de la faune, de nombreux résultats sont disponibles concernant différents groupes d'animaux (éthologie, écologie) et traitent notamment de l'impact de l'exploitation forestière sur les populations (Ganzhorn et Sorg 1996).
En ce qui concerne l'agroforesterie, un grand nombre d'essais couvrant une large palette d'espèces et de pratiques différentes ont été entrepris depuis une dizaine d'années, principalement en station ou en milieu contrôlé. Des bilans ont été établis récemment dans le but de planifier la suite des travaux (Styger 1995, Moller 1996).
L'exploitation locale et régionale des ressources forestières, sujet quelque peu méconnu dans les débuts de la recherche forestière au Menabe, a fait l'objet de plusieurs études prenant à chaque fois un village comme sujet d'investigation. Le plus important de ces travaux a été publié (Favre 1990). On placera dans la même catégorie les recherches visant à mieux connaître le rôle de l'exploitation du bois de la forêt naturelle dans l'économie régionale (Raonintsoa 1996).
Il convient de signaler enfin que les différents projets de développement ainsi que des institutions oeuvrant à Morondava et dans la région ont accumulé au cours des années nombre de données concernant la structure, l'organisation et les activités de la population du Menabe central. Ces informations, guère publiées (p.e. Cabalzar 1996), sont néanmoins disponibles et prennent présentement de l'importance.
On notera que cette description concerne une période relativement courte, quoique récente (1978-1996) et un éventail relativement étroit de domaines de recherche. Cependant, la focalisation sur l'arbre et la forêt revêt une grande importance économique sur le plan local (chasse et cueillette) et régional (économie du bois; réserve de terres cultivables en forêt). Un bilan régional complet aurait bien entendu une toute autre ampleur, notamment dans les domaines des sciences sociales et humaines, de l'agriculture et de l'élevage, des ressources en eau.
Néanmoins, il n'est pas exagéré d'affirmer que l'on dispose aujourd'hui d'une collection imposante, originale et fiable de résultats souvent complémentaires de recherches sur la foresterie et l'arbre dans le Menabe central. La gestion de ce capital, au service de l'amélioration des conditions d'existence de la population et du développement régional, montre d'intéressantes perspectives.

Mieux cibler, coordonner et dynamiser les recherches

Procédant à un essai de synthèse, il apparaît que les activités de recherche présentées ci-dessus constituent un tout relativement disparate. Le terme de «programme», qui implique une démarche coordonnée, n'est que partiellement applicable. Trois axes de recherche se dégagent de l'ensemble:

- la recherche agroforestière (hors forêt)
- la recherche en gestion participative des forêts (interface homme/forêt)
- la recherche en aménagement et gestion de la forêt dense, sylviculture et recherches sur la faune comprises.

Ces axes de recherche s'inscrivent dans des activités plus larges de développement rural. Les travaux de recherche proprement dits sont pour une grande part géographiquement bien localisés. Les activités de développement concernent des espaces plus vastes, parfois à l'échelle régionale.

Par-delà l'appréciation généralement très positive émise à l'encontre de ce «programme» de recherche, il convient de relever trois points critiques:

- la recherche en aménagement et gestion de la forêt dense s'est déroulée jusqu'à maintenant de manière trop autonome par rapport aux problèmes du milieu rural; la constitution d'un «paquet technologique» de connaissances n'a pas encore réellement débouché sur des activités de recherche-développement en gestion participative des forêts;
- la recherche agroforestière se déroule dans une trop grande mesure en milieu contrôlé voire en station;
- enfin, l'on est en présence d'approches différentes (hors forêt, interface, en forêt dense) dont la coordination au niveau des objectifs, des sujets, des objets et des moyens n'est pas optimale, bien que la finalité reste la même.

A l'avenir plus que par le passé, la finalité du développement visera l'amélioration des conditions de vie en milieu rural moyennant une gestion durable des ressources naturelles. Les activités de développement qui se déroulent actuellement dans le Menabe s'inscrivent dans cette approche. Comment dès lors concilier les besoins (qui sont clairement identifiés), les moyens et l'«héritage»? En particulier, comment s'assurer que le «programme» actuel de recherche, qui constitue dans notre cas l'héritage, puisse être pleinement intégré dans les activités futures de développement?

Partant du constat que:

- l'accent du développement s'est déplacé hors ou à la périphérie de la forêt dense (interface homme/forêt)
- l'accent est mis sur les populations villageoises (organisation du milieu rural, foresterie paysanne et communautaire)
- les activités de recherche doivent avoir une utilité aussi immédiate que possible, également en ce qui concerne l'arbre et la forêt,

il apparaît clairement que les axes de recherche en gestion participative des forêts et en aménagement/gestion de la forêt dense doivent être rapprochés et surtout coordonnés afin qu'ils deviennent véritablement complémentaires.

En gestion participative des forêts, il est temps, sur la base de la connaissance du milieu social, physique et biologique, d'entrer dans des processus d'aménagement des espaces et de gestion des ressources; les aspects techniques n'en sont pas absents. A cet égard, on a vu qu'un volume important de connaissances concernant la forêt dense est à disposition, qu'il faut adapter et développer en tenant compte des situations nouvelles, plus proches des villages (zones périphériques de forêt dense, formations secondaires) où la notion de foresterie paysanne supplante celle de foresterie. Les questions relatives à la propriété, les aspects économiques, les filières des produits de l'arbre et de la forêt occupent une grande place dans ce contexte. L'approche, transdiciplinaire, procédera d'une démarche collaborative de recherche-développement.

En aménagement et gestion de la forêt dense, la réflexion doit porter à plus long terme, sans perdre de sa complémentarité avec la recherche en gestion participative des forêts ou, plus généralement, avec les activités de recherche-développement en foresterie paysanne. On y voit d'une part une nécessité, d'autre part un intérêt scientifique. La nécessité est donnée par le constat simple et largement reconnu selon lequel les forêts tropicales seront préservées moyennant des améliorations dans le domaine de l'agriculture d'une part, le développement de méthodes d'exploitation durable d'autre part. Ce constat est également valable pour les forêts sèches. Quant à l'intérêt scientifique pour la connaissance des écosystèmes et de leur dynamique, il est actuellement croissant dans la zone intertropicale. Plus exactement, on assiste à un regain d'intérêt pour la recherche sur les milieux naturels et sur l'action de l'homme dans ces milieux.

La distinction faite ici entre la nécessité et l'intérêt scientifique est artificielle. L'intérêt scientifique seul n'est pas suffisant pour justifier des recherches dans des situations graves de maldéveloppement. Il peut cependant constituer un puissant moteur pour faire progresser les connaissances qui permettront de développer des modes de mise en valeur durable des ressources forestières tropicales (et autres; Lugo et Lowe 1995).

