PD-ABR-336

UNIVERSITY DEVELOPMENT LINKAGES PROGRAM (UDLP)

STATE UNIVERSITY OF NEW YORK AT STONY BROOK
UDLP PROJECT 1993-1998

TITLE ENVIRONMENT AND NATURAL RESOURCE MANAGEMENT OF BIODIVERSITY IN MADAGASCAR

Participating Universities
SUNY at Stony Brook (USIHE) - Lead
Eastern Michigan University (USIHE)
Duke University (USIHE)
University of Antananarivo (DCIHE, Madagascar)
University of Fianarantsoa (DCIHE, Madagascar)

Annual Report October 1, 1997 through September 30, 1998

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UDLP Evaluation Workshop In November 1997, UDLP participants met in Ranomafana for a UDLP Evaluation Workshop emphasizing input from the Malagasy partners This evaluation meeting was frank and comprehensive, highlighted strengths and weaknesses, and resulted in a series of recommendations (Appendix 1)

A Objective One: Design and Establish Training and Enhancement Programs in Madagascar

A 1 Activities and Progress

a International Primatological Congress and Pre-Congress in Madagascar

DCIHE/ University of Antananarivo hosted the XVIIth Congress of the International Primatological Society (IPS) Five hundred fifty (550) scientists from 35 nations registered to participate The Congress included 20 Symposia, 2 Workshops, 16 Paper sessions (~9 20-minute presentations each), 108 Poster presentations, 1 Video, (totaling 422 presentations) and 1 Environmental play presented by Malagasy schoolchildren (Appendix 2) That the University of Antananarivo had the capacity, as well as the international recognition, to host such a major conference was largely the result of UDLP capacity-building activities over the past 5 years This conference was virtually completely funded by non-USAID sources (Appendix 2), a stellar example of the far-reaching effects of the initial USAID investment in this UDLP Linkage program.

This Conference provided students and professors from all over Madagascar with the opportunity to learn from and establish contacts with primatologists from around the world Students and professors were able to attend presentations on cutting-edge science, a rare and valuable opportunity for developing-country scientists The Conference reinforced to the people of Madagascar the international importance of Malagasy lemurs The Conference introduced Malagasy hospitality and facilities to the international participants, encouraging them to return to conduct research in Madagascar (or visit as tourists!)

The IPS hosted a Pre-Congress at Ranomafana National Park (RNP) for advanced graduate students or persons working in the primate conservation sector from developing countries Nineteen participants from 12 countries received funding from a variety of sources (Wenner-Gren, Conservation International, Primate Conservation Inc , and USAID) to enable them to attend the Pre-Congress and IPS Congress (Appendix 3) Participants arrived in Madagascar on August 4, 1998, and drove to Ranomafana National Park on August 5, where the Regional Head of the National Park Service (ANGAP), the RNP Park Manager, and the Director of MICET (National Coordinator for UDLP) welcomed them. From August 5 – 8 they participated in a series of primate-related lectures and field activities (Appendix 4) These activities were organized and led by Malagasy and international hosts (mostly UDLP participants – see Appendix 3)

b Field Course at Ranomafana National Park

Although the original UDLP program did not include a 1997 UDLP Field Course, the Malagasy students and faculty expressed such a strong desire for another field course that a short field course was organized for November 1997 Twenty-two students attended the course 5 from DCIHE/University of Antananarivo, 4 from DCIHE/University of Fianarantsoa, and 13 from US universities privately funded through a Study Abroad program from USIHE/Stony Brook (Appendix 5) The course was taught by 4 international faculty, one each from the 3 USIHE Universities and a guest speaker from the Bolton Institute in the UK, and 9 faculty from DCIHE Universities (Appendix 5)

The course met for 2 weeks at Ranomafana National Park (Appendix 6) and was coordinated by Dr Patricia Wright (USIHE/Stony Brook) and Dr Peter Reinthal (USIHE/E Michigan) Classes were scheduled so that there were lectures in the morning and field and laboratory exercises in the afternoon Topic covered included lemur paleontology, captive breeding, and conservation biology, ecological census techniques, parasitology, environmental law, watershed management and limnology, and individual micro-projects Dr Elwyn Simons of USIHE/Duke University participated in the course and worked closely with students

Discussions during the field course with Malagasy students and professors revealed why the course is so popular

- The course provides Malagasy DCIHE students with skills and resources necessary to pursue their DEA degrees at the DCIHE Universities

- The course provides the first introduction to native Malagasy flora and fauna for most DCIHE students and many DCIHE professors For the DCIHE professors, the UDLP course allowed them to incorporate examples and studies of native flora and fauna into their university courses DCIHE students unable to attend the UDLP Field Courses benefit by learning more about their own natural history in DCIHE university classes

- Numerous DCIHE students from courses in previous years have been placed in environmental jobs both in government and in conservation (NGO) organizations (Appendix 16) Including the UDLP Field Course on their CV's has greatly helped their chances of getting these jobs

c DCIHE students complete their DEA degrees

DCIHE/University of Antananarivo student Harison RANDRIANASOLO completed his DEA in December, 1997 His thesis concerned the feeding behavior of understory birds in Ranomafana National Park

Marie Jeanne Raherilalao defended her DEA before her committee of DCIHE/University of Antananarivo professors and USIHE/Dr Steve Zack Her thesis concerned the effects of habitat fragmentation on bird populations of Ranomafana National Park (see Appendix 7)

d First University-level Environmental Institute in Madagascar opens doors

The DCIHE/University of Fianarantsoa Institute for Science and Technology of the Environment (ISTE) welcomed its first class of 45 students (Appendix 8) This new Institute is the first formal higher education center dedicated to environmental sciences in Madagascar The creation of the ISTE is a direct result of linkage activities, especially the UDLP Field Course held at Ranomafana National Park each year, the training program for Malagasy University Officials in the US in September,1997, and close ties between US and Malagasy Universities developed and nurtured by the UDLP The new students are actively involved in classwork and participated in a one-week field trip to Ranomafana National Park (funded by UDLP, see also Appendix 7) where students were introduced to the native flora and fauna For most of these students, this was the first time that they had seen the endemic plants and animals that have brought international attention to the environmental crisis in Madagascar

e Ornithologist travels to Madagascar to train Malagasy students

USIHE/Dr Steve Zack traveled to Madagascar to work with advanced Malagasy students who he has been advising and mentoring during the linkage program (Appendix 7) The primary impetus of his trip was to attend the DEA defense of DCIHE/University of Antananarivo student Marie Jeanne Raherilalao Additional activities included a lecture at DCIHE/University of Fianarantsoa ISTE on the pressing environmental concerns of Madagascar to 50 students and faculty, participation in the University of Fianarantsoa ISTE field trip to Ranomafana National Park (RNP) by presenting a slide show on endemic fauna of RNP, assistance in a forest walk emphasizing ecological interactions impacted by the encroachment of slash and burn (tavy) agriculture, and close work with a number of advanced students on their research projects

f Facilitation of research in Madagascar

The ICTE staff in Stony Brook and Madagascar has assisted over 50 international scientists in their preparations to conduct research in Madagascar this year (Appendix 9) International scientists are required to train Malagasy students as a condition of receiving permission from ANGAP to conduct research in Madagascar Therefore these research facilitation services are an important part of providing Malagasy (as well as international) students with training opportunities in Madagascar International researchers are supported by outside sources of funding, and provide financial support for the Malagasy students that they train This is a good example of using USAID funds (for ICTE staff in US and Madagascar) to leverage additional funds for training in Madagascar

US scientists planning research in Madagascar request assistance from ICTE in acquiring permits, choosing equipment, and making arrangements at field sites around Madagascar including Ranomafana National Park The ICTE/Stony Brook office provides advice and assistance to US and other international researchers preparing to work in Madagascar Once in Madagascar, the Malagasy ICTE staff sees to it that scientists have the equipment and supplies they need, and that they get where they need to go (see Appendix 10 for a letter from a researcher at the California Academy of Sciences, who was impressed with the facilitation services his team received from

ICTE/MICET) The number of researchers visiting Madagascar and requiring assistance is swelled this year by the International Primatological Society Congress held in Antananarivo in August of this year (1998)

A major success of the UDLP was the establishment of email communication between the Madagascar and US offices of ICTE several years ago This email communication has allowed us to improve the facilitation services that we can offer

A 2 Problems or Barriers

Logistical arrangements for courses (UDLP, Earthwatch), researchers, and special activities (IPS Congress) were a challenge for UDLP participants in Madagascar and the US However, all activities ran smoothly Lack of computers and the need to use out-dated and slow computers increased the challenge of organizing all of these international activities

B Objective Two. Training in the US of Malagasy Faculty and Students

B.1 Activities and Progress

A major accomplishment of the ULDP program this year was the acceptance of DCIHE student Pascal RABESON into a Ph D program at the University of Georgia, see below Mr Rabeson is a talented and motivated individual, and we feel confident that he will be very successful

In addition, there has been continued administrative support for the DCIHE students that are working on long-term degrees as well as support for several DCIHE UDLP graduates who are seeking advanced training in the US, including Vololontiana (Tiana) Razafindratsita

Pascal RABESON (UDLP/DCIHE student) has worked closely with USIHE-Eastern Michigan University professor Dr Peter Reinthal on ichthyological and water quality studies for several years Mr Rabeson has studied entomology, including a systematics training session with Dr E 0 Wilson at Harvard University During the reporting period, he served as a teaching assistant for the 1997 UDLP field course and continued as the Ecological Monitoring Advisor to the Ranomafana National Park Project

Mr Rabeson was accepted for a Master's degree program at USIHE/Eastern Michigan University (EMU) in 1997 to work with Dr Peter Reinthal Due to a family situation, Dr Reinthal had to take temporary leave from EMU, thus delaying the start of Mr Rabeson's training During this period, Mr Rabeson began collaborations with Dr Cathy Pringle of the University of Georgia It was decided that since Mr Rabeson already had a Master's Degree (from the former Soviet Union), that a Ph D program might be more appropriate During the reporting period, Mr Rabeson was accepted at the University of Georgia in a Ph D program to study restoration ecology of riparian zones with Dr Pringle and Dr Ron Carroll Mr Rabeson traveled to U of Georgia in late 1997 to begin his program in Jan, 1998

Mr Rabeson's first year of support, including travel, living expenses, and intensive English will come from UDLP funds to Dr Reinthal at USIHE/EMU (total cost, approximately $14,500) The University of Georgia is waiving the first year of tuition If Mr Rabeson completes his first year at U Ga satisfactorily, he will receive a teaching assistantship that will guarantee tuition and living expenses for four more years (estimated value, $100,000) By attending the U Ga , Mr Rabeson will receive a higher degree (Ph D) than he would have received at EMU (MS) Thus Mr Rabeson will help meet the great need for Ph D -trained biologists in Madagascar

This is an excellent example of the importance of ULDP funds for initiating advanced training for DCIHE students The initial $14,500 of UDLP funds spent on Mr Rabeson's first year will be used to leverage an additional $100,000 from non-UDLP sources for his continued training

In late December 1997, before traveling to U Ga , Mr Rabeson spend 2 weeks with Dr Reinthal (USIHE/EMU) preparing a paper for publication on insects of Madagascar

After attending an intensive English course he was able to pass the TOEFL exam (score 557) At the same time, he took a plant ecology seminar He is working closely with his UGA committee, the USIHE linkage coordinator, and the PI to find outside funding for his research program In the spring semester, 1998, he took courses in stream ecology, community ecology, and research He is working closely with his UGA committee, the USIHE linkage coordinator, and the PI to find outside funding for his research program One promising avenue of support is via ANGAP with EP2 funding ANGAP is very interested in his research on aquatic monitoring and restoration of riparian habitats Pascal is preparing a proposal for submission to ANGAP entitled the Effect of Riparian Zone Degradation upon Water Quality of the Namorona River Over the summer session at UGA, Mr Rabeson successfully completed courses in GIS and statistics During fall semester 1998 he is taking courses in limnology and watershed conservation teaching in courses in ecology and 'modern topics in ecology'

Mr Jonah RATSIMBAZAFY (UDLP/DCIHE student) continues successfully as a USIHE/ SUNY-Stony Brook graduate student in the Doctoral Program in Anthropological Sciences In the Fall semester, 1997, he continued analyzing his data and preparing his Ph D Dissertation proposal He works with USIHE\SUNY-Stony Brook Professor Patricia Wright as his principal advisor

Mr Ratsimbazafy, who has received funding from Wenner-Gren, the Brookfield Zoo, Wildlife Preservation Trust International, and Primate Conservation Inc , continues to prepare and submit grant proposals to fund his field research During the reporting period, Mr Ratsimbazafy prepared and submitted proposals to three granting agencies (Margot Marsh, Wildlife Conservation Society, and Wildlife Preservation Trust International) All three proposals were funded for a total of $20,000

Mr Jean-Claude Andrianantenaina RAZAFIMAHAIMODISON (UDLP/DCIHE student) successfully completed his Master's Degree in Spring 1997 in the Program for Biodiversity at the City University of New York He has worked extensively with USIHE/Professor Steve Zack in

Madagascar In fall 1998, Mr Razafimahaimodison entered the graduate program at the University of Massachusetts at Amherst to work with Dr Kroodsma

Lalaina RAVELOMANANTSOA (DCIHE student funded by UDLP) graduated on August 2, 1998 with a Master's in International Environmental Law from the Vermont Law School The Vermont Law School is the top ranked school for Environmental Law in the US Mr Ravelomanantsoa received his Master's Degree after successfully completing three intensive semesters of coursework at VLS He has returned to Madagascar and is currently working for ICTE He has been promised a teaching position at the University of Fianarantsoa's new Institute for Science and Technology of the Environment