L'objectif futur pourrait être formulé ainsi: contribuer, par une recherche systémique, à la mise au point de modalités d'aménagement et de gestion de la forêt dense au profit des populations riveraines et de l'économie régionale, dans une perspective de durabilité écologique, économique et sociale.

Enfin, il est certainement utile de reconsidérer dans une certaine mesure le rôle de la recherche agroforestière. La conception des essais doit se nourrir des connaissances locales tout d'abord, du bagage scientifique des chercheurs ensuite. Il est évident aujourd'hui d'organiser la recherche agroforestière dans une mesure prépondérante en milieu réel, de manière participative dès l'identification des besoins et la planification des travaux. Pour atteindre cet objectif difficile, les chercheurs se placent et raisonnent à l'échelle du terroir villageois et s'inscrivent dans une démarche d'aménagement du terroir.

En conclusion: le terroir villageois est l'espace privilégié de coordination des activités de recherche. Les axes de recherche agroforestière, en gestion participative des forêts et en aménagement/gestion de la forêt dense procèdent d'une même finalité mais poursuivent des objectifs complémentaires avec des méthodes différentes. Ils interviennent dans des espaces partiellement superposés dont le dénominateur commun n'est autre que le terroir villageois. C'est dire que le terroir villageois peut et doit servir de lieu de rencontre et de coordination des différentes recherches. Le terroir est le lieu privilégié de la planification coordonnée des activités d'un programme de recherche sur l'homme, l'arbre et la forêt.

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NOTES

Behavior and ecology of the mongoose lemur

The mongoose lemur (*Eulemur mongoz*) is restricted to the seasonal forests of North-West Madagascar and the Comoro Islands (Anjouan and Mohéli). It used to be considered unusual in that it has been reported to be variably nocturnal or diurnal (i.e. cathemeral) and to show a variable social structure, in most cases monogamy. Its diet has been described as highly nectivorous during the dry season and frugivorous/folivorous during the wet season (Tattersall 1982).
The aims of the 10-month study conducted at Anjamena (45°55'E; 16°03'S), Madagascar, on two neighbouring groups of *E. mongoz* included: 1) collection of baseline data on the behavior and ecology throughout the entire active phase during the wet and dry seasons; 2) investigation of the behavioral mechanisms underlying the social structure and the functional relevance of group size; 3) investigation of the proximate role of environmental cues in the activity pattern and the functional relevance of cathemerality; 4) chemical analysis of food items and quantification of food and nutrient intake.

Group Size and Group Composition

Throughout the entire study at Anjamena, group composition remained relatively constant, changes in group size being limited to births and emigration of subadult individuals. All groups in the vicinity of the study site were small, cohesive family units, containing one adult male, one adult female and 1-4 offspring, indicating a monogamous social structure. When close to sexual maturity, subadult animals of both sexes were difficult to distinguish from adults, which might explain some reports of multi-male and multi-female groups of *E. mongoz* (Tattersall 1982; Curtis and Zaramody in press).
Group size is in the range proposed for monogamous primates (Terborgh 1983) and cohesion between the pair mates was found to be high in both study groups. The behavioral mechanisms of reinforcement of the pair-bond through close proximity and mutual anogenital marking, paternal participation in the care of offspring and territoriality all in accord with the general characteristics of monogamy in primates. However, the feature of mate monopolization by males proposed as typical of monogamous social systems seems to be more attributable to females in *E. mongoz*, as they exhibit high levels of intrasexual aggression and the males do not. Female dominance, characteristic of most species of lemur, may thus include more than female feeding priority in *E. mongoz* (Anzenberger 1992; Curtis 1997; Young *et al.* 1990).
Three main factors are generally thought to influence group size in primates: the distribution of food resources, predation and life-history patterns (Clutton-Brock and Harvey 1977; Overdorff 1996). Insufficient detailed data were collected in this study to investigate the relationship between group size and food resources. Neither predation nor life-history patterns provided a satisfactory explanation for the small group size in *E. mongoz*.

Activity Pattern

The mongoose lemurs at Anjamena revealed a cathemeral activity cycle throughout the wet and dry seasons. However, significantly more diurnal activity was exhibited during the wet season and more nocturnal behaviour during the dry season. The most powerful environmental cue appeared to be the light-dark cycle, encompassing sunrise, sunset and day length. Through close negative association of onset and cessation of activity with sunrise and/or sunset, the main activity phase was shifted into either the dark or the light phase, depending on day length and hence the season. This activity pattern is probably modulated by an inhibitory effect of low light intensity in the forest during the wet season, when vegetation is dense, and results in mainly diurnal activity.
The functional relevance, or survival value, of cathemerality is difficult to assess: No clear advantages to food-related behavior appear to be derived from this activity pattern except perhaps greater resource accessibility, enhanced by nocturnal behavior during the dry season leading to a reduction in interspecific competition. A better case can be made for thermoregulation as a key factor, because cathemerality may well represent a behavioural thermoregulatory mechanism, allowing the mongoose lemur to effectively conserve energy by being active at night during the dry season when temperatures are low. Nocturnal behavior during the dry season, when least cover is provided by vegetation, probably allows *E. mongoz* to avoid predation by raptors (Curtis *et al.* in press).

Chemical Analysis and the Quantification of Food and Nutrient Intake

Chemical analyses of plant matter consumed by *E. mongoz* at Anjamena revealed nutrient distributions in different food items similar to those found in other studies on primate diets (Waterman 1984): water content was high in fruit and flowers, high levels of protein were found in leaves; crude lipid content was highest in seeds; soluble carbohydrates were most abundant in mature fruit and flowers; mineral content was highest in petioles. With the exception of methionine and cystine, which were deficient in protein in all types of food item, essential amino acids were generally present in excess. Values for crude fibre were generally in accordance with those found in other studies (Waterman 1984): crude fibre content was highest in dead wood and fungi; fairly high in mature leaves and fruit; lower in immature leaves, flowers, petioles and seeds; and lowest in dead leaves. Contrary to expectation, high values for crude fibre were found in both immature and mature fruit. This is surprising, as mature fruit ought to be attractive to the potential seed disperser and not as indigestible as immature fruit. Although the present study focussed mainly on primary compounds in food items and secondary components were not investigated, the high levels of geophagy in *E. mongoz* may indicate the prevalence of such substances in its food (Curtis 1997).
Fruit was the dominant food item in the diet of *E. mongoz* during both seasons. During the wet season, fruit was complemented mainly by nectar and during the dry season mainly by leaves. Food intake in percent of body weight was comparable to that reported in other studies (Curtis 1997; Hladik *et al.* 1971; Richard 1985). Estimates for nutrient intake for each month were fairly consistent, but there were slight seasonal differences. The intake of water, ash, non-protein nitrogenous compounds and nitrogen-free extract was marginally higher during the dry season, whereas crude lipid, protein and crude fibre intake was higher during the wet season. Nutrient intake was at the low end of

the range for protein and lipids by comparison with other species (Curtis 1997; Hladik *et al.* 1971; Richard 1985; Barton *et al.* 1993). Protein requirements were probably adequately fulfilled, although essential amino acid intake was lower relative to body size than the recommended intake in humans (Lloyd *et al.* 1978). The low intake of lipids in the natural diet may provide an indication as to why *E. mongoz* is peculiarly prone to obesity in captivity, if fed on an inappropriate diet, whereas no other lemurid is reported to suffer from this problem (Clark 1993; Curtis 1997).