Vololontiana RAZAFINDRATSITA (UDLP DCIHE/University of Antananarivo student) is an ornithology student chosen from the Linkage 1995 course to receive advanced training at SUNY Stony Brook, California and Costa Rica during 1996 During the reporting period, Tiana worked full-time as a research assistant in Madagascar for Professor Ted Stiles of Rutgers University Tiana was a teaching assistant for the 1997 UDLP Field Course at Ranomafana National Park

B.2 Problems and Barriers

The barrier to success for this aspect of the program is that both international travel and training programs are very expensive relative to the possibilities for Malagasy students and professors We continue in our attempt to locate funded programs for students to continue on in the US in graduate programs We feel that this is the only clear route for long-term improvement of Malagasy Higher Education in conservation and development

C Training in Research Methods and Grant Writing

C 1 Activities and Progress

a Training in computer use

USIHE professors and UDLP staff assisted students in Madagascar with training on computers, data analysis and scientific writing

USIHE/Dr Steve Zack presented a lecture and demonstration entitled "Demystification of the Internet" to 25 DCIHE/University of Antananarivo professors and students, as well as MICET staff and former UDLP students (Appendix 7) Many participants previously had no experience with or even tangible concept of the internet and the world-wide web

The establishment of email and connection with the Internet at the UDLP office in Antananarivo (supported by UDLP) several years ago has provided countless Malagasy professors and students with the opportunity to learn about and use email and the internet

b Training in grant writing

USIHE Principal Investigator Dr Patricia C Wright and USIHE Coordinator Dr Fredrica van Berkum assist DCIHE students training in the US with locating sources of additional funding and preparing and submitting proposals to funding agencies

Jonah Ratzimbazafy, DCIHE student attending USIHE/Stony Brook Ph D program, submitted grant proposals to three granting agencies (Margot Marsh, Wildlife Conservation Society, and Wildlife Preservation Trust International) All three proposals were funded for a total of $20,000

Training in grant writing was a major theme in the 1997 UDLP course held in Ranomafana Instruction during the 1997 UDLP course included introduction to grant writing and publications

DCIHE/Dr Lydia RABETAFIKA is a senior investigator in a grant proposal submitted by UDLP PI Dr Patricia Wright to the National Science Foundation Dr Rabetafika helped to prepare the proposal entitled "Dispersion and Prevalence of Lemur Parasites in the Rain Forest of Madagascar "

The ICTE began preparations to submit grant proposals to write management plans for two protected areas (Tsimanampetsotsa and Kalambatritra) The proposals will be submitted to ANGAP Several Malagasy students are involved in proposal preparation, giving them valuable hands-on experience

c Training in research methods

Training in research methods was a major theme in the 1997 UDLP course held in Ranomafana Instruction during the 1997 UDLP course included research methods and experimental design, statistics and computers, computer use, and data analysis and management The UDLP field course included field research methods training as well, including census techniques (DCIHE/Dr Daniel RAKOTONDRAVONY), parasitology (DCIHE/Dr Lydia RABETAFIKA) behavioral ecology of primates (USIHE/Dr Patricia Wright), fish and water sampling (USIHE/Dr Peter Reinthal)

USIHE/Dr Steve Zack worked closely with several advanced students on research methods (see Appendix 7)

USIHE/University of Eastern Michigan Dr Peter Reinthal worked closely with DCIHE student Pascal Rabeson on analysis of ecological monitoring data

Malagasy graduate students DCIHE/RAHERILALAO Marie Jeanne and DCIHE/ RANDIRANARISOA Samuelson received training in spider identification and the use of all collecting techniques for insects and arachnids from entomologists from the California Academy of Sciences

The ICTE staff in Stony Brook and Madagascar has assisted over 50 international scientists in their preparations to conduct research in Madagascar this year (see above, and Appendix 9) International scientists are required to train Malagasy students as a condition of receiving permission from ANGAP to conduct research in Madagascar Therefore these research facilitation services are an important part of providing Malagasy (as well as international) students with research training opportunities in Madagascar International researchers are supported by outside sources of funding, and provide financial support for the Malagasy students that they train

C 2 Problems and Barriers

Lack of available computer equipment is a major limitation to adequate training of students and professors in grant writing and research methods

D Production of Publications on Research and Development

D 1 Activities and Progress

In late December 1997, before traveling to the University of Georgia to begin his Ph D program, Pascal Rabeson spend 2 weeks with Dr Reinthal (USIHE/EMU) preparing a paper for publication on insects of Madagascar

USIHE Dr Steve Zack is preparing 9 manuscripts for publication with Malagasy co-authors (see Appendix 7)

DCIHE students Harison Randrianasolo, Marc Rabenandrasana, Marie Jean Raherilalao, and Tiana Razafindratsita continued collecting and analyzing data and preparing their data for publication in international scientific journals USIHE and DCIHE professors assisted them

The publication list for Ranomafana National Park continues to grow (Appendix 11)

D 2 Problems and Barriers

The major barriers to publication for DCIHE professors and students includes the need for more advanced statistical training, and the lack of funding to support field research Students interested in publishing in international scientific journals would benefit from more time spent in collaboration with USIHE professors

E Revise Curriculum

E 1 Activities and Progress

In September 1997 the Dean of the Faculty of Sciences at the DCIHE/University of Antananarivo and the Rector (President) of the DCIHE/University of Fianarantsoa attended a training program

in the US (see Annual Report, Year 4) From Oct 1 to Dec 30, 1997, these two DCIHE/University officials began to incorporate the lessons learned from the workshop into their plans for expanding environmental education at the two DCIHE Universities The Rector of the University of Fianarantsoa formally established an Institute for Environmental Studies at his University In January 1998 the first group of students began training at the new institute (Appendix 8) The program of the ISTE is described in Appendix 12

This program brings together faculty at the University of Fianarantsoa from a range of departments Faculty from the University of Antananarivo will also participate in this program This extraordinary example of inter-University cooperation is a direct result of UDLP efforts to bring together faculty from different disciplines and universities to develop the field of environmental education in Madagascar

In addition, the Faculty of Sciences at the University of Antananarivo has added Environmental Studies to the list of degree programs in which students can receive their DEA

The establishment of the Institute for Environmental Studies at DCIHE/University of Fianarantsoa and the new degree program at DCIHE/University of Antananarivo are major successes for the UDLP They are the first formal higher education programs in Environmental Studies Department in Madagascar As such, they signify a major stride for Madagascar in incorporating environmental concerns into the national consciousness and curriculum. Also, these new programs are based on an interdisciplinary model of faculty participation, previously unknown in Madagascar The Malagasy University system is based on the French system, where interdisciplinary interactions among faculty are virtually unknown Two UDLP activities were pivotal in introducing the power of an interdisciplinary approach to Malagasy Universities

1) From the beginning of the Linkage program, USIHE faculty has included DCIHE faculty from diverse departments in both the University of Antananarivo and the University of Fianarantsoa in teaching the UDLP Field Courses The DCIHE faculty was interested in participating, but unsure of how such a diverse faculty could effectively instruct students Part of the success of the UDLP field methods courses at Ranomafana National Park has been due to the enthusiasm of the Malagasy faculty as they learned to work in an interdisciplinary course After 5 years of contributing to the UDLP field courses, this faculty is now participating in interdisciplinary programs at their own Universities

2) The Dean of the Science Faculty of DCIHE/University of Antananarivo, and the Rector of DCIHE/University of Fianarantsoa were able to see interdisciplinary departments in action during their September 1997 training program in the US (see Annual Report, Year 4) During their training in the US, these DCIHE University officials met with faculty, provosts, deans, and university presidents, who were able to show them the effectiveness of the interdisciplinary Environmental Studies programs that were in place in the US

In September 1998, the first group of students completed their first year of study

E 2. Problems and Barriers

Barriers to this activity are mostly financial. Inexperience with interdisciplinary approaches to environmental studies has been overcome as described above Funding for curriculum revisions is extremely limited in Madagascar The Environmental Studies Program at DCIHE/University of Fianarantsoa has been established with no additional University funding If this program is to expand and grow, new funds must be located

F Ensuring the Sustainability of the Linkage

1 Malagasy partners request continuation of the linkage

In this last year of the Linkage, DCIHE faculty and students have asked the USIHE how the linkage can be continued and expanded Of particular concern to the Malagasy participants are the continuation of the UDLP Field Course, support for the fledgling Institute of Environmental Studies Program at DCIHE/University of Fianarantsoa, and a degree program at DCIHE/University of Antananarivo, and continuation of the training of promising Malagasy students in the US (Appendix 1) We are seeking sources of funding for these programs

2 Proposal to ALO

In March, 1998, USIHE/Stony Brook submitted a Partnership proposal to the Association Liaison Office for University Cooperation in Development to create a new partnership with DCIHE/University of Fianarantsoa This new partnership also includes a private business school in Antananarivo and a private Malagasy ecotourism enterprise The purpose of the new partnership is to strengthen the ability of Malagasy higher education institutions to provide environmental training to the business people, decision-makers, and citizens of Madagascar The new partnership builds on the success of the UDLP in establishing the first environmental higher education program in Madagascar (University Fianarantsoa/ISTE)

ALO received far more proposals than they had anticipated (100 proposals for 10 grants) Our proposal was highly rated and considered one of the proposals that ALO would like to support, but not in the top 15 proposals that were funded ALO is actively seeking additional funds to support our proposed partnership

G Summary of Quantitative Outputs During Year 5

1) Design and Establish Training and Enhancement Programs in Madagascar

- 1 field course conducted (1997)
  - 5 DCIHE/ University of Antananarivo Professors involved in field course
  - 4 DCIHE/ University of Fianarantsoa Professors involved in field course
  - 1 Guest Lecturer contributed to course
  - 3 USIHE professors contributed to the field course

    - 5 Advanced DCIHE students worked as teaching assistants for field course
    - 5 DCIHE/ University of Antananarivo Students participated in the field course
    - 4 DCIHE/ University of Fianarantsoa Students participated in the field course
    - 13 USIHE/ SUNY at Stony Brook Undergraduate Students (self funded) participated in the field course
- 26 UDLP Field Course graduates have environment-related jobs in Madagascar
- 45 students begin their studies at the new Institute for Science and Technology of the Environment (ISTE) at DCIHE/University of Fianarantsoa
- 45 ISTE students participate in field trip to Ranomafana National Park
    - 1 DCIHE professor participated in the field trip
    - 1 USIHE professor participated in field trip
- 1 USIHE professor presents lecture to ISTE students at DCIHE/University of Fianarantsoa
- 2 UDLP students defend their DEA theses, with USIHE and DCIHE professors in attendance
- 1 Pre-Congress session held before the XVIIth Congress of the International Primatological Society
    - 19 Participants
    - 12 Developing countries represented
    - 8 International instructors from USA and Japan
    - 9 Malagasy instructors
- 1 Major international scientific convention held XVIIth Congress of the International Primatological Society
    - 550 Registered participants
    - 35 Nations represented
    - 422 Presentations in 47 Scientific Sessions
        - 20 Invited Symposia
        - 16 Paper Sessions with approximately 9 20-minute presentations in each
        - 108 Poster Presentations
        - 2 Workshops
        - 1 Video presented
        - 1 Environmental Play presented by Malagasy school children
- 68 Researchers received facilitation services from ICTE offices in NY and Antananarivo

2) Training in the US of Malagasy Faculty and Students

- 4 advanced DCIHE students were trained in the US (in graduate programs)
- 1 DCIHE student was aided administratively to help her join US graduate programs
- 1 DCIHE student attended an intensive English class and received a 557 on the TOEFL
- 1 DCIHE student completed a MA in International Environmental Law at Vermont Law School

3) Training in Research Methods and Grant Writing

- 1 field course was held which included advanced training in research methods and grant writing
- 1 lecture presented by a USIHE professor to Malagasy DCIHE students and professors on

'Demystification of the Internet'
- 2 USIHE professors worked closely with advanced DCIHE students on research methods and data analysis
- 2 USIHE staff assisted DCIHE students studying in the US with grant writing
- 1 grant proposal submitted by USIHE professor in collaboration with DCIHE professor
- 3 grants submitted by DCIHE graduate student in US are funded

4) Production of Publications on Research and Development
- 10 publications co-authored by USIHE professors and DCIHE students being prepared
- 17 new publications added to the ICTE Publication list in 1998

5) Revise Curriculum
- 1 Institute of Environmental Studies established at DCIHE/University of Fianarantsoa
- 1 degree program in Environmental Sciences for DEA students established at the University of Antananarivo
- 1 new Institute of Science and Technology of the Environmental opens its doors at DCIHE/University of Fianarantsoa

6) Other
- 9 Lectures presented throughout the US featuring UDLP and its programs
- 1 New collaborative relationship developed over the internet between a Malagasy and a US Professor
- 1 New popular article concerning ICTE's work in Ranomafana (including UDLP activities) distributed to over 21,000 Earthwatch members
- 1 DCIHE grad student's work is featured in a newsletter
- 1 Grant proposal submitted for sustaining the linkage

H Internationalization of Malagasy and US Institutions

1 International Primatological Congress

The XVIIth Congress of the International Primatological Congress, hosted by the University of Antananarivo from Aug 10 – 14, 1998, and the Pre-Congress that preceded it (August 4 – 8), were major events that internationalized all institutions involved (Appendices 2 & 3) That the University of Antananarivo had the capacity, as well as the international recognition, to host such a major conference was the largely the result of UDLP capacity-building activities over the past 5 years The Congress was reported in Malagasy newspapers (Appendix 2)

This Conference provided students and professors from all over Madagascar with the opportunity to learn from and establish contacts with scientists from around the world The Conference reinforced to the people of Madagascar the international importance of Malagasy lemurs The Conference introduced Malagasy hospitality and facilities to the international participants, encouraging them to return to conduct research in Madagascar (or visit as tourists!)

2 UDLP Field Course at Ranomafana

The UDLP Field Course included participants from the US, France, Great Britain and Madagascar This field course promotes important collegial relationships among participants from many countries Malagasy and international scientists learn to appreciate the significance and importance to the world of the biodiversity of Madagascar Furthermore, as described above, the UDLP course promotes an interdisciplinary approach to environmental studies that is new to Madagascar

3 The PI presents talks around the US

The Principal Investigator, USIHE/Stony Brook Professor Patricia C Wright was invited to speak at a number of institutions across the US (Appendix 13) At each of these speaking engagements (all funded from outside sources), the important training and other linkage activities of the UDLP were presented Dr Wright emphasized the importance of close ties between developing country partners and US

4 Public Relations Outreach

The Linkage Program and related activities are described in several books

1 Bohlen, J T (1993) For the Wild Places Washington, D C Island Press
2 Boyd, R , & Silk, J (1997) How Humans Evolved New York WW Norton and Company
3 Goodman, S M , & Patterson, B D (Ed) (1997) Natural Change and Human Impact in Madagascar Washington Smithsonian Institution Press
4 Leuzzi, L (1997) To the Young Environmentalist New York Franklin Watts
5 Quammen, D (1989) A murder in Madagascar Audubon Magazine, 93 (1) 50-58

Earthwatch Inc has been sending volunteer groups (two groups of 10 – 12 volunteers, Appendix 5) to Ranomafana National Park in Madagascar since 1996 This program has provided exposure to UDLP programs for a diverse array of US citizens In 1998, Earthwatch sponsored an African Fellowship Team for African conservation workers to visit Ranomafana National Park Representative from four African Nations attended the program (Appendix 3) The success of the Earthwatch programs is due, in part, to capacity building by the UDLP program.

Recently, ICTE's programs in Ranomafana, including the UDLP program, were the subject of a major articles in *Earthwatch The Journal of the Earthwatch Institute* (circulation over 21,000, Appendix 14), and in the Fall 1998 issue of *California Wild* (Appendix 17)

Primate Conservation International (PCI) and the Wildlife Preservation Trust International (WPTI) have provided logistical and financial support to Malagasy UDLP student Jonah Ratsimbazafy for his graduate program in the US at SUNY Stony Brook PCI and WPTI featured Jonah and his work in a recent newsletters (Appendix 15)

I Appendices

Appendix 1 – Workshop on the Evaluation of the Five Year UDLP Program (1993-1997)(with 3 Tables)
Appendix 2 –XVIIth Congress of the International Primatological Society Summary of Programs, Proceedings, and two Malagasy newspaper articles
Appendix 3 – Consultant's Report to ICTE IPS Pre-Congress and Earthwatch African Fellows Program
Appendix 4 – Program of Activities for the IPS Pre-Congress
Appendix 5 – Students, Teaching Assistants, and Professors at the 1997 UDLP Field Course
Appendix 6 – Schedule of Activities for the 1997 UDLP Field Course
Appendix 7 – Trip Report Dr Steve Zack in Madagascar
Appendix 8 – Students Attending the First Year of the University of Fianarantsoa Institute for Science and Technology of the Environment
Appendix 9 – Liste des Chercherurs au Sein de L'ICTE Durant L'Annee 1998
Appendix 10 – Letter from the California Academy Academy of Sciences
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Appendix 15 – Publicity for DCIHE student Jonah Ratsimbazafy
Appendix 16 – List of UDLP students who have jobs
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Appendix 1 – Workshop on the Evaluation of the Five Year UDLP Program (with 3 Tables)

WORKSHOP ON THE EVALUATION OF THE FIVE YEAR UDLP PROGRAM (1993-1997)

submitted by the Malagasy professors
December 1997

Prepared by Daniel Rakotondravony and Leonie Rajaonah

EVALUATION OF THE University Development Linkage Project
Ranomafana - Ifanadiana, Fianarantsoa, Madagascar
Evaluation made by the Malagasy professors

General introduction
During the fifth and last session of the UDLP course in Ranomafana in December 1997, Malagasy professors were asked to give their views on the five year UDLP course, held in the Ranomafana National Park They were also asked to give recommendations for the future The following took part in this workshop

- Dr Patricia Wright, Executive Director of the Institute for the Conservation of Tropical Environments
- Pr Lydia RABETAFIKA, Professor from the University of Antananarivo
- Pr Leonie RAJAONAH, Professor from the University of Fianarantsoa
- Dr Frances Joanna Kerridge, Professor from the Bolton Institute
- Pr Daniel RAKOTONDRAVONY, Professor from the University of Antananarivo
- Pr Spiral Jules GERMAIN, Professor from the University of Antananarivo
- Pr Roger RATOVONJANAHARY, Professor from the University of Fianarantsoa
- Dr Benjamin ANDRIAMIHAJA, National Coordinator of the Institute for the Conservation of Tropical Environments

The workshop was led by Dr Patricia Wright

Justification of the UDLP program
The main objective of the UDLP program was to develop environmental education at the University level in Madagascar This means that the project should provide to each participant not only the opportunity to acquire basic knowledge but to get them really involved in the conservation and protection of environment In fact, every participant and all disciplines benefited from the UDLP All participants developed a strong sense of environmental awareness that was, at best, weak before the UDLP

Furthermore, everyone agreed that now that environmental training in Madagascar had become established, more time was needed to develop and improve it That makes the renewal of the Linkage Program important In fact, all participants recognized that learning in class is not enough, everyone has to see the nature, the forest, for a good combination of classroom and field courses The linkage program was the first opportunity for most Malagasy UDLP professors and students to visit their rain forest

The UDLP should be expanded in the future, to reach a larger audience of students and professors

Students
A major success of the UDLP was the possibility of combining the theoretical courses given during University lectures with fieldwork This is of a high interest as it allows a better understanding of nature and environment The result is encouraging

Objective and Expected outputs of the 5-year UDLP

Objective 1 Design and establish training and enhancement programs in Madagascar

- enhancement of the existing academic training programs at the Malagasy Universities by providing multidisciplinary programs for a better understanding of environmental issues Students from different fields (from the University of Antananarivo and Fianarantsoa) were selected to take part in the UDLP field course at Ranomafana National Park

- fieldwork (in the Ranomafana National Park, Beza Mahafaly and at Isalo)
- conduct research for "memoires", publication or theses

Objective 2 Training in the US for faculty professors and students

The motives of these trainings
discover new horizons
have new ideas
progress in research (work in lab,)
share experiences

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discover new models and other methods
social and cultural exchanges
environmental education
learn about other education systems
personal improvement
bibliography
publication
discover new technologies
contact with other researchers belonging to the same field
visit of different habitats
opportunity to choose training disciplines
English course
participation in international conferences

For the students, this training give them the opportunity to benefit from the following
six month training
English course
understand the American environmental systems
OTS course
work on Masters, PhD
participation in international conferences
Smithsonian Institute Man and the Biosphere course

Objective 3 Training on research methods and grant writing
learn sampling methods
learn data analysis methods
write research proposal and grant application
get familiar with computer

Objective 4 publication on research and development
publication of research results in collaboration with international scientists

Objective 5 Revise curriculum
enhance existing science courses by adding environmental issues to existing courses
new environmental sciences curricula

Based on these different topics, objectives and expected outputs mentioned above, the committee came to the evaluation of the actual results obtained during this five year UDLP session For that, indicators have been established

Evaluation of the Objectives

Objective 1 enhancement and training programs in Madagascar

a Development of environmental awareness participants to UDLP course, including national and international professors and students developed a strong sense environmental awareness and a keen appreciation for the need to conserve the environment and biodiversity

b UDLP field course (held every Oct/Nov at Ranomafana National Park) has given to the students the opportunity to initiate research projects in consultation with the participating professors, who serve as scientific advisors on their research It is worth pointing out that the UDLP field courses provided the students with access to new information (before UDLP, unavailable in Madagascar) and to the facilities at Ranomafana National Park This, coupled with the ability to initiate independent research projects, greatly assisted the students in their long term research work for end of study degrees, DEA, and theses (Table 2) All students who took part in the five year UDLP courses designed and wrote up their own independent projects (Table 1)

UDLP student Tiana RAZAFINDRATSITA noted that for her and for most ULDP students, the first time she saw forest was through the UDLP field course

The Recteur of the University of Fianarantsoa commented that the UDLP has enhanced existing Malagasy academic programs

Malagasy professors also learned from the UDLP field course From the beginning, Malagasy professors from the linked Universities (DCIHE/University of Antananarivo and DCIHE/University of Fianarantsoa) participated in teaching the UDLP field course They learned about ecology, evolution, and conservation from the USIHE professors, and in turn informed the USIHE faculty about their own fields of expertise The Malagasy professors have incorporated this new knowledge into their lectures at their home universities The Malagasy professors feel confident that they are able to take over the teaching of the UDLP field course

The UDLP field course (and training in the US, see below) served as a model of interdisciplinary study to Malagasy professors and students Malagasy education is based on the French system in which interdisciplinary work is rare Initially, the Malagasy professors were unsure of how an interdisciplinary course could work, and were skeptical of its success Participation in the UDLP field course allowed them to appreciate the value of an interdisciplinary approach. Now, faculty from different departments and even different Universities are collaborating to teach the first environment studies program in Madagascar – the new Institute for Science and Technology of the Environment at the DCIHE/University of Fianarantsoa

4 UDLP course sessions 1994, 1995, 1996, 1997

Number of Malagasy students	Number of American students
1994 40	1994 5
1995 38	1995 5
1996 5	1996 8
1997 9	1997 13

c Many participants in the UDLP field course have received employment from environment-related organizations (Table 3) Some of these students have received these jobs before they graduated and were able to study and work at the same time Thus, the UDLP opened new range of opportunities for Malagasy students

d A workshop on the planning and development of an international course and training on biodiversity research was held at the end of the 1996 UDLP session Recommendations from this workshop were presented in an earlier report

e Comparison visits to many protected areas and biological sites of interest
Ranomafana
Isalo
Ifaty
Manombo
Beza Mahafaly
Zombitse

Objective 2 trainings and visits in the US for faculty professors and students

a Malagasy professors and students considered the UDLP-sponsored training programs in the US to be of great value Benefits included 1) training opportunities not available in Madagascar, 2) access to the wealth of published material available in the US, 3) contact with international professors, 4) upgrade of the Malagasy educational system, 5) promotion of the exchange of knowledge

b Students who participated in training in the US felt that UDLP experience helped prepare them for their US experiences Tiana RAZAFINDRATSITA noted that the technical training received during the UDLP field course was so good that she had no trouble at the Organization for Tropical Studies course in Costa Rica For Tiana, the OTS was a valuable opportunity to inform other students about Madagascar

c The Recteur of the University of Fianarantsoa and the Doyenne of the Faculty of Sciences both credited their UDLP-sponsored training visit in the US with changing their attitudes about interdisciplinary studies During this training course, these University officials visited Environmental Studies programs at several US universities They were able to experience first-hand the power of an interdisciplinary approach to environmental studies Both professors returned to Madagascar committed to helping their faculty collaborate more closely using an interdisciplinary model The Recteur commented that he could not have developed an appreciation for the power of interdisciplinary work without actually seeing it in action.

d Training in the US allows Malagasy professors and students the ability to control or choose what they learn In contrast, when US faculty travel to Madagascar to teach, he/she then controls what the Malagasy audience learns

e Summary of training activities in US

Malagasy professors and authorities (Ms Berthe RAKOTOSAMIMANANA)
- International congress on conservation
- International Congress IPS in Bali (Indonesia)
- Duke University
- Wisconsin
- Chicago (on Conservation)
  - Ms Berthe RAKOTOSAMIMANANA
  - Mr Benjamin ANDRIAMIHAJA
  - Mr Raymond RAKOTONINDRINA, ANGAP Executive Director

Students (training and university studies)
- Jean Claude RAZAFIMAHAIMODISON
- Jonah Henri RATSIMBAZAFY
- Pascal RABESON
- Vololontiana RAZAFINDRATSITA
- Lalaina RAVELOMANANTSOA

University officials (Dr RATZIMBAZAFY, Recteur de l'Universite de Fianarantsoa , Dr Adolphe RANDRIANTSOA, Doyen of Science Faculty at University of Antananarivo , Dr Benjamin ANDRIAMIHAJA, National Coordinator ICTE)
- Environmental programs in the US
  - Duke University
  - Yale
  - Stony Brook
  - New York
  - Vermont
- Information visits
  - Washington D C
  - New York
  - Stony Brook
  - American Museum of Natural History, New York

Objective 3 (training on research methods and grant writing)

a A major component of training in research methods has been increasing the computer literacy of the Malagasy students and professors This has been very successful The computer sign up list for students at the ICTE/Stony Brook office in Tsimbazaza is always full The ICTE/Stony Brook office now has email, allowing access to the internet as well as greatly enhanced communication between the linkage partners

b The ICTE offices in Stony Brook and in Antananarivo (partially funded by UDLP) now facilitate the research in Madagascar of over 50 international scientists/year ANGAP requires that these researchers train Malagasy students (funded by the researcher) Many Malagasy students have gained valuable field experience and technical training from international researchers Sometimes long-term collaborative relationships have been established

Presently all international scientists who work in Madagascar must attend a debriefing by ANGAP officials at the conclusion of their stay in Madagascar It was recommended that these debriefings also occur at the Universities where scientific questions can be addressed

c Malagasy students in graduate programs in the US have been quick learners in the art of grant writing Jonah Henri RATSIMBAZAFY at SUNY-Stony Brook has had 8 grants funded Jean Claude RAZAFIMAHAIMODISON also had success writing grants while a student at CUNY Two Malagasy students in Madagascar have had success in applying for grant funding Daniel RAZAFIMAMONJY, and Harison RANDRIANASOLO