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Recent discoveries of the Hairy-eared Dwarf Lemur (*Allocebus trichotis)*

One of the most scarcely known Malagasy lemurs is the nocturnal hairy-eared dwarf lemur, *Allocebus trichotis*, a monotypic genus belonging to the family of Cheirogaleidae. It was given the highest priority rating in the IUCN/SSC Primate Specialist Group's Lemurs of Madagascar (Mittermeier *et al.* 1992) and was put into the IUCN Red List as a critically endangered species, along with such a famous species like the aye-aye (*Daubentonia madagascariensis)* (Mittermeier *et al.* 1994).

Since its rediscovery in 1989 by Meier and Albignac (1991) this cryptic and highly endangered species has only been observed around the lowland rainforest of the Mananara area. Recent findings provide new evidence for a more widespread occurrence of *A. trichotis* in Madagascar. In March 1995, a first sighting and capture of the species in the lowland part of the Réserve Naturelle Intégrale de Zahamena was made by N. Rakotoarison. In addition, this species was found for the first time in a highland rainforest in the central eastern area of Madagascar, in the region of Forêt de Vohidrazana, in the vicinity of the very popular touristic area of Andasibe-Périnet (Rakotoarison *et al.* 1997). Further possible sightings were made in Cap Masoala (Sterling & Rakotoarison, unpubl. data) and in the Réserve Spéciale d'Anjanaharibe-Sud (Schmid, Goodman & Randriamahazo, pers. comm.). *A. trichotis* does not seems to occur at a high density in any of those areas. For an effective future preservation of this rare and highly endangered species, three major actions shoud be undertaken simultaneously: (1) Long-term field studies to improve our knowledge on its distribution and ecology, (2) *C*aptive studies and breeding programmes in order to enlarge our present understanding of its biology, (3) Protection of habitats where a healthy population of the species is detected in unprotected areas (like the Forêt de Vohidrazana).

Submitted by the late **Nasolo Rakotoarison** in May 1996

Photographic evidence of *Allocebus trichotis* in the Réserve Spéciale d'Anjanaharibe-Sud

Until its rediscovery in 1989 in lowland rain forest near Mananara (Meier and Albignac 1990), the status of *Allocebus trichotis* was unclear. In fact it was referred to as "unquestionably the rarest of surviving lemurs" (Tattersall 1982). In more recent years this species has been observed and trapped at several different localities, and it is becoming increasingly clear that it has a broader distribution and occurs in a range of habitats than previously surmised.

Recent reports include individuals that were trapped in the Réserve Naturelle Intégrale de Zahamena, east of Lac Alaotra (Rakotoarison 1995) and in the Forêt de Vohidrazana close to Andasibe, Moramanga (Rakotoarison *et al.* 1997). Further, there are recent sight observations of this species on the Masoala Peninsula (Sterling and Rakotoarison 1998) and in the Réserve Spéciale (RS) d'Anjanaharibe-Sud to the west of the Andapa Basin (Schmidt and Smolker in press). Although the description there is nothing ambiguous about the recent sight records from the RS d'Anjanaharibe-Sud, further documentation in the form of a photograph of an animal in the wild is always desirable. Recently the first author was in the this reserve and obtained photographic documentation of this species (see cover picture).

In 1994 the RS d'Anjanaharibe-Sud was the subject of a multidisciplinary biological inventory and the results of which will soon be published in monograph form (Goodman in press). The group worked four different sites in the reserve between 875 m and 1950 m. In the 875 m transect zone *Allocebus* was observed on five occassions (Schmid and Smolker in press), but was not recorded at any higher elevations. The 875 m site was in partially degraded forest with an extensive system of trails.

In early June 1997 HS was in the reserve to obtain photographs of various plants and animals. On 2 June at about 21:00 a small lemur was observed within 8 m and photogra-

phed. On the basis of the photograph the animal is clearly identifiable as *Allocebus trichotis* (see cover picture). The lemur was observed at approximately 1250 m.a.s.l., just below the second camp occupied during the 1994 mission. The specific locality of the site was: Réserve Spéciale d'Anjanaharibe-Sud, 9.2 km WSW Befingotra, 14°44.7'S, 49°27.7'E, 1260 m.

The vegetation at 1260 m is a formation typical of lower montane forest with trees attaining a height of 25-30 m. *Sloanea* and *Canarium* were abundant, along with members of the families Clusiaceae and Sapindaceae. The smaller trees, 15-20 m height, included *Uapaca*, which was common and easily recognized by its stilted roots. Other abundant families included Clusiaceae, Apocynaceae, Araliaceae, Monimiaceae, Myrtaceae, Ebenaceae, Flacourtiaceae, Oleaceae, Anacardiaceae, and Moraceae (*Ficus*). Lianas were common. Epiphtyes were abundant with ferns and orchids predominating.

The highest elevation previously reported for *Allocebus trichotis* was 1 235 m (Rakotoarison *et al.* 1997). On the basis of the RS d'Anjanaharibe-Sud information and other published details on this species, it occurs from lowland rainforest to montane forest and is apparently tolerant of moderate levels of human disturbance. We strongly suspect that this species has a much broader geographical range than currently known.

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Progress report on the QMM faunal studies: Lemurs in the littoral forest of southeast Madagascar

QMM (QIT Madagascar Minerals), a Malagasy company owned by QIT-Fer et Titane (subsidiary of Rio Tinto plc, UK) and the Malagasy state represented by OMNIS, conducted extensive exploration programs along the east coast of Madagascar for heavy mineral sands which are a source of titanium dioxide principally in the form of ilmenite minerals. These investigations led to the discovery of a potential economic orebody near Fort-Dauphin in southeastern Madagascar.

The major parts of the proposed mining area are comprised of highly degraded ecosystems, but some areas include wetlands, and some of the few remaining littoral wet forests of Madagascar at Petriky, Mandena and Ste. Luce (Fig. 1). In order to assess possible effects of mining, a series of intensive impact studies have been carried out in a first phase, and additional studies are planned. Based on these impact studies a number of conservation zones are being proposed to preserve representative components of the ecosystems affected by the mining operation. The mined areas will be rehabilitated progressively after each year of exploitation. So far, the conservation and rehabilitation programs include components for revegetation with exotic species and ecological restoration with native tree species, and also a faunal and a conservation component. At present, rehabilitation is planned with exotic tree species to provide the sustainable basis to satisfy, in the short term, the needs for timber and fire wood of the region. Restoration with native tree species of local interest should provide further benefits for the local human population, but also provide suitable habitat for parts of the endemic flora and fauna. These restored ecosystems could then provide buffer zones and possibly corridors between the proposed conservation zones.

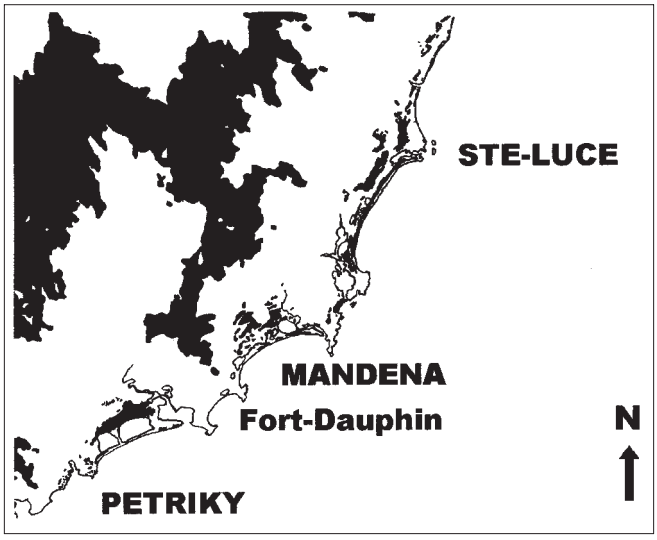

Fig. 1. Survey regions; black = forested areas.

The primate surveys in 1989-1992 were carried out by P. Daniels, C. Hemingway, J. Ravoarisoa, H. J. Ratsimbazafy and J. M. Ryan. They are summarized in a report produced by Lewis Environmental Consultants (1992). The surveys of 1998 were carried out by J. Fietz, J. U. Ganzhorn, J.-B. Ramanamanjato and J. Schmid.

In February 1998, Madagascar's parliament passed a law that provides the basis to continue preparation of the mining project. In view of these recent developments, some baseline data on the lemurs of the region are provided here. We also include a brief evaluation, to what extent lemur species may be affected by the mining operation and how they might react to the planned restoration efforts.

Intensive lemur surveys between 1989 and 1992 revealed the presence of six lemur species in the littoral forests. Their distribution and relative densities are given in Table 1. In March/April 1998 some of the surveys were repeated to assess possible changes over the last few years. The results reported here refer to sites within the three project areas: Petriky (P1-D), Mandena (M 20 and M 16), and Ste. Luce (S7, S8 and S9; Figure 1). In addition, surveys included degraded forest areas and exotic tree plantations adjacent to these sites. As shown in Table 1, the abundance of lemur species has not changed markedly between 1989/92 and 1998.

Table 1. Occurence of lemur species in littoral forests around Fort Dauphin. 89 summarizes abundances in the project areas during surveys of 1989-1992 based on 331.6 km and 83.4 km of diurnal and nocturnal census work, respectively. 98 summarizes data of the 1998 census, based on 13.7 and 9.7 km of diurnal and nocturnal surveys. R (rare): 0.19 animals observed per 1 km of transect; U (uncommen): 0.20 - 0.39 animals/km; C (common): 0.40 - 0.99 animals / km; A (abundant): 1.0 animals / km; P: species present, but transects too short (1 km) to justify specification of relative abundance.

Region	**Vegetation type**	***Microcebus murinus***		***Microcebus rufus***		***Cheirogaleus medius***		***Avahi laniger***		***Hapalemur griseus***		***Eulemur fulvus collaris***	
		89	**98**	**89**	**98**	**89**	**98**	**89**	**98**	**89**	**98**	**89**	**98**
Petriky	DLF[1]	A				U		U					
	LF	A											
Mandena	DLF	A	A			A	A	A	A	R		U	
	EP[2]												
	ML[2]		P										
	PP[2]												
Ste. Luce	LF (S7)			A	A	A	A	A	A			A	
	LF (S8)			A	A	A	A	A	A				
	DLF[2] (S9)				P								
	LF (S9)			A	A	A	A	A	A			A	
	P[2] (S9)												

DLF = Degraded littoral forest; EP = *Eucalyptus* plantation; LF = Littoral forest; ML = marsh, dominated by *Melaleuca leucodendron*; PP = Pine plantation; P = *Philippia* growth; S7-S9 mark forests labelled in 1989-92.

[1] DLF did not exist in Petriky during the 1989-92 surveys; [2] not surveyed in 1989 - 1992.

However, since the initial surveys in 1989, the remaining forest plots (prior to any mining operations) have been heavily degraded due to tavy, extraction of timber and fire wood. In the meantime, a substantial part of the proposed conservation zone at Petriky had been transformed into a field of manioc, resulting in a zone of pure sand after one year of cultivation. The forest plots at Ste. Luce are under substantial pressure for timber, fire wood and even tavy. Without any conservation efforts or inclusion into a larger scale development project that considers conservation of natural ecosystems as a vital component of its activities, these littoral forests are unlikely to persist long into the next millenium.

In view of these considerations and to protect faunal conservation values, a series of options was developed to cover the assessed area of direct or indirect influence of the project on the fauna. The preferred option proposed would provide virtually 100% protection of the species known from the region.

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Prosper. 1995. Hypoplasie dentaire chez les Lémuriens Indroïdes subfossiles et actuels: étude comparative et relations avec les types d'alimentation. Mémoire de D.E.A en Anthropologie, Option: Primatologie, Faculté des Sciences, Université d'Antananarivo. Résumé: Trois types d'hypoplasie dentaire ou défaut ont été observés dans cette étude: ce sont les points, les lignes et les vallées. Il existe des liens entre ces défauts et l'alimentation. Tous ces constats ont permis d'extrapoler les régimes alimentaires des espèces subfossiles et de reconstituer leur paléoenvironnement.
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Rabetafika, L. 1995. Nouveaux sporozoaires de la Faune

malgache. Thèse de doctorat d'état ès- Sciences- naturelles, option: Ecologie parasitaire, Université de Paris IV. Résumé: L'étude des sporozoaires de Reptiles et de Batraciens malgaches révèle des Hémococcidies appartenant à deux groupes distincts. Une nouvelle espèce de *Plasmodium* et deux espèces d'Haemoproteidae rattachées provisoirement au genre *Nycteria* ont été décrites chez deux *Lemur fulvus fulvus*, un *Avahi laniger* et un *Hapalemur griseus*. Les *Plasmodium* des Lémuriens appartiennent, de même que les Haemoproteidae, au groupe «malariae» qui est primitif. Le polyparasitisme par plusieurs espèces est particulièrement important et constant. La distribution en taches des Lémuriens conduit à une vicariance des espèces plasmodiales provenant de zones géographiques différentes.