Last, DCIHE Professor/Lydia RABETAFIKA and USIHE Professor/Patricia WRIGHT submitted a grant proposal to the National Science Foundation for the study of parasites in lemurs

d Summary of activities related to training on research methods and grant writing
* Statistics course
* Writing independent projects
* Computer class
* Theoretical and practical courses on grant writing

Objective 4 (Publication)

a Publication of research results is often the last stage in training or a research program Therefore it is not surprising that few Malagasy students have succeeded in publishing their research results The students who have published are Tiana RAZAFINDRATSITA and Jonah Henri RATSIMBAZAFY Preparation of publications by students requires intensive interaction with a professor Finding the time for such interactions can be difficult (and potentially expensive when the two parties are in the US and Madagascar)

b Currently, the results of research in Madagascar are published in international journals which are largely unavailable to Malagasy scientists A 'Journal of Madagascar Research' modeled after a similar journal in Indonesia would make the results more accessible to scientists and policy makers in Madagascar A condition of receiving a visa or a research permit might be publication in this journal with a Malagasy collaborator Such a journal would need an editor and would require considerable time and effort

Objective 5 (Revise Curriculum)

a The UDLP has had a major impact on the curricula of existing University courses Professors who have participated in the UDLP incorporate information learned from visiting international scientists, and from the UDLP field course Before the UDLP, science courses included no information on environmental issues and conservation

b Two major new departments have been established at the University of Fianarantsoa as a result of the UDLP An Environmental Law Department at the University of Fianarantsoa and a Department of Environmental Sciences and Techniques at the University of Fianarantsoa

RECOMMENDATIONS

Taking into account all those observations, the committee drew up and suggested the following recommendations

- The University of Toliara should be invited to join the UDLP A meeting should be held to discuss the roles of the participants
- Continue the UDLP Field Course, but diversify the offerings to include a large general course and smaller more specialized (advanced) courses
- Transfer responsibility for teaching the UDLP field course to the Malagasy professors (outside funding will still be needed)
- Involve professors and students from the University of Toliara in the UDLP field course

- The UDLP field course could be held at different sites around Madagascar
- The UDLP should purchase a bus to transport students to different field sites in Madagascar
- More computers are needed for Malagasy professors and students
- All international scientists working in Madagascar must teach a seminar on their specialty at the University of Antananarivo and one at the University of Fianarantsoa
- The debriefing of international scientists at the conclusion of their stay in Madagascar (presently occurs at ANGAP) should also occur at the Universities
- Malagasy professors need longer (6 month) training programs in the US that are focussed on increasing knowledge in their scientific fields This information would then be passed on to their students upon their return to Madagascar
- The Universities of Antananarivo and Fianarantsoa need to make English courses available It is important that at least a few Malagasy students and/or professors speak English fluently
- When Malagasy students pursuing graduate studies in the US return to Madagascar, they should train other students in the arts of grant writing
- Improve the availability of statistics and computer courses to improve grant writing and in publication preparation skills of Malagasy scientists
- Publications of research in Madagascar from international journals should be made more readily available to Malagasy professors and students
- Establish a 'Journal of Madagascar Research' (see objective 4, above)

Evaluation Workshop Table 1

List of the student research projects

1994

Titles	Name of the students
- Contribution a l'etude du comportement de Propithecus diadema edwardsi male avant la periode de reproduction	RAHARIVOLOLONA Brigitte Marie
- Etude ecologique et biologique de la famille des Gobiidae de la riviere de Namorona	RAHERILALAO Marie Jeanne
- Etude quantitative de l'alimentation d'Hapalemur aureus (primates Lemuridae)	RAJARISON Antoine
- Degradation du milieu et la pratique du Tavy aux alentours de la forêt de Ranomafana	RAKOTOSAMIMANANA Tina Hanitriniaina
- Contribution a l'etude comparative des systemes de communication chez Eulemur rubriventer et Eulemeur fulvus rufus a Ranomafana	RAMINOARISOA Vaonasolo
- Differences de comportement entre Eulemur rubriventer habitues aux touristes et Eulemur rubriventer encore sauvages	ANDRIAMIHAJA Marie Felicite
- Etude comparative du comportement de deux femelles leaders de deux groupes differentes de Propithecus diadema edwardsi	RASOLOHARIJAONA Solofonirina
- Etude ecologique, biologique du genre sympatrique Phyllastrephus dans un groupe plurispecifique de la sous-canopee dans le Parc National de Ranomafana	RANDRIANASOLO Hanitriniaina Harison
- Influence des plantes aquatiques sur la production piscicole d'eau douce de la riviere de Namorona	RATSIMIALA Ramonta
- Etude ecologique et biologique du genre Xiphophorus sp de la riviere de Namorona	RAVOLOLONALISOA Solofohanitra
- Etude ecologique et biologique du genre Tilapia sp de la riviere Namorona	ANDRIANJOHANY Bakolisoa Solange Olivia

1995

Titles	Name of students
- Etude des poids de naissance en rapport avec l'environnement dans les zones peripheriques du Parc National de Ranomafana	Jean Claude RAKOTONIAINA
- Le FRAM et la conservation de la biodiversite	Benjamin Francis RAHERINIRAINY
- Contribution a l'etude de la plannification familiale dans les relations entre les pressions humaines et l'environnement dans la zone peripherique du Parc National de Ranomafana	Liva RAJOHARISON
- Percentage of time spent feeding between males and females of Propithecus diadema edwardsi	Kerri KERVIN
- Contribution a l'etude ethnobotanique de l'Uvaria acuminata (senasena) dans la région de Ranomafana	Brigitte RAMANDIMBISOA
- Etude de la strategie de pollinisation chez Bakerella grisea (Tongoalahy vaventiravina) dans la forêt du Parc National de Ranomafana	Stephan Richard RAKOTONANDRASANA
- Etude de la dispersion des graines forestieres tropicales par l'Eulemur rubriventer, Primates prosimiens	Jasmin Emile RANDRIANIRINA
- Effort to establish sustainable development in Ranomafana	Michele BRODERICK
- Contribution à l'etude ethnobotanique de l'Agelaea pentagyna (Vahimenty) dans la region de Ranomafana	Roger RAJERISON
- Etude des arthropodes comme indicateurs de suivi ecologique entre une forêt primaire Vatoharanana et une forêt secondaire Talatakely	Hanta H RAKOTOVAO
- Conception et realisation d'un systeme d'information concernant la biodiversite	Leonard RAMANANKANDRAINA
- Conception et realisation d'un systeme d'information concernant la biodiversite	Herisoa Ignace RAZAFINIRINA
- Contribution à l'etude chimique de l'Uvaria acuminata (senasena) dans la region de Ranomafana	Andre RAHAOVA
- Etude de l'influence de la lumière solaire sur la production de nectar chez le genre Bakerella grisea (tangoalahy vaventiravina) dans la forêt du Parc National de Ranomafana	Justin RAKOTOARIMANANA
- Le comportement alimentaire dans la nature et la dispersion des graines par le Propithecus diadema edwardsi	Louis Nicolas RAZAFIMBELO
- An ethnobotanical study of kasoa and the medicinal plants used for its treatment	Christian SCARAGLINO
- Etude des sons du Centropus toulou et application de la bio-acoustique a l'environnement	Jean Theophile RAJAONARIVELO
- Famille et education a l'environnement	Bernadette RAKOTOARISOA
- Etude comparative de la nutrition et de l'alimentation par la methode du modele causal Actions du volet de Developpement Rural dans le cadre du	Serge Henri RATSIRAHONANA

PCDI du Parc National de Ranomafana	
- Medicinal uses for the Harongana (Harongana madagascariensis) and Voara (Ficus baroni)	Tracy VAN HOLT
- Habitat et diversite spécifique des oiseaux du Parc National d'Isalo	Marie Jeanne RAHERILALAO
- Consequence de la destruction de l'environnement, utilisation des methodes physiques pour l'evaluation des populations d'un ecosysteme forestier	Felicite RAZANAKOLONA
- Differences in the interactive dynamics between the children of Madagascar and the children of America within a social environment	Jennifer SPARKE
- Etude physique des sons Leptosomus discolor	Tantelinirina RATSIMBAZAFY

MINI PROJECTS 1996

Titles	Name of students
- Use of medicinal plants by two malagasy prosimians	Sandra BLACK
- Hormonal correlates of ranging and scent marking among female Prophitecus diadema edwarski during the breeding season	Debra DURHAM
Etude chimique des plantes anti-paludeenne utilisees par les habitants de la zone peripherique du Parc National de Ranomafana	Denis RANDRIANADRASANA
Feeding ecology and seed dispersal a comparison of Eulemur rubriventer and Eulemur fulvus rufus	Naomi PATTERSON
Etude des effets de lisiere sur quelques plantes utiles dans le Parc National de Ranomafana	Tiana Velosoa RAKOTOVAO
Study of the Natural History and Differences in Two Male Color Morphs of the Madagascar Paradise Flycatcher, Terpsaphone mutata, in Ranomafana National Park	Miguel SCHWARTZ
La communaute aviaire des forêts fragmentees creees par le Tavy	Marie Jeanne RAHERILALAO
The Effects of Forest Disturbance on the Diversity and Composition of Tree Species and Food Resource Selection and Availability of Propithecus diadema edwardsi in Ranomafana National Park	Elizabeth BORDA
A Comparison Study on the Diversity of Butterflies found in Talatakely, Vatoharanana and the village of Ranomafana	Michael PUTNAM
Etude de l'effet de la limite creee par le "tavy" sur la densite des lemuriens et des micro-mammifères dans le Parc National de Ranomafana	Brigitte Marie RAHARIVOLOLONA
Traditional vs modern medecine in Madagascar an investigation emphasizing the surrounding villages of the Ranomafana National Park	Carrie LAUGHEAD
Health care within the Ranomafana National Park Project	Arnelle MCNEAL

1997

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Titles	Name of students
Gestion communautaire rationnelle des ressources forestieres dans la zone peripherique du PNR. Cas d'Ambodiaviavy	Abdon Julien JONARISONA TIANA Andriantsihoarana M
Besoin energetique d'un menage et la conservation de la biodiversite	ANDRIANARIVO Haingotiana MIANDRY LALA Radomitsimba
Influence of RNP on local schools	Brian KATZ
Folklore and fadys in Ranomafana	Devon SCHWEIDEL
Vocalisations in Hapalemur simus	Eileen LARNEY
Traditional baskets of RNP	Erica Mc CALL
Parental care in Eulemur rubriventer and Hapalemur simus	Jane ZAMOSTINA
Women's health in Ranomafana et Ambatolahy	Jessica ABOLAFIA
Effects of ecotourism on behavior of Eulemur rubriventer at Bellevue	Jessica GRILLO
Enquête sur l'utilisation de plantes medicinales par la population environnante du PNR	LEHIMENA Eliane
Study of nocturnla lemurs in the Ranomafana region	Michael JEFFRIES
Malagasy healthcare system	Michael KILEY
Scent marking behavior of Propithecus diadema edwardsi	Nadine BADER
Etude de la regéneration de bambous dans la region de Talatakely	RAHAJANIRINA Voninavoko
Recherche de parasites intestinaux chez Propithecus diadema edwardsi et Cheirogalus major	RANDRIAMIADAMANANA Fiankinantsoa Mampiandra
Etude de la diversite des insectes sur une plante fougere (groupe de Pteridophytes) a Mariavaratra (PNR)	RANDRIANARISOA Jean Samuelson
Importance of vocalisations in social behavior of Propithecus diadema edwardsi	Rebecca HARTFIEL
Contribution a l'inventaire des oiseaux de sous-bois de Talatakely	SOARIMALALA Regis L
Chameleons in the Ranomafana National Park	Sorina IVAN
Study of carnivores in the Ranomafana National Park	Verne SIMONS

Evaluation Workshop Table 2

List of "Memoires de Maîtrise", DEA, and CAPEN theses from UDLP Students

* ANDRIAMAMPIANDRASOA Jean Christian, "Gestion du personnel et etablissement du rapport financier"
* RAHARIJAONA Lantonirina, "L'education a l'environnement est-elle un instrument efficace pour lutter contre la degradation de l'environnement dans la region de Ranomafana?"
* Paul Raymond Pascal Koto, "Plantes medicinales antigales"
* RAKOTONDRAMANANA Vololoniaiana, "Comment introduire l'éducation a l'environnement dans la discipline mathematique dans la classe de septieme"
* RAKOTONDRABE Georges Aime, "Etude matérielle et logicielle du systeme de positionnement par satellites pour la delimitation du Parc National de Ranomafana"
* RANDRIANANDRASANA Denis, "Plantes medicinales antidiabetiques du Parc National de Ranomafana"
* RANDRIANANTENAINA Honore Consequences de la destruction de l'environnement
* RAZAFINDRAVAO Marie Josephine, Le permis de construire,
* RAMANANKANDRAINA Leonard, "Schema directeur informatique du Ministere de l'Enseignement Superieur", DII, University of Fianarantsoa
* RAZAFINIRINA Herisoa Ignace, "Informatisation de la Direction de la promotion du Commerce exterieur", DII, University of Fianarantsoa
* RAKOTOARISOA Bernadette, "La famille et l'Education a l'Environnement au sein du Parc National de Rano-mafana", CAPEN, University of Fianarantsoa
* RAHERINIRAINY Benjamin Francis, "Le FRAM et la Conservation de la Biodiversité - cas des EPP autour du Zone Peripherique du PNR", CAPEN, University of Fianarantsoa
* RAKOTONIAINA Naritiana, "Contribution a l'etude des impacts des troupeaux bovins sur l'ecosysteme Forestier du Parc National de Ranomafana", DEA, University of Antananarivo
* RAHARIVOLOLONA Marie Brigitte, "Impact de l'exploitation selective de la forêt et la variation saisonniere sur la composition de la population de rongeurs et d'insectivores dans une forêt seche de l'Ouest de Madagascar", DEA, University of Antananarivo
* RANDRIAMANALINA Malalatiana, "Contribution a l'etude des relations sociales chez deux groupes de *Propithecus verreauxi verreauxi* (Grandidier, 1867) dans le site d'interêt biologique de Kirindy, Morondava (Madagascar)", DEA, University of Antananarivo
* RALISOAMALALA Rosette, "Etude du rôle de *Propithecus verreauxi verreauxi* (A. Grandidier, 1867) et de Eulemur fulvus rufus (Audebert, 1800) dans la dissemination des graines de la forêt de Kirindy (Morondava), Madagascar ", DEA, University of Antanana-rivo
* RAMINOARISOA Vaonasolo, "Contribution a l'étude comparative des morphotypes de *Rattus* de Madagascar par l'etude des caracteres morphologiques et des caracteres anatomiques des os crâniens", DEA, University of Antananarivo
* RATSIRAHONANA Serge, ''Contribution de l'Anthropologie Nutritionnelle dans la Conservation de la Biodiversite dans Deux Aires Protegees le Parc National de Ranomafana et le Parc National Isalo'', DEA, University of Antananarivo
* RAVELOMANANTSOA Lalaina, '' La mission de service public d'un Projet de Conservation et de Developpement Integres, cas du Projet Parc National de Ranomafana '' , Memoire de Maîtrise en Droit Public et Sciences Politiques, University of Antananarivo

Evaluation Workshop Table 3.

Malagasy UDLP Students who hold Environment-Related Jobs

* RAJARISON Antoine In charge of Ecological Monitoring in Zahamena (UDLP 1994)
* RASOLOARISON Rodin research coordinator in Kirindy (Morondava) (UDLP 1994)
* RAKOTONDRAMANANA Vololoniaina assistant in environmental education (MICET) Ranomafana (UDLP 1994)
* ANDRIAMAMPIANDRASOA Christian in charge of accounting in the Ranomafana National Park (UDLP 1994)
* RAKOTONDRABE Georges In charge of GIS in the Ranomafana National Park (UDLP 1994)
* RAZAFINDRATSITA Tiana Ecological monitoring Technical Advisor in the Ranomafana National Park (UDLP 1994)
* ANDRIANJOHANY Solange in charge of environmental education within the Ranomafana National Park (UDLP 1994)
* RANDRIAMANALINA Malalatiana in charge of ecological monitoring in Andohahela (UDLP 1994)
* RATSIMIALA RAMONTA Isabelle professor at the University of Antananarivo (Faculty of Sciences, Botanical Department) (UDLP 1994)
* RAHERILALAO Marie Jeanne ICTE/Stony Brook research assistant (UDLP 1994-1995-1996)
* RAKOTOSAMIMANANA Tiana Secretary during the XVIIth IPS Congress (UDLP 1994)
* RANDRIANASOLO Harison research assistant at GTZ, Antananarivo (UDLP 1994)
* RABENANDRASANA Marc research assitant at "BirdLife International" Antananarivo (UDLP 1994)
* ANDRIAMIHAJA Felicite Maître Assistant at the University of Antananarivo (Faculty of Science, Department of Biological Anthropology and Paleontology) (UDLP 1994)
* RAHARIVOLOLONA Brigitte Marie ICTE/Stony Brook research assistant (UDLP 1994, 1996)
* RAJOHARISON Liva in charge of biodiversity at ICTE/Stony Brook (UDLP 1995)
* RAZAFINIRINA Ignace Engineer in computer science at " Ateliers de Capricorne " (UDLP 1995)
* RAMANANKANDRAINA Leonard Engineer in computer science at BCAM (Bureau de Conception et d'Application en Management) (UDLP 1995)
* RAKOTONIAINA Jean Claude biologist, research assistant in entomology at "Institut Pasteur de Madagascar " (UDLP 1995)
* RATSIRAHONANA Serge research assistant at ICTE/Stony Brook (UDLP 1995)
* RAJERISON Roger in charge of *"Monographie Nationale"* at ANGAP (UDLP 1995)
* RAZAFIMBELO Louis Nicolas Inspecteur de police in Antananarivo (UDLP 1995)

Appendix 2 –XVIIth Congress of the International Primatological Society Summary of Programs, Proceedings, and two Malagasy newspaper articles

XVIITH CONGRESS OF THE INTERNATIONAL PRIMATOLOGICAL SOCIETY
UNIVERSITY OF ANTANANARIVO, MADAGASCAR
AUGUST 10 – 14, 1998

Symposia

1 Callitrichine mixed-species troops Patterns, mechanisms, and consequences, Eckhard Heymann, Hannah Buchanan-Smith, Scott Hardie

2 Towards the understanding of mouse lemur diversity Insights from the wild and lab, Dorothea Wrogemann, Angela Glatston

3 Captive Care, Hilary Box

4 Information content of acoustic signals in non-human primates, Kurt Hammerschmidt, Dietmar Todt

5 Sociality in nocturnal lemurs New insights from recent field studies, Ute Radespiel, Eleanor Sterling

6 Oncopathology of non-human primates, Boris Lapin

7 Herbivorous primates What do we know and where do we go from here? Chia Tan

8 Social influences on feeding in non-human primates, Hilary Box, Dorothy Fragezy

9 Primates as pests, David Hill, Kate Hill

10 The effects of forest fragmentation and habitat disturbance on primate populations worldwide, Lisa Gould, Jonah Ratsimbazafy

11 The world's most endangered primates and the global status of primate conservation as we enter the 21st century, Russel Mittermeier

12 Effects of psychosocial stress on development, Gene Sackett

13 The behavior, ecology, and conservation status of nocturnal primates, Sharon Gursky, Brigitte Raharivololona

14 Diversity and speciation in nocturnal primates a review of major concepts and approaches, Elke Zimmerman, Judith Masters

15 Cognitive factors in great ape conservation, Anne Russon

16 Paleobiology of subfossil lemurs, William Jungers

17 Use of molecular biology techniques for systematics, phylogeny and population studies of the lemurs, Yves Rumpler

18 New Developments in "Theory of Mind," Andrew Whiten

19 Exploration and responses to novelty in marmosets and tamarins, Lesley Rogers, Hilary Box

20 Primate aging, Joe Erwin

Workshops

1 Impact and systainability on hunting primates, Robert Lee, Elizabeth Bennett, John Robinson

2 Conservation problems and solutions for the coming millennium, Noel Rowe, Benjamin Andriamihaja, Patricia Wright

5 Plenary Sessions

16 Paper Sessions (~9 20-minute presentations each session)

108 Poster Presentations

1 Video

1 Environmental Play, acted by Malagasy School Children, Tamatave School

Proceedings of the XVIIth Congress of the International Primatological Society
University of Antananarivo, Madagascar, August 10-14, 1998

On the invitation of Mr Joseph Andriamampianina, President of the Organizing Committee for the XVII Congress, and under the patronage of the President of the Republic of Madagascar, Admiral Didier Ratsiraka, the International Primatological Society held its XVII Congress in Antananarivo from August 10 to 14, 1998 The Organizing Committee for the Congress included Mme Berthe Rakotosamimanana, General Secretary, Mme Hanta Rasamimanana, Chair, Scientific Committee, Mme Gisele Randria, Chair, Logistics, and Mme Hanta Razafindraibe, Chair, Sponsorships and Financial Planning Many members of the Groupe d'Etudes et de Recherches en Primatologie (GERP) assisted with the Congress There were 550 registered participants from 35 nations who presented 422 talks, posters, workshops, and films in 47 scientific sessions Professor Carl Erickson (Duke University, USA), Dr C Marcel Hladik (CNRS, France) and Dr Joanna Durbin (Jersey Wildlife Preservation Trust, Madagascar) delivered plenary addresses In addition to the scientific program, musical and dance events enlivened the evenings, and a very special theatrical performance occurred on the last day of the congress Children from Tamatave and Lake Alaotra regions performed in plays written, in the first case, by Mr Ratahakarijaona, past Director of the public schools in Tamatave, a city in Eastern Madagascar, and in the second case, by the children themselves The plays presented conservation themes as interpreted by the children, and it is safe to say that these presentations will be among the most memorable events of the congress for all those who viewed them

At the closing ceremony, five very special primatologists were honored for their abiding contributions to primatology, and to science in general, in Madagascar Dr Jean-Jacques Petter was given an honorary Meritorius Professorship at the University of Antananarivo by Meritorious Professor Edmond Razafindrakoto On behalf of the President of the Republic of Madagascar, the Minister of Higher Education Sidison Joseph presented Dr Alison Jolly with the Officier de l'Ordre National Malagasy, and Pr Yves Rumpler Dr Elwyn Simons, and Chatrath P S with the Chevalier de l'Ordre National Malagasy, some of the highest honors the President of the Republic of Madagascar can bestow The sumptuous farewell banquet and dance on Friday evening provided an elegant closure to a stimulating pleasant and altogether successful congress The Society extends sincere thanks and congratulations to the Organizing committee on the success of the Congress

The Organizing committee will publish a thematic proceedings volume from the Congress containing some presentations concerning Malagaszy primates

A Precongress workshop in Primate Conservation was held prior to the Congress (August 4-9) at Ranomafana National Park The Precongress workshop was organized principally by Dr Patricia Wright and Benjamin Andriamahaja, of the Institute for the Conservation of Tropical Environments (ICTE) of the State University of New York Stony Brook, and supported by a grant from the Wenner-Gren Foundation to Dr Dorothy Fragaszy on behalf of IPS Thirty-four participants from 11 primate-habitat countries participated in the workshop, which by all accounts was both exciting and productive, as have been the two previous Precongresses

Many private and governmental organizations provided financial support for the Congress and for the Precongress, these are listed at the end of this report The Society gratefully acknowledges their support

The following organizations, associations, and businesses provided assistance and support to the VXII Congress Association Nationale pour la Gestion des Aires Protegees, American Society of Primatologists, BIOCULTURE, Mauritius Ltd, Brasserie STAR, Caisse d'Epargne de Madagascar, Conservation International, Cortez Travel Agency, Duke University, Ecole Normale Superieure, Institute for the Conservation of Tropical Environments, Japanese Fund for the 17th IPS, Jersey Wildlife Preservation Trust, Jlio sy RAno Malagasy, Maison du Tourisme, Malagasy Goveinment, Margot Marsh Foundation, MATERA Ocean Indien, Ministry of Higher Education, ONE GEF/PNUD, PACT Madagascar, Primate Conservation Incorporated, Paositra Malagasy Parc Botanique et Zoologique de Tsimbazaza, QIT Madagascar Minerals Ltd, Russell Mittermeir, Societe MORITANI, the John D and Catherine T MacArthur Foundation, Toshisada Nishida, Embassy of the United Kingdom, University of Antananarivo, USAID Madagascar, and the Wenner Gren Foundation

L'Express de Madagascar July 6, 1998

SCIENCES

LE XVIIe CONGRÈS DE LA SOCIÉTÉ INTERNATIONALE DE PRIMATOLOGIE À RANOMAFANA

(Antananarivo - Matera) - Madagascar abrite pendant deux semaines le XVII Congres de l Interna-tional Primatological Society dont une partie en pre-Congres regroupe une trentaine de chercheurs des pays en voie de developpement au Parc National de Ranomafana (a 365 Km de Tananarive) Le pre-Congres a debute le 4 aout avec la participation des personnalites malgaches comme Mme Berthe Rakotosamimanana Secretaire general du XVII Congres au même titre que les primatologues de renom comme Alison Jolly Patricia Wright Metermeier Matera Madagascar les a justement rencontres pour evoquer successivement des enjeux du pre-Congres du Congres lui-même ainsi que des questions de conservation en general

Docteur Patricia Wright, Primatologue-chercheur et Conservationniste, de l Universite de Stony Brook (USA) Elle a decouvert en 1986 le Golden Bamboo Lemur (Hapa lemur aureus) dans la forêt de Ranomafana. Ce qui a valu, depuis, la reconnaissance du Parc par le gouvernement malgache.