Radespiel, U. 1997. The social organization of the grey mouse lemur (*Microcebus murinus*, J.F. Miller 1777). Doctoral thesis, Tierärztliche Hochschule Hannover, Germany. Résumé: The patterns of the social organization of nocturnal lemur species are still poorly understood. The social organization of the nocturnal grey mouse lemur (*Microcebus murinus*) was studied in their natural habitat in a dry deciduous forest of Northwestern Madagascar and in captivity. The field study was conducted during two field periods each of three months duration (August-November, 1995 and 1996). On a study area of 24.75 ha, 52 (33,19) individuals were trapped in the first year and 45 (31,14) individuals in the second year, using capture/recapture techniques. Population dynamics were high, since only 26.67 % (n=12) of the animals caught in the second year were known from the first year. The main mating season took place between Mid-September and Mid-October. The home-range sizes of 10 (5,5) focal animals were determined telemetrically within and outside the main mating season. Within the main mating season the home-ranges of males were significantly larger than those of females. Furthermore they were also larger than outside this period of time. The position of the home-ranges remained constant during the whole study and they overlapped to a high degree within and between the sexes. Each focal animal had access to more than one potential mate and therefore the mating system was characterized as a multi-male/multi-female-system. Intrasexual competition between the males for the access to fertile females was of the scramble type. A monopolization of females by certain males could not be detected. The spatial distribution indicates that those mouse lemurs which lived together in one area, could have known each other individually.

Grey mouse lemurs spend the days in sleeping-holes or leaf nests, which protect them from predators and buffer the daily climatic variations. It could be shown that the sleeping-sites of females were on average safer and better insulated than those of males. Females used less sites but each of them more often than males. The spatial distribution of the sleeping-sites did not differ between the sexes. Most transmitter females (75%, n=9) regularly slept in stable sleeping groups which consisted mainly (in three out of four cases) of females only. Only 33.3 % (n=3) of the males slept in groups on a regular basis. The results indicate that sleeping-sites may have formed a restricted resource for the mouse lemurs, which could have been monopolized by females due to female dominance. Therefore, the resource 'sleeping-site' could possibly be a key resource for grey mouse lemurs. It's spatial distribution and availability could determine the presence and distribution patterns of females, which in turn could affect the spatial distribution of competing males. In the second part of the study experimental groups (consisting of 2,2 adult animals) were observed under laboratory conditions in order to analyse the dominance relationships and the intra-group competition for food or sleeping-sites. Females won nearly all decided conflicts with males in all contexts and therefore female dominance could be confirmed quantitatively for *Microcebus murinus*. Dominance relationships existed between the males whereas they could not be detected between females. The analysis did not reveal a high degree of neither feeding competition nor sleeping-site competition. It can be concluded that the social organization of the grey mouse lemur is more complex than formerly thought and that the traditional view of the grey mouse lemur as a primitive solitary primate should be critically reviewed.

Rakotondratsima, M.P.H. 1995. Contribution à l'étude des impacts de la perturbation humaine sur les populations de *Eulemur fulvus albifrons* et *Varecia variegata rubra* dans la Péninsule de Masoala, Madagascar. Mémoire de D.E.A de Sciences Biologiques appliquées, Option: Ecologie-environnement, Faculté des Sciences, Université d'Antananarivo. Résumé: La population riveraine pourrait ne pas être trop nombreuse et que l'exploitation de la forêt se fait principalement d'une façon sélective par extractions des ressources de la forêt, il se pourrait qu'il n'y a pas d'impacts significatifs de la perturbation humaine sur les populations de *Eulemur fulvus albifrons* et *Varecia variegata rubra*.

Rakototiana, M.L.O. 1995. Etude des relations sociales chez les individus d'un groupe de Makis (*Lemur catta*, Linné 1758) dans la Réserve privée de Berenty, Madagascar. Mémoire de D.E.A de Sciences Biologiques Appliquées, Faculté des Sciences, Université d'Antananarivo. Résumé: Les relations sociales des individus du groupe de Makis se reflètent par des comportements d'attraction et de répulsion qu'ils manifestent les uns envers les autres. Cependant, la distribution de ces différents types de comportements et, par conséquent, la forme des rapports sociaux entre les individus dépendent en grande partie de leurs liens de parenté, de la dominance, ainsi que de la présence des jeunes. L'étude a été, en effet, réalisée au cours de la période de mise bas, et les liens de parenté unissant les femelles et les natifs du groupe sont connus.

Ralisoamalala, R.C. 1996. Etude du rôle de *Propithecus verreauxi verreauxi* (A. Grandidier, 1867) et de *Eulemur fulvus rufus* (Audebert, 1800) dans la dissémination des graines de la forêt dense sèche de Kirindy (Morondava), Madagascar. Mémoire de D.E.A en Anthropologie Biologique, Option Primatologie, Faculté des Sciences, Université d'Antananarivo. Résumé: Chez *Eulemur f. rufus*, 12 espèces de graines sont disséminées par l'intermédiaire des fèces. Par contre, 6 espèces pour *Propithecus v. verreauxi*, et ce, en crachant les graines aux alentours du pied parental. La superficie exploitée pour la recherche de nourriture varie d'une espèce à une autre: elle est de 12,7 ha pour le groupe de *Eulemur fulvus rufus* et de 4 à 8,4 ha pour les groupes de *Propithecus v. verreauxi*. L'exploitation du site et le choix des fruits dépendent de la disponibilité des ressources en fruits et de la nature de la forêt.

Ramanantsoa, C. 1997. Comportement et régime alimentaire de l'*Indri indri* dans la Réserve spéciale n° IV Anjanaharibe-sud, Madagascar. Rapport de stage, Ecole pour la formation de spécialistes de la faune, Ministère de l'Environnement et des forêts, République du Cameroun. Résumé: L'Indri indri est un Lémurien qui a des comportements très bizarres et spectaculaires. Chaque groupe défend son territoire, mais malgré tout ça, il émet des differents signaux pour éviter le chevauchement qui provoque les conflits et les bagarres entre eux. Socialement, son comportement est très diversifié. Durant l'identification de sa nourriture, le nom de l'espèce de la plante et les strates exploitées ont été noté. L'Indri indri n'a mangé que des bourgeons des trois espèces suivantes: *Symphonia clusoides, Ravensara* spp. et *Merpilodaphne faucherei*.