L idee du pre-Congres est une tradition au niveau de l Ips explique-t-elle a Matera. Pour cette fois donc, il s agit d une rencontre-echange entre trente chercheurs de pays en voie de developpement dont six d Asie (Chine, Indonesie et Vietnam) six autres d'Afrique (Ghana, Cameroun Ouganda

Dr Patricia Wright primatologue-chercheur et conservationniste

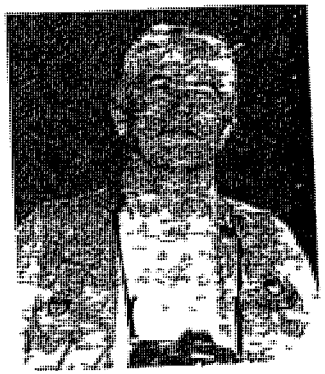
et Tanzanie) un chercheur du Nepal et un autre de l Inde et pour la region de l Amerique du Sud le pre-Congres en compte sept (Argentine Bresil Colombie Mexique et Costa Rica) Le reste du quota est comble par les chercheurs malgaches *L enjeu du pre Congres reside dans les echanges qui se font deja au niveau de ces chercheurs explique le Dr Wright car ils parleront concretement des problemes de conservation rencontres dans leur pays respectif* Le contexte n est peut-être pas exactement le même mais au moins les memes phenomenes telles la deforestation la chasse etc leurs sont communs, dit-elle A l issu de ce pre-Congres, les responsables envisagent la creation d un reseau entre ces chercheurs et eventuellement voir la possibilite d une rencontre annuelle. Par ailleurs, le Dr Wright en évaluant les chercheurs malgaches avec qui elle a l habitude de travailler depuis maintenant dix ans recorde une appreciation particuliere sur le fait *qu ils sont veritablement concernes a travers leur travail par les problemes environnementaux de leur pays* dit-elle et elle se felicite de la cooperative en terme des structures mises en place dans le pays pour contrôler et suivre de pres la Conservation en general Avant de terminer que *c est deja tres impressionnant et tres important le fait que Madagascar est le seul pays au monde a avoir un programme environnemental a long terme (en faisant ainsi reference au PEI et PEII)*

Pr Berthe Rakotosamimanana secretaire general du XVIIe Congres de l IPS

Professeur Alison Jolly, enseignant a l Universite de Princetown (Usa) Auteurs de plusieurs ouvrages sur les Makis et Lemuriens (dont le Sifaka) apres avoir travaille pour la premiere fois a Madagascar en 1962 On lui doit un peu sinon beaucoup la tenue du Congres a Madagascar du temps ou elle etait encore presidente de l Ips de 1992 a 1996

Il faut lancer toute l economie pour aider l environnement C est d emblee l approche qu a le Professeur Jolly en terme de conservation et de travail sur les lemuriens *On ne peut pas se borner aux lemuriens* dit elle *tout est lie et cela je l ai compris en commençant mes travaux en 1962 a Madagascar Le futur du lemurien depend de la foret et de la foret depend la vie des habitants de la region et de la depend l economie nationale* Pour le professeur Jolly le lemurien est la pepiniere du processus d extension de la forêt de par le comportement de celui-ci pour expliquer un peu les tenants et aboutissants de la conservation a travers les primates et en avisant sur la projection de developpement economique Sinon la tenue du Congres a Madagascar prend egalement deux sens *J y vois un sens international* dit elle *du fait que c est quand meme la societe de tous les gens qui etudient les parents de l homme* Par ailleurs poursuit elle *ces animaux sont des animaux tropicaux donc ils prennent un grand role dans la conservation dans le monde* Pour Madagascar uniquement *c est*

Pr Alison Jolly Enseignant a l universite de Princetown



Pr Metermeier Primatologue , chef du groupe de l Uncn

la conservation a Madagascar je suis tres optimiste dit elle *et il faut le dire A Madagascar on peut encore faire beaucoup de chose dans ce sens car l etendue du territoire et les specimens existant le permettent tout n est pas encore perdu Il faut une politique certes mais surtout une economie qui offre d autres opportunites* dit-elle Le professeur Alison Jolly pense en effet qu il y a beaucoup d inegalite entre d une part les touristes les bailleurs de fonds et les hoteliers et d autre part le petit paysan qui paie le cout de tout ce systeme il faut lui offrir d autres emplois pour ne pas detruire et il faut que toute l economie lui offre dit elle encore des marches Avant de conclure sur son message que *Madagascar est un pays tres tres riche mais il ne faut jamais penser que c est un pays pauvre* dit elle *Le pays est riche en culture en nature et il faut que les gens prennent conscience que les touristes qui viennent ne font pas le deplacement pour voir la pauvrete mais la richesse et de cela* conclut elle *les Malgaches peuvent en etre fiers*

Professeur Berthe Rakotosamimanana, Secretaire general du XVII Congres de l Ips Primatologue, chef du departement Primatologie et Anthropologie biologique de

un peu les difficultes des chercheurs malgaches et cela bien entendu a des impacts au niveau de l evolution de la recherche dans le pays *nous attestons un retard au niveau de la sortie de nos resultats* Les chercheurs du pays sont obliges de partir a l exterieur pour valider sinon entamer une recherche approfondie de donnees et *c est comme cela que nos propres resultats ne nous appartiennent plus apres* explique t elle Par rapport au pre-Congres l interet reside dans le fait que *au moins ces chercheurs seront directement au courant de l evolution des recherches et non plus a travers les ouvrages comme cela a toujours ete longtemps le cas* explique t-elle Mme Rakotosamimanana d expliquer que l enjeu dans ce type d echange est qu au moins les participants sont au courant des differents changements qui s operent sur la scene internationale qu il est ainsi aise de suivre l orientation des recherches et une fois les relations ainsi etablies l acces aux differentes publications internationales devient incontournables pour en faire une reconnaissance internationale Simon le professeur Rakotosamimanana a egalement insiste sur le fait qu une fois sur le reseau des echanges il est plus facile d acceder aux financements

Professeur Metermeier, Primatologue, chef du groupe de l'Uncn depuis 1977 et president de Conservation internationale de 1989 a 1998

Le professeur Metermeier n est pas inconnu dans la grande Ile apres avoir ete au Wwf et apres avoir ecrit, comme tout grand primatologue qui se respecte des ouvrages sur la conservation en general C est ainsi qu il vient de sortir avec son equipe la *Megadiversite* qui repertorie en meme temps les pays connaissant la biodiversite la plus importante dans le monde et ou Madagascar s affiche parmi les six pays les

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pectif Le contexte n est peut-être pas exactement le meme mais au moins les mêmes phenomènes telles la deforestation la chasse etc leurs sont communs dit-elle A l issu de ce pre-Congres les responsables envisagent la creation d un réseau entre ces chercheurs et éventuellement voir la possibilite d une rencontre annuel le Par ailleurs le Dr Wright en evaluant les chercheurs mal-

Madagascar est le seul pays au monde a avoir un programme environnemental a long terme (en faisant ainsi reference au PEI et PEII)

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lemurien depend de la forêt, et de la forêt depend la vie des habitants de la region et de la depend l economie nationale

Pour le professeur Jolly, le lémurien est la pepinière du processus d'extension de la forêt de par le comportement de celui-ci pour expliquer un peu les tenants et aboutissants de la conservation a travers les primates et en avisant sur la projection de developpement economique Simon, la tenue du Congres a Madagascar prend egalement deux sens *Il vous un sens international dit-elle du fait que c est quand meme la societe de tous les gens qui etudient les parents de l homme Par ailleurs poursuit elle ces animaux sont des animaux tropicaux donc ils prennent un grand role dans la conservation dans le monde* Pour Madagascar uniquement, *c est un temoignage de l importance accordee par les scientifiques du monde au pays* dit-elle Avant de rajouter que ce XVII Congres serait egalement l aboutissement des deux autres grands congres nationaux tenus dans le pays en 1970 et en 1985 lequel a d ailleurs *lache les efforts modernes sur l environnement* explique-t elle Et en mentionnant les problemes de

pays sans qui paie le cout de tout ce systeme il faut lui offrir d autres emplois pour ne pas detruire et il faut que tout l economie lui offre dit-elle rencontres des marches Avant de conclure sur son message que *Madagascar est un pays tres très riche mais il ne faut jamais penser que c'est un pays pauvre dit-elle Le pays est riche en culture en nature et il faut que les gens prennent conscience que les touristes qui viennent ne font pas le deplacement pour voir la pauvrete mais la richesse et de cela conclut elle les Malgaches peuvent en etre fiers*

Professeur Berthe Rakotosamimanana Secretaire general du XVII Congres de l'Ips Primatologue, chef du departement Primatologie et Anthropologie biologique de la faculte des sciences d'Ankatso et responsable des diplomes d Etudes approfondies du departement

Les chercheurs malgaches font surtout face a des problemes d infrastructures on n a pas la methodologie de pointe pour nos recherches dit-elle faute de moyens techniques et financiers C est ainsi que le Professeur Berthe Rakotosamimanana explique

professeur Rakotosamimanana a egalement insisté sur le fait qu'une fois sur le réseau des échanges, il est plus facile d'accéder aux financements.

Professeur Meiermeier, Primatologue, chef du groupe de l Unesco depuis 1977 et président de conservation internationale de 1989 à 1998

Le professeur Meiermeier n est pas inconnu dans la grande Ile apres avoir ete au Wwf et apres avoir ecrit, comme tout grand primatologue qui se respecte des ouvrages sur la conservation en general C est ainsi qu il vient de sortir avec son equipe la *Megadiversite* qui repertorie en meme temps les pays connaissant la biodiversite la plus importante dans le monde et ou Madagascar s affiche parmi les six pays les plus importants En parlant des problemes de conservation *il y a beaucoup de connaissance actuellement a Madagascar qu il y avait 14 ou 15 ans de cela Ceci dit poursuit il la perte evaluee a pres de 80% reste a maitriser La biodiversite de Madagascar contient surtout un interet economique et non plus seulement scientifique Je suis optimiste dit-il quant au deroulement des travaux effectues dans ce sens d autant que le President international de l Ips (le Japonais Nishida) a propose que la faune et la flore malgaches soient considerees comme un patrimoine mondial et cela dit il n arrive pas beaucoup* Il en attend de ce Congres que *beaucoup de jeunes Malgaches s y interessent et deviennent professionnels en matiere de Conservation car c est ce critical mass qui a toujours manque* Pour son message final le professeur Meiermeier voulut rappeler et faire comprendre qu *il faut reconnaitre simon que les lemuriens sont symboliques et que la biodiversite autour d un pays ce qu il est c est une identite au meme titre qu une civilisation une culture une coutume une langue*

Solange Razafimbelo-Harisoa

XVII[e] CONGRES DE L'IPS

LA CONSERVATION, PAR LES PAYS EN DÉVELOPPEMENT

(Antananarivo, 12 août Matera) Pleins feux actuellement sur le XVII Congrès de la Société internationale de primatologie (Ndrl Matera 11 août) Pendant que les discussions s'alimentent autour des thèmes d'exposé les échanges entre les spécialistes (chercheurs enseignants étudiants) vont bon train Matera Madagascar en tant que partenaire de la manifestation s'est enquis auprès des participants représentant les pays en voie de développement si tant est que les approches devraient être plus ou moins similaires dans la Conservation Par ailleurs la question sur l'importance du pré Congrès et du XVII Congrès a été également développée

Mexique Dr Ernesto Rodriguez, Vice President de l'Ips et responsable d'un projet de conservation au Mexico

L'ensemble des activités autour de ce Congrès a beaucoup de significations dit il En bon scientifique le Dr Rodriguez explique que les échanges d'idées sur des sujets précis sont très importants *Nous pouvons a l'occasion dit il acquerir de nouveaux elements de recherches Bien sur* poursuit il *c'est juste un jet mais le vrai travail commence a ce niveau* Dans la foulée le vice président de l'Ips de mettre un point d'honneur également sur le coté informel du Congrès car *les discussions individuelles avec d'autres gens partageant la meme passion et defendant la meme cause ne sont pas a minimiser* Un autre aspect par ailleurs du Congrès de l'Ips est l'opportunité qu'il offre selon les explications du Dr Rodriguez aux etudiants ou chercheurs à la recherche de fonds pour financer et soutenir leurs travaux de recherche sur le terrain En effet dans le système universitaire le chercheur est obligé de constituer un *proposal* à un bailleur donné (institution gouvernementale ou non internationale) pour soutenir voire parrainer son travail sur le terrain Il n'est pas toujours évident cependant d'y accéder ou tout au moins il est toujours interessant d'avoir le principal interlocuteur en face avant les procédures administratives Ainsi le Congrès est une occasion pour ce faire Sinon dans la projection du Congrès il est toujours possible d'organiser une autre réunion de travail indique le Dr Rodriguez L'argument rejoint certainement une autre vocation de l'Ips qui est de donner des formations

Evoquant par ailleurs les problèmes de Conservation rencontrés au Mexique le vice président de l'Ips explique à Matera Madagascar *que c'est en fait les memes problemes rencontres par les pays tropicaux en faisant un usage expansif des ressources naturelles* Le Dr Rodriguez ajoute cependant qu'il y a certes une certaine pression interne obligeant les gens à cette option *mais il y a aussi un poids ressenti en dehors du pays* il fait allusion aux exigences du marché international lesquelles portent souvent sur des produits rares de la foret tropicale C'est là d'ailleurs qu'il souligne l'importance du fait que le Congrès soit tenu à Madagascar *c'est très important* dit il *car la megadiversite du pays est tres importante et visiblement il y a une volonte commune un effort international vers cette Conservation qu'on evoque tant*

Interrogé enfin sur sa conception actuelle de la Conservation *l'idee de la Conservation de l'environnement a changé* conclut le Dr Rodriguez *Et cela non seulement au niveau des scientifiques mais aussi au sein de l'opinion publique egalement Nous devons donc gérer une moyenne intellectuelle car la valeur culturelle a également evolue*

Indonesie M Jatna Surpiatna, Directeur de Conservation Internationale en Indonesie Premier organisateur du Pre Congres à Bali en 1994

Si la tenue tous les deux ans du Congrès est devenue presque une tradition au niveau de l'Ips le Pre Congrès en était à sa première édition lors de la rencontre de Bali en 1994 Le directeur de la Conservation internationale de l'Indonésie en était donc le premier organisateur *L'idee* dit il *est de demontrer que tous les pays en voie de developpement qui possedent des primates ne tirent jamais profit de cette richesse qu'ils ont Tout revient souvent a l'Occident car ils ont les moyens financiers pour ce faire Donc en 1994 quand l'organisation de l'Ips nous est echue nous avions decide d'inviter et de prendre en charge 40 chercheurs des pays en voie de developpement a Bali pendant trois jours Nous les avions formes pour qu'ils deviennent par la suite eux aussi leaders dans leur pays respectif en tant que primatologues* Les organisateurs voulaient mettre en évidence à l'époque le fait qu'il y a une opportunité pour les travaux pratiques *car aux Usa par exemple* explique M Jatna *c'est essentiellement des travaux de laboratoire donc theoriques* L'idéal selon ses explications c'est de concilier les deux les travaux de terrain la theorie et les travaux de laboratoire Ce qu'il appelle le *triple down effects*

Quant aux problemes de Conservation que connait l'Indonésie le pays serait visiblement victime de son succès économique selon les explications de M Jatna En effet l'economie locale repose sur les produits oléagineux l'industrie et le tourisme ce dernier accueille près de 6 millions de personnes par an et constitue ainsi le troisieme revenu economique du pays Dans le volet industriel l'Indonésie est le principal exportateur de contre plaqués explique le directeur de la C I et le pays en fait sa seconde ressource Cette production à l'exportation n'a pu etre chiffrée Cependant cette exploitation menace les 38 parcs nationaux du pays et les 350 aires protégées

Par ailleurs l'expansion agricole de l'Indonesie constitue paradoxalement un danger également pour la Conservation *Nous avons 5 millions ha de palmeraies* explique t il *mais le produit est tellement rentable qu'il menace a l'heure actuelle les 120 millions ha de forets que nous disposons* Sinon les autorités envisagent incessamment la solution de transmigration de la population en effet la répartition démographique au sein des 3 000 iles qui font l'Indonésie est tres disproportionnée qu'il faut procéder à un éclatement de la population Et enfin la dernière menace écologique et environnementale en Indonésie reste le développement des infrastructures *il y a trop de routes* dit il *et cela tend a se developper encore et encore*

Chine M Zhang Shuyi Professeur Enseignant a l'Academie des Sciences de Pekin

Je suis en train de realiser un de mes principaux reves avec cette visite a Madagascar introduit d'emblée ce représentant de la Chine Il explique à Matera qu'il a pu faire un peu le tour du monde par le biais de ses études et de ses recherches et il se rend compte de la valeur des travaux sur terrain après le Pré Congrès de Ranomafana (Ndrl Matera 11 août) *C'est vraiment autre chose* dit il *de voir ces lemuriens dans la foret c'est une passion car en Chine ils sont au zoo Cela a un aspect quelque peu artificiel* dit il

Et expliquant les problèmes que rencontre son pays dans la Conservation et la protection de l'environnement Zhang Shuyi d'indiquer que *la Chine a longtemps ouvert ses portes Le pays* poursuit il *est devenu tres capitaliste plus que les Etats Unis ce qui fait qu'on fait n'importe quoi pour faire de l'argent chez nous on vent la foret* Zhang Shuyi avance que selon une étude établie par le ministère chinois chargé de l'Environnement de 1993 à 1998 le pays encourt un deficit évalué à US 100 milliards de dollars du fait de la destruction de l'écosystème *Maintenant* dit il *j'ai la reponse a la question de savoir pourquoi un pays pauvre devient il de plus en plus pauvre parce qu'il a vendu son ecosysteme* Zhang Shuyi se dit etre animé d'une volonté politique pour asseoir et faire accepter cette évidence *Rien que pour ça* dit il *je veux entrer dans l'arene politique chinoise*

Concernant Madagascar conclut M Zhang Shuyi *le lemurien est un symbole comme l'est pour nous la muraille de Chine et le Panda Il faut le proteger*

Argentine Mario di Bitetti etudiant en preparation de son Ph D

Cela fait près de huit ans que Mario Di Bitetti baigne dans le milieu de la recherche Il n'en est certes pas à son premier meeting international mais il réitere à Matera que *l'interet du Congres pour lui reside dans les rencontres avec les gens des autres pays et d'apprendre a partir de leurs experiences Dans les pays du tiers monde il y a differentes perspectives de recherches* poursuit il *et il nous faut partager nos acquis dans ce sens* Par ailleurs il est important également pour ce Graduate Student d'aller à l'exploration de forets de pays tiers *c'est une chance d'etre ici a Madagascar*

L'Argentine se caractérise par la diversite de son ecosysteme malheureusement aucun lien n'a eté etabli entre ces entites explique Mario di Bitetti Par ailleurs le pays souffre egalement des ravages des animaux sauvages qui detruisent un tout sur leur passage *on n'a pas de parcs nationaux a cause de cela* explique t il Sinon le Sud et l'Ouest du pays sont fortement menacés par l'avancement de l'edulcoration D'autre part les plantations et l'exploitation faites par les gros investisseurs [illegible] bananes orange et mandarine dans le Nord ouest du pays ramènent encore une fois à l'imperialisme du marché mondial Parallelement l'industrie du papier s'est développee egalement dans le pays *la culture du pays est vulgarisee consequence nous avons adopte totalement la monoculture* Mario di Bitetti avisé est attentif sur la manière dont les autres chercheurs de ce Congrès ont resolu ou traite de tel problemes

Colombie Pablo Stevenson etudiant en preparation de Ph D a une universite aux Usa

L'interlocuteur se dit tres interesse de connaitre Madagascar deja dans son domaine de recherche et aller ainsi sur le terrain *Comme je prepare ma specialisation en primatologie* dit il *j'ai deja etudie les lemuriens et les fossiles de Madagascar Ce pays est tres particulier* dit il *de la fascination qu'il suscite*

Et concernant la Colombie le probleme de la Conservation est quelque peu complexe explique Mario Stevenson D'abord il y a l'aspect politique *les gens ne veulent plus aller dans les champs* explique t il *par peur des represailles de guerillas du coup ils vont directement dans la fabrication des pipes dans les exploitations petrolieres* Par ailleurs a cause de la pauvreté les gens se mettent à exploiter de plus en plus le bassin de l'Amazonie Et enfin la Colombie connait d'autres difficultes dans la gestion de son environnement notamment le trafic de drogue *les gens sous le poids de la pauvrete s'y mettent a fond c'est la voie la plus aisee pour gagner de l'argent Dans cette activite* dit il *la foret est transformee en champ de plantations*

Solange Rafambelo Harisoa

Appendix 3 – Consultant's Report to ICTE· IPS Pre-Congress and Earthwatch African Fellows Program

CONSULTANT'S REPORT TO
THE INSTITUTE FOR THE CONSERVATION OF TROPICAL ENVIRONMENTS
Suzanne Zeeve, Ph D

I IPS PRECONGRESS Beginning May 1 1998, I acted as consultant to the Institute for the Conservation of Tropical Environments (ICTE) to coordinate preparations for the 1998 Precongress of the International Primatological Society (IPS), which was held at Ranomafana National Park, Ifanadiana, Madagascar, August 4-9 1998 Participants for the Precongress were chosen from a pool of candidates submitted by professional colleagues working primarily in developing countries, most of these candidates were either advanced graduate students or working in the primate conservation sector in a developing country Traditionally, participants attend the Precongress as a special training program in advance of the main IPS Congress

Significantly, the 1998 IPS meetings took place for the first time in a primate habitat country, which created the opportunity for the Precongress to provide an intensive field primatology and conservation session By holding the Precongress at Ranomafana National Park, which is the site of many long-term activities in research, conservation and development, participants gained first-hand experience in a broad array of relevant aspects for their own work in primate conservation

Between May 1 and July 28 1998, I performed the following activities

- Arranging distribution of Wenner-Gren funding and logistics for Precongress participants from 15 countries this involved contacting all candidates for support to obtain curricula vitae and specifics of their financial situations and needs, communicating with the IPS accounting division on mechanisms for transferring funds to awardees,
- Maintaining email/fax/post communications to provide information and documentation to participants, providing formal letters of invitation by courier, fax and post for candidates requiring exit visas from their home countries,
- Maintaining contact with ICTE Executive Director Dr Patricia Wright and the IPS Precongress Committee in the USA and Madagascar, as well as with other parties (e g IPS president Dr Toshisada Nishida and IPS past-president Dr Alison Jolly) to develop the program for the Precongress activities and to finalize financial agreements on registration fees for Precongress participants, etc ,
- Arranging participation of a veterinarian/geneticist to provide a module on animal immobilization techniques as part of the Precongress field training program,

- Coordinating joint funding arrangements with Conservation International and Primate Conservation Incorporated,
- Communicating and coordinating with USAID/Madagascar for sponsorship for African nationals,
- Verifying itineraries for all Precongress participants,
- Communicating with MICET/ICTE in Madagascar to coordinate all airport rendezvous and hotel arrangements for Precongress participants,
- Arranging purchase and transportation of field equipment for the Precongress
- Preparing slides and photographic materials for the IPS and delivering by hand to the Executive Director in Madagascar

The IPS Precongress participants included
Dr Li Jin-Hua (China)
Dr Zhang Shuyi (China)
Dr Mukesh Kumar Chalise (Nepal)
Mr S F Wesley Sunderraj (India)
Ms Kaberi Kar Gupta (India)
Dr Le Xuan Canh (Vietnam)
Mr Vu Noc Thanh (Vietnam)
Dr Ernesto Rodrigues-Luna (Mexico)
Ms Esmerelda Urquiz (Mexico)
Ms Camilla Pastor (Mexico)
Mr Pablo Stevenson (Colombia)
Mr Mario DiBitetti (Argentina)
Ms Leticia Domingues Brandao (Brazil)
Mr Ernest Nufoh (Nigeria)
Mr William Olupot (Uganda)
Mr Christopher Bakuneeta (Uganda)
Mr Michael Abedi-Lartey (Ghana)
Mr Johannes Subiyanto (Indonesia)
Dr Jatna Supriatna (Indonesia)

Trainers, instructors and others present at the Precongress included
Dr Patricia Wright (USA)
Dr and Mrs Toshisada Nishida (Japan)
Drs Alison and Richard Jolly and Ms Susan Jolly (USA)
Dr John Oates (USA)
Edward Louis, Jr DVM, Ph D (USA)
Drs Mary Pearl and Don Melnick (USA)
Dr Sam Waser (USA)
Dr Suzanne Zeeve (USA)
and from Madagascar,
Dr Rasamimanana Berthe
Ms Razafindratsita Vololontiana
Mr Rajiarison Emile
Mr Rakotonirina George

Mr Randriapiona Richard
Mr Talata Pierre
Mr Rakotonirina William
Mr Rasabo Loret
Dr Rahimlavo Ernestine and the Ranomafana Ecological Monitoring Team
Officials and staff of ANGAP (Association National pour la Gestion des Aires Protegees)

At the end of July 1998, I traveled in Madagascar in advance of the participants and assisted in logistics and all Precongress activities, including orientation in Antananarivo, travel to Ranomafana, implementation the Precongress program, travel back to Antananarivo, and administrative assistance during the main IPS Congress Following the IPS meetings, I assisted in final administrative duties (e g , computing and payment of registration fees to the IPS Committee at University of Antananarivo, meeting with William Konstant of Conservation International for final accounting for jointly-supported individuals, reporting to Dr Dorothy Fragaszy for her report to Wenner-Gren, etc) Feedback from all participants and others attending the IPS Precongress was overwhelmingly positive

II EARTHWATCH Also during the May-July 1998 period, I coordinated preparations for the Earthwatch African Fellowship Team (Earthwatch U K) as co-principal investigator with Dr Patricia Wright This was the first time that Ranomafana National Park was chosen as a field site for the African Fellowship Program, in addition to eight African Fellows, the team was joined by Earthwatch coordinator Gill Barker and an outside evaluator, Nell Baker Advance preparations included
- communication and correspondence with Dr Wright and Earthwatch-U K ,
- preparing updated briefing materials for distribution to the team,
- arranging budget and wire transfers for payment of field grants,
- purchase and transportation of field equipment,
- maintaining contact with MICET/ICTE - Madagascar to provide information to Earthwatch and to coordinate itineraries, transportation and housing for the team on arrival

The Earthwatch African Fellowship Team included
Mr Kakule Vwirasihikya (Democratic Republic of Congo)
Mr Gerard Murengeei (Dem Rep Congo)
Dr Jonathan Arushi-Arushi (Uganda)
Mr Moses Mafabi (Uganda)
Mr Twehyo Mnahson (Uganda)
Mr Daniel Osembe (Kenya)
Mr Charles Musyoki (Kenya)

The team was also joined by Mr Humphrey Mbelli of Cameroon, by arrangement with USAID/Madagascar Others assisting with the program at Ranomafana National Park included Dr Ed Louis, Mr Ambroise Dalecky, the

Ranomafana Ecological Monitoring Team, the Ranomafana research guide team and officials and staff at ANGAP

Three team members arrived in Madagascar three days ahead of the rest of the team, since this period overlapped with the IPS meetings in Antananarivo, it was arranged that they attend IPS I accompanied them to University of Antananarivo to facilitate the registration process The rest of the team arrived on August 15, and I spent the next two weeks with them, providing close supervision and escorting the group while traveling to Ranomafana, implementing the field program with Dr Wright and other instructors, facilitating the independent evaluator's program, accompanying the team on short excursions and back to Antananarivo and providing follow-up, and coordinating all Earthwatch activities with MICET/ICTE Madagascar, including accounting and administrative assistance

The Earthwatch African Fellowship Team was extremely successful, and it has been recommended that another team come to Ranomafana National Park next year

To help implement the above programs (IPS Precongress and the Earthwatch African Fellowship Team), I spent from July 29 to August 31 1998 in Madagascar

Appendix 4 – Program of Activities for the IPS Pre-Congress

Schedule for International Society of Primatology 1998 PreCongress Ranomafana National Park, Madagascar