Ramanantsoa, H. 1996. L'étude de la hiérarchie des mâles chez *Lemur catta* et l'enseignement de cette espèce aux Lycéens. Mémoire pour l'obtention du Certificat d'Aptitude Pédagogique de l'Ecole Normale, E.N.S, Université d'Antananarivo. Résumé: La hiérarchie des mâles de

Lemur catta se manifeste par les différents comportements de ces animaux à l'intérieur d'un groupe donné: ses comportements d'approche et de rejet des autres. La connaissance superficielle ou même fausse de cette espèce par les Lycéens sera remplacée par la connaissance acquise sur terrain pour l'élaboration d'une démarche d'enseignement sur *Lemur catta*, en vue d'une éducation des adolescents répondant aux objectifs définis par la loi 94-033 portant orientation générale de l'enseignement et de l'éducation à Madagascar.

Ramanivosoa, B.V.L. 1996. Contribution à l'étude des Lémuriens subfossiles en rapport avec les Lémuriens actuels par les caractères de l'omoplate et de l'humérus: Etudes ostéologique et myologique des Lémuriens subfossiles. Etude cladistique sur la position du genre *Archaeolemur* avec les autres Lémuriens. Thèse de doctorat de 3è cycle en Anthropologie, Option: Primatologie, Faculté des Sciences, Université d'Antananarivo. Résumé: Par les caractères de l'omoplate et de l'humérus, les Lémuriens subfossiles sont proches des Indridae, des Lémuridae et des grands Singes. Par l'étude cladistique, le genre *Archaeolemur* se rapproche plus des Indroïdea que des Lémuroïdea tant sur les caractères de l'omoplate que ceux de l'humérus. Le groupe Indridae- Palaeopropithecidae est le groupe - frère du genre *Archaeolemur*.

Ranaivosoa, V. 1997. Réserve spéciale d'Analamazaotra: étude du territoire d'*Indri indri* , écologie et relations sociales. Mémoire pour l'obtention du Certificat d'Aptitude de Pédagogique de l'Ecole Normale, E.N.S, Université d'Antananarivo. Résumé: La superficie du territoire d'un groupe est aux environs de 20 ha et ce territoire est délimité par des marquages et défendu par des cris territoriaux qu'on peut entendre à plus de 1 km. La Réserve spéciale d'Analamazaotra est caractérisée par un climat frais et humide. Elle est aussi caractérisée par des grands arbres de 15 m de hauteur, d'aspect dense mais à cimes non- jointives et est constituée de 3 strates bien distinctes. L'*Indri indri* vit en groupe de 1 à 5 individus et les relations sociales intragroupes sont plus fréquentes que celles des intergroupes.

Randriamanalina, M.H. 1996. Contribution à l'étude des relations sociales chez deux groupes de *Propithecus verreauxi verreauxi* (Grandidier, 1867) dans la Site d'Intérêt Biologique de Kirindy, Morondava (Madagascar). Mémoire de D.E.A en Anthropologie Biologique, Option: Primatologie, Faculté des Sciences, Université d'Antananarivo. Résumé: Les interactions agonistes ont lieu en général, dans les sites d'alimentation où les femelles sont plus agressives et dominantes envers les mâles. Les individus de même sexe sont plus liés amicalement que ceux, de sexe opposés. Le lien femelle- mâle dominant peut être remarquable. Les bébés attirent l'affection des autres adultes et les mères deviennent le centre attractif du groupe.

Randrianambinina, B. 1997. Contribution à l'étude biologique de *Microcebus ravelobensis* (Zimmermann *et al.*, in press) dans la région d'Ampijoroa/Ankarafantsika. Mémoire de D.E.A en Sciences Biologiques Appliquées, Option: Ecologie- environnement, Faculté des Sciences, Université d'Antananarivo. Résumé: *Microcebus ravelobensis* a été observé pour la première fois dans la région d'Ampijoroa. Les résultats ont montré que cette espèce est différente de *Microcebus murinus, Microcebus rufus et Microcebus myoxinus* du point de vue morphologique et biologique.

Rasoarivelo, D.S. 1997. Essai de comparaison des activités et comportements entre deux groupes d'Indris habitués aux visiteurs et un groupe d'Indris sauvages de la Réserve spéciale d'Analamazaotra. Mémoire pour l'obtention du Certificat d'Aptitude Pédagogique de l'Ecole Normale, E.N.S, Université d'Antananarivo. Résumé: Toutefois, les localisations des activités et les types d'activités se ressemblent pour ces deux groupes d'Indris. Par contre, les Indris se diffèrent par la qualité et la quantité des nourritures consommées. Le type d'activité « nourriture » domine la journée du groupe habitué aux visiteurs et le type d'activité « repos" pour celui du groupe sauvage. L'heure du sommeil est plutôt vers 15 h pour le groupe sauvage, tandis que pour le groupe habitué aux Touristes, elle est vers 17 h. Ces derniers se laissent contempler pendant la plupart de leurs activités; mais les Indris sauvages émettent des cris d'alarme et s'enfuient à la moindre approche des visiteurs.

Rasoloharijaona, S. 1995. Contribution à l'étude du genre *Archaeolemur* sp. (Filhol 1895) de l'Ankarana: morphologie comparée et ostéométrie. Essai de reconstitution du Paléoenvironnement et la région de l'Ankarana. Mémoire de D.E.A d'Anthropologie Biologique, Option: Primatologie, Faculté des Sciences, Université d'Antananarivo. Résumé: *Archaeolemur* sp. de l'Ankarana est une nouvelle espèce qui semble rejoindre celle d'Amparihingidro, annoncée par Tattersall, en 1982. Il avait un mode de vie différent des autres Archaeolemurs provenants d'autres sites situés plus au Sud. Grâce à cette étude d'*Archaeolemur* nov. sp. de l'Ankarana, et de ses faunes associées, nous avons trouvé que le paléoenvironnement de la région était identique à celle de l'Est: le paléoclimat était du type pluvial humide, et la forêt était dense et sempervirente.

Ravaoarisoa, J. 1996. Study of the relationship between diet and misticatory apparatus in rainforest Lemurs in Panomafana National Park. Mémoire de D.E.A, Université d'Antananarivo.

Razafindraibe, H. 1997. Phylogénie moléculaire des Indriidae (Primates, Strepsirhini). Analyse cladistique de la répartition des bandes d'ADN hautement répété et de la séquence nucléotidique du gène du cytochrome b chez les Indriidae (Primates, Strepsirhini). Thèse de doctorat de l'Université Louis Pasteur- Strasbourg I, France. Résumé: L'évolution des Indriidae semble refléter les grandes règles concernant l'évolution (David *et al.* 1983) parce qu'elle s'est faite par l'alternance de périodes de « spéciation rapide «, à l'éocène probablement, et de périodes de « stases évolutives « ce qui semble s'être produit une fois les différentes espèces établies. Actuellement, au sein du genre *Propithecus*, la multitude de sous-espèces pourraient être les prémices d'une phase de « cladogenèse « naissante. Sur le plan moléculaire, cette réalité semble également exister, étant donné les différentes transformations reconstruites tout au long de l'histoire évolutive.

Roth, O. 1996. Ecology and social behaviour of the woolly Lemur (*Avahi laniger)*, a nocturnal Malagasy Prosimian. Master' s thesis in Evolutionary Biology, University of Basel (Switzerland).

Rümenap, S. 1997. Ethology and endocrinology of free ranging female Sifakas (*Propithecus v. verreauxi*). Diploma thesis. Göttingen University.

Schlitz, A. 1995. Molecular genetics of *Lepilemur ruficaudatus*. Diploma thesis. Tübingen University.

Schmid, J. 1997. Torpor in the Grey Mouse lemur (*Microcebus murinus*) in Madagascar: energetic consequences and ecological relevance. Dissertation. Tübingen University.

Yamashita, N. 1996. The relationship between tooth morphology and mechanical dietary properties in two Malagasy lemur families (Lemuridae and Indriidae). Dissertation Abstracts International A57(6): 2550.

Theses of Malagasy students completed before 1995

Many theses of Malagasy students have not received the attention they deserve in the international literature. Therefore we summarize here the theses completed in Madagascar before 1995. Theses completed afterwards are listed with the „current theses".

Andrianarivo, A.J. 1981. Etude comparée de l'organisation sociale chez *Microcebus coquereli*. Mémoire de D.E.A en Sciences Biologiques Appliquées, Option: Ecologie ani-

male, E.E.S.Sciences, Université de Madagascar. Résumé: Ce petit Lémurien nocturne est caractérisé par ses activités essentiellement solitaires, avec seulement quelques approches sociales. Il semble qu'un groupe familial est assez large. Chaque groupe exploite en commun un territoire relativement stable, au centre duquel se trouve leur «village» de nids.

Andriantsoa-Rahelinirina, L. 1985. Distribution de quelques espèces végétales consommées par les Lémuriens dans la forêt d'Ampijoroa. Mémoire de D.E.A en Sciences Biologiques Appliquées, Option: Ecologie végétale, E.E.S. Sciences, Université de Madagascar. Résumé: Cette étude a permis d'établir la distribution des individus de chaque espèce végétale par classe de hauteur, de diamètre et de la répartition spatiale.

Andriatsarafara, F.R. 1988. Etude écoéthologique de deux Lémuriens sympatriques de la forêt sèche caducifoliée d'Ampijoroa: *Lemur fulvus fulvus* (E. Geoffroy, 1796) et *Lemur mongoz* (Linné, 1766). Thèse de doctorat de 3è cycle, Option: Ecologie animale, Faculté des Sciences, Université d'Antananarivo. Résumé: Les deux espèces de Lé- muriens sympatriques semblent posséder des niches écologiques différentes qui leur permettent de coexister et de réduire ou d'éviter la compétition dans le même habitat. Cette étude a montré que ces deux espèces de Lémuriens ont un rythme d'activité toutefois différent, une distribution spatiale différente et une dissemblance dans l'organisation sociale et territoriale. Par contre, *Lemur fulvus fulvus* et *Lemur mongoz* partagent le même régime alimentaire.

Andriatsarafara, R. 1975. Contribution à l'étude biologique d'un Lémurien malgache: le Microcèbe (*Microcebus murinus*, Miller, 1777). Thèse de doctorat d'Etat Essences-Naturelles, E.E.S. Sciences, Université de Madagascar. Résumé: Cette étude apporte une contribution à la connaissance de la reproduction, comportement social, cycle annuel, consommation alimentaire et thermorégulation du *Microcebus murinus*.

Rabarivola, J.C. 1990. Coussinets et dermatoglyphes des Lémuriens: étude descriptive. Rapport entre coussinets, dermatoglyphes et mode de locomotion. Mémoire de D.E.A en Anthropologie Biologique, volet: Primatologie, Faculté des Sciences, Université d'Antananarivo. Résumé: L'étude simultanée des dermatoglyphes, des coussinets et de la locomotion de diverses lignées de lémuriens malgaches, a permis de constater les quelques points suivants: l'évolution des coussinets et des dermatoglyphes qui sont vraiment confirmées par cette étude, et la présence d'un certain nombre de modes de locomotion.

Rabarivola, J.C. 1993. Etude génétique comparative de populations naturelles de *Eulemur macaco* des îles de Nosy-be et de Nosy-Komba, et de la presqu'île d'Ambato. Thèse de doctorat de 3è cycle en Anthropologie Biologique, Faculté des Sciences, Université d'Antananarivo. Résumé: La présence d'une variabilité génétique est beaucoup plus élevée au niveau des différents systèmes étudiés dans la population de Nosy- be que dans celles de la presqu'île d'Ambato et de l'îlot de Nosy- Komba. L'origine du peuplement de Nosy- Komba se serait fait à partir des animaux de grande Terre par l'introduction récente par l'Homme. La forte consanguinité des trois populations étudiées serait le résultat de la destruction massive et intensive de leur habitat naturel.

Rabetafika, L. 1987. Etude morphologique et biologique des Plasmodium des Lémuriens. Mise au point de modèles expérimentaux. Thèse de doctorat de 3è cycle en Sciences Biologiques Appliquées, Option: Ecologie- Parasitologie, Faculté des Sciences, Université d'Antananarivo. Résumé: L'étude morphologique, structure et ultrastructure des formes sanguines et sporogoniques a mis à jour des caractères originaux chez les plasmodies des Lémuriens, qu' on ne trouve pas chez les espèces inféodées aux autres Mammifères. L'étude biologique révèle que la splénectomie du lémurien parasité entraîne une augmentation importante de la parasitémie. Traitée par la quinine, celle-ci décroît momentanément pour subir une nouvelle recrudescence, quelques jours après, au cours de laquelle, prédomine une seule espèce. Cette prédominance varie à chaque poussée parasitaire.

Rakotoarisoa, S.V. 1994. Etudes des influences des facteurs externes sur la structure de la population de *Propithecus verreauxi verreauxi* dans la Réserve privée de Berenty et ses intérêts pédagogiques et éducationnels. Mémoire pour l'obtention du Certificat d'Aptitude Pédagogique de l'Ecole Normale, E.N.S, Université d'Antananarivo. Résumé: La composition du sol, la distribution et la composition des plantes, l'abondance et la qualité de la nourriture disponible influent sur la densité, la surface du domaine vital journalier ainsi que celle des zones de chevauchement et la féconditéé des Sifaka. Par contre, la taille moyenne du groupe, la natalité, la mortalité, la structure selon le sexe et l'âge ne sont nullement influencées par ces facteurs externes, malgré la présence de sècheresse entre les années 1991 et 1992 dans le sud malgache. Ces résultats constitueraient un élément d'une base de données pour les enseignants, les éducateurs et les personnels qui travaillent sur la conservation.

Rakotoniaina, G.V. 1992. Etude comparée éthoécologique d'*Eulemur rubriventer* et d'*Eulemur fulvus rufus*. Mémoire de D.E.A d'Anthropologie Biologique, volet: Primatologie, Faculté des Sciences, Université d'Antananarivo. Résumé: Ces deux espèces ont des comportements communs, tels que: le rythme d'activité quotidien et le régime alimentaire. D'autres caractères éthologiques dans la vie sociale les différencient comme: (1) la composition du groupe: celle d'*Eulemur rubriventer* est caractérisée par un adulte mâle, par contre celle de *Eulemur fulvus rufus* contient plusieurs mâles adultes; (2) marquage du territoire plus fréquent chez *Eulemur rubriventer;* (3) le mâle d'*Eulemur rubriventer* assiste la femelle pour l'éducation de leur enfant.

Rakotosamimanana, L.R. 1991. Etude de la variation saisonnière du cycle de l'épithélium séminifère chez *Avahi* (Jourdan 1834): un Primate Prosimien de Madagascar. Thèse de doctorat en Médecine, Faculté de Médecine, Université d'Antananarivo. Résumé: Cette étude de la variation du cycle de l'épithélium séminifère chez *Avahi* nous montre que l'acitivité spermatogénétique est maintenue pendant la saison d'inactivité sexuelle, avec un ralentissement important du cycle de l'épithélium séminifère et une très forte proportion de cellules en dégénérescence. La reprise de l'activité spermatogénétique pendant la période de reproduction se traduit par l'augmentation de la surface du tube séminifère et du nombre de cellules de la lignée germinale, en particulier les spermatides. Le rendement de la spermatogenèse pendant la saison de reproduction est voisin de celui des autres Primates; la gamétogenèse est moins performante chez *Avahi*.

Ranalison, O. 1994. Contribution à l'étude de l'alimentation du Lémurien en captivité: *Hapalemur aureus*. Mémoire de fin d'études en Agronomie, Option: élevage, E.S.S. Agronomiques, Université d'Antananarivo. Résumé: La valeur énergétique du bambou est faible par rapport aux autres plantes comme les légumes. Le bilan énergétique chez *Hapalemur aureus* élevé en captivité est en déficit à cause de l'insuffisance de l'apport énergétique.

Randria, G. 1990. Contribution à l'étude de la colonne vertébrale du genre *Pachylemur* (Lamberton 1946). Anatomie et analyse cladistique. Thèse de doctorat de 3è cycle en Paléontologie, Faculté des Sciences, Université d'Antananarivo. Résumé: La colonne vertébrale du genre *Pachylemur* taduit une certaine robustesse notamment au niveau de la colonne lombaire: (1) sa formule vertébrale devait être: vertèbres cervicales=7, vertèbres thoraciques=12, vertèbres lombaires=7 avec un sacrum à 3 vertèbres; (2) le groupe frère du genre *Pachylemur* est le groupe: *Lemur, Hapalemur, Varecia*; (3) le genre *Pachylemur* aurait été un marcheur-coureur quadrupède ne

sautant que très rarement. Il aurait été aussi un grimpeur lent qui serait retrouvé quelquefois suspendu à des branches d'arbres; (4) l'ancêtre hypothétique des Lémuridés aurait été, du point de vue locomotion, intermédiaire et assez proche du genre *Pachylemur* d'une part et du groupe-frère *Lemur-Hapalemur-Varecia* d'autre part; (5) - la position du genre *Pachylemur* pourrait être intermédiaire entre la famille des Lémuridés et la famille des Indridés.

Randriamihaja, M.F. 1993. Le régime alimentaire et dents chez les Lémuriformes. Mémoire de D.E.A en Anthropologie Biologique, volet: Primatologie, Faculté des Sciences, Université d'Antananarivo. Résumé: *Lemur catta* et *Eulemur fulvus rufus* sont des frugivores ayant des molaires à simples cuspides et un dessin occlusal simple. Hapalemur griseus griseus et Avahi sont des folivores ayant des molaires à dessin occlusal compliqué ou la crénulation de l'émail englobe les cuspides. Indri indri est un folivore qui peut être momentanément frugivore, d'où la configuration bilophodonte qui se retrouve aussi chez Archaeolemur. Megaladapis, par ses molaires, est un folivore des milieux lacustres.

Ratsimbazafy, H.J. 1992. Etude comparative de l'éthoécologie de deux Prosimiens malgaches: *Propithecus diadema edwardsi* (A. Grandidier, 1871) et *Hapalemur aureus* (Meier, Albignac, Peyreiras, Rumpler, Wright, 1987). Mémoire de D.E.A d'Anthropologie Biologique, Volet: Primatologie, Faculté des Sciences, Université d'Antananarivo. Résumé: L'étude comparative éthoécologique de *Propithecus diadema edwardsi* et de *Hapalemur aureus* a permis de conclure que toutes les particularités morphologiques et comportementales de ces animaux sont liées et adaptées à leur niche écologique.

Ravaoarisoa, J. 1990. Catalogage des os d'Anjohibe. Etude morphologique et biométrique de l'appareil masticateur du genre *Pachylemur* . Mémoire de D.E.A d'Anthropologie Biologique, volet: Primatologie, Faculté des Sciences, Université d'Antananarivo. Résumé: Les Lémuriens subfossiles occupent une place très importante parmi les os récoltés dans la grotte d'Anjohibe. La plupart du développement des os crâniens semble être en relation avec la grandeur des muscles masticateurs. Chez les *Pachylemur*, la musculature fut probablement très développée comme en témoigne la présence de crêtes vigoureuses et saillantes, des arcades zygomatiques fortes et très convexes en dehors sur le crâne, et l'importance de la grosseur des dents et de la robustesse de la mandibule.

Cover photo: *Allocebus trichotis* in Anjanaharibe-Sud; photo taken by H. Schütz

LEMUR NEWS

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