August 4			
	07 00 a.m	Orientation meeting	ICTE/Stony Brook office, Tsimbazaz Antananarivo
	08 00 a.m	Departure from Antananarivo by car (8 hour trip) for Ranomafana National Park	
	01 00 p m	Lunch	Ambositra
	05 30 p.m	Arrival	Ranomafana National Park entrance
	06 00 p m	Settle into tentsites	Research Station
	07 30 p m	Dinner	Research Station
August 5			
	07 00 a.m	Breakfast	Resarch Station
	08,00 a.m	Leave RNP station for the Ranomafana village	
	09 00 a.m	Opening ceremony: - Regional Head of National Park Service (Charles RAKOTONDRAINIBE) - Ranomafana National Park Manager (Jocelyn RAKOTOMALALA) - Director of Madagascar Institut pour la Conservation des Environnements Tropicaux (Dr Benjamin ANDRIAMIHAJA)	Hotel Thermal, Ranomafana village
	11 00 a.m	Return to the Research Station	
	01 00 p.m	Welcoming at the Research Station (Pr. Patricia C. WRIGHT)	Research Station
	02 00 p m	Walk in the forest (George RAKOTONIRINA, Emile RAJERIARISON, Richard RANDRIAMAMPIONONA)	Forest
	04.00 p m	Rest	
	06.00 p.m	Dinner	Research Station
August 6			
	06 - 07 a.m	Bird walk (Tiana RAZAFINDRATSITA, Loret RASABO, Jean Claude RAKOTONIAINA)	Forest
	08 00 a.m	Breakfast	Research Station
	08 30 a.m	IPS Conservation Committee (Ernesto Rodriguez-Luna)	Research Station laboratory
	09 00 a.m	Mistnetting birds	
	10 00 a.m	Coffee break	
	10 30 a m	Lemur lecture - Subfossil lemurs (Pr Berthe RAKOTOSAMIMANANA) - Living lemurs (Pr Patricia WRIGHT) - Bamboo lemurs (Chia TAN and Christina GRASSI) - Methods of lemur parasites (Mampiandra FIANKINANTSOA)	Research Station Laboratory
	12 30 p m	Lunch	Research Station
	02 00 p.m	Lemur capture (Louis David, Ed Louis)	
	03 00 p m	Coffee break	

	03 30 p m	Making casts of lemurs (Adam HARTSTONE-ROSE)	Research Station laboratory
	04 00 p m	Labwork on fruits (Tiana RAZAFINDRATSITA)	Research Station laboratory
	04 30 p.m	Lemur endocrinology (Kate Clark-Schmidt)	Research Station
	06 00 p m	Dinner	Research Station
	06 30 p m	Nightwalk	Forest
August 7			
	06.00 a.m	Breakfast	Research Station
	07 00 a.m	Lemurs in disturbed habitats (Jonah RATSIMBAZAFY)	Research Station
	09.00 a m	Darting (David Louis, Ed Louis)	Forest
	12 00 p.m	Lunch	Research Station
	02.00 p.m	Genetics and conservation biology (Dr. Mary PEARL)	Research Station laboratory
	02 30 p.m	Visit to Vohiparara	
	04 00 p m	International Development (Richard JOLLY)	Research station laboratory
	04.30 p.m	Coffee break	
	05 00 p m	Release captured lemurs	
	06.00 p m	Dinner	Research Station
August 8			
	07 00 a.m	Breakfast	Research Station
	08 00 a m	Visit Park entrance and campsite	Park entrance
	09 00 a.m	Visit artisanal shop	Ambatolahy (3 minute drive from the park entrance)
	09 30 a m	Visit Ranomafana Museum	Ranomafana village
	10 30 a.m	Coffee break	Ranomafana Museum
	11 00 a.m	Visit the park office	Ranomafana village
	12 00 p m	Lunch	Manja Hotel, Ranomafana village
	01 30 p m	Visit living classroom	Ranomafana village
	02 00 p.m	Visit model farm	
	03 00 p.m	Closing ceremony	Hotel Thermal, Ranomafana village
	06 00 p.m	Party	Swimming pool place (with hot mineral spring)

Appendix 5 – Students, Teaching Assistants, and Professors at the 1997 UDLP Field Course

UDLP STUDENTS

LEHIMENA Eliane, University of Antananarivo, Faculty of Science
SOARIMALALA Regis Voahangy, University of Antananarivo, Faculty of Science
RANDRIANARISOA Jean Samuelson, University of Antananarivo, Faculty of Science
RANDRIAMIADAMANANA Fiankinantsoa Mampiandra, University of Antananarivo, Agricultural Department
RAHAJANIRINA Voninavoko, University of Antananarivo, Faculty of Science
ANDRIANARIVO Haingotiana, Teaching Department in Fianarantsoa, Faculty of Physics and Chemistry
MIANDRY LALA Radonitsimba, Teaching Department, Faculty of Mathematics
TIANA Andriantsihoarana Manantsoa, University of Fianarantsoa, Faculty of Environmental Law
JONARISONA Julien Abdon, University of Fianarantsoa, Faculty of Environmental Law

TEACHING ASSISTANTS

Tiana RAZAFINDRATSITA, Ranomafana National Park
Pascal RABESON, Ranomafana National Park
Serge RATSIRAHONANA, University of Antananarivo, Faculty of Science
Harison RANDRIANASOLO, Teaching Department in Antananarivo, Faculty of Science
Marie Jeanne RAHERILALAO, University of Antananarivo, Faculty of Science
Benedicte LECLERC

PROFESSORS

Patricia WRIGHT, State University of New York at Stony Brook
Peter REINTHAL, Eastern Michigan
Frances Joanna KERRIDGE, Biology and Environmental Studies, Bolton Institute
Elwyn SIMONS, Duke University
Adolphe RANDRIANTSOA, University of Antananarivo
Berthe RAKOTOSAMIMANANA, University of Antananarivo
Lydia RABETAFIKA, University of Antananarivo
Daniel RAKOTONDRAVONY, University of Antananarivo
Germain Jules SPIRAL, University of Antananarivo
RATSIMBAZAFY, University of Fianarantsoa
Roger RATOVONJANAHARY, University of Fianarantsoa
Annie RAKOTONIAINA, University of Fianarantsoa
Leonie Zoelme RAJAONAH, University of Fianarantsoa

Appendix 6 – Schedule of Activities for the 1997 UDLP Field Course

UDLP SCHEDULE

Thursday, November 06

09 30	Distributing UDLP materiels
10 00	Coordination meeting with professors (led by Dr Patricia WRIGHT, Dr Elwyn SIMONS and Benjamin ANDRIAMIHAJA)
15 00	Opening ceremony

Friday, November 07

08 00 - 10 00	Subfossil lemurs (Dr Elwyn SIMONS)
10 00 - 10 30	Break
10 30 - 12 00	Lemur captive breeding (Dr Elwyn SIMONS)
12 00	Lunch
14 30 - 16 30	Debate on Environmental Program 2 (EP2) with Mr Benjamin ANDRIAMIHAJA

Saturday, November 08

08 00 - 10 00	Ecological Census Techniques (Dr Daniel RAKOTONDRAVONY)
10 00 - 10 30	Break
10 30 - 12 00	Ecological Census Techniques (Dr Daniel RAKOTONDRAVONY)
12 00	Lunch
14 00 - 16 30	Film, Sport (basket-ball, swimming)

Sunday, November 09
Walk in the forest

Monday, November 10

08 00 - 10 00	Intellectual property (Pr Annie RAKOTONIAINA)
10 00 - 10 30	Break
10 30 - 12 00	The New Malagasy Law on NGO (Pr Annie RAKOTONIAINA)
12 00	Lunch
14 00 - 16 30	Debate Madagascar's fossiliferous sites (Dr SPIRAL Germain)

Tuesday, November 11

08 00 - 10 00	Parasitology (Dr Lydia RABETAFIKA)
10 00 - 10 30	Break
10 30 - 12 00	Parasitology (Dr Lydia RABETAFIKA)
12 00	Lunch
14 00 - 16 30	Parasitology

Wednesday, November 12

08 00 - 10 00	Introduction to Environmental Law (Pr Leonie RAJAONAH)
10 00 - 10 30	Break
10 30 - 12 00	Introduction to Environmental Law (Pr GOUSSOT)
12 00	Lunch
14 00 - 16 30	The Malagasy educational system – Environmental Education (Roger

	RATOVONJANAHARY)

Thursday, November 13

08 00 - 10 00	Watershed management (Dr Peter REINTHAL)
10 00 - 10 30	Break
10 30 - 12 00	"Watershed management (Dr Peter REINTHAL)
12 00	Lunch
14 00 - 16 30	Preparation de micro-projets (Etudiants avec l'encadrement des professeurs)

Friday, November 14

08 00 - 10 00	Lemur and Conservation Biology (Dr Patricia WRIGHT et Dr Franckie KERRIDGE)
10 00 - 10 30	Break
10 30 - 12 00	Lemur and Conservation Biology (Dr Patricia WRIGHT et Dr Franckie KERRIDGE)
12 00	Dejeuner
14 00 - 16 30	Debate on Le programme de formation sur l'environnement a l'Universite (Daniel RAKOTONDRAVONY)

Monday 17, Tuesday 18 November

- Professors Workshops on the evaluation of the UDLP courses
- Students Work on micro-projects

Wednesday, November 19

Presentation of micro-projects
Closure ceremony

Appendix 7 – Trip Report: Dr Steve Zack in Madagascar

Conservation Research and Student Training in Madagascar

Final Report of 1998 Field Activities

for the University Development Linkage Program Grant (UDLP)

by Dr Steve Zack

Scientific Advisor, *International Conservation of Tropical Environments (ICTE)*
SBS Building, 5th Floor
State University of New York
Stony Brook, NY 11794-4364

and

Conservation Biologist, *Wildlife Conservation Society*

Correspondence Adress 2218 Jessica Way, Redding, CA 96002 USA
Phone 530/223-4899 E-Mail SteveZack@msn com

Abstract ***From 20 March until 6 April 1998, I visited Madagascar to attend as a committe member the DEA (Master's equivalent) thesis defense of my UDLP student Marie Jeanne RAHERILALAO. With her and with other former UDLP students who I trained in conservation research, I renewed discussions and collaborations to facilitate the development of publishable manuscripts and further discuss their potential education and research opportunities in Madagascar and abroad. I presented four separate lectures to present and former UDLP students and faculty in Antananarivo, Fianarantsoa, and Ranomafana on issues related to biodiversity, conservation, and technology I led two forest walks with a large group of University of Fianarantsoa students in Ranomafana National Park and interpreted fauna and flora issues relating to ecological interactions and conservation. I collected the data from, and advised and collaborated with, the Ecological Survey team members (ornithologists) at Ranomafana National Park, in order to soon bring these efforts to publication. I discussed present and future collaborations in conservation training and research with Dr Benjamin ANDRIAMIHAJA, General Director of the Madagascar Institute for Conservation of Tropical Environments (MICET). My activities with the UDLP program from 1994-1998 have resulted directly in two DEAs, two CAPENs (pending), and the ongoing development of collaborative data sets for manuscripts that will soon result in ten or more publications on biodiversity and conservation issues in Madagascar***

Introduction My collaborations with Dr Patricia Wright, Dr Peter Reinthal, and Dr. Benjamin ANDRIAMIHAJA began in Madagascar in 1989 I then began my activities in Madagascar in research and the training of Malagasy university students, at that time coming from Yale University. I have been a major collaborator with the University Development Linkage Program (UDLP) grant, and its co-PIs Drs. Wright and Reinthal, in Madagascar since the original field course offering in 1994 I represented Duke University in the field courses of 1994, 1995, and 1996. I taught the bulk of the lectures in the courses offered in 1994 through 1996

Because of teaching obligations in the United States, I could not attend the final field course of 1997. I was given the opportunity by ICTE to wrap up my UDLP activities this year by attending the DEA (Master's equivalent) defense of my student, Marie Jeanne RAHERILALAO, at the University of Antananarivo and to discuss the field research and further education opportunities of other former UDLP students Returning to Madagascar also gave me the opportunity to represent ICTE in several collaborative ventures with Benjamin ANDRIAMIHAJA and his MICET staff here in Antananarivo I feel my trip was very successful (see Calendar in Appendix II), and was an important "wrap-up" of UDLP issues developed over the years, as indicated in the following sections.

1998 Accomplishments and Activities Upon arrival in Madagascar, I was able to continue my ongoing collaboration with Dr Benjamin ANDRIAMIHAJA, Directeur Genéral of the *Madagascar Institut pour la Conservation des Environnements Tropicaux* (MICET) He brought me up to date on the diverse and various activities of MICET, and suggested my participation in upcoming talks and collaborations with several groups Thus, I gave a lecture and demonstration of the use of the Internet , entitled "Demystification of the Internet " The talk was to 25 professors (University of Antannarivo), students, MICET staff, and former UDLP students at the MICET office. It has only been in the past year that the MICET office has had access to the internet, and the group had no experience with, or tangible concept of, the internet and the "world wide web "

At the University of Fianarantsoa, I gave a talk to the faculty and students of the newly created Department of Sciences and Techniques of the Environment My talk focused on the pressing environmental concerns of Madagascar, and how our UDLP collaborations with students have studied some of the conservation concerns

at Ranomafana National Park The talk was attended by more than 50 students and faculty, and I answered questions for over a half hour from the excited and interested student body there

At Ranomafana National Park, with former UDLP students Marie Jeanne RAHERILALAO and Vololontiana RAZAFINDRATSITA, and guide Loret RASABO, we led a group of 40+ University of Fianarantsoa students into the forest to give them hands on examples of ecological interactions of biodiversity in the rainforest We emphasized those interactions that are affected or likely to be affected by the encroachment of slash-and-burn agriculture ("tavy") Later in the afternoon of the same day, I presented a slide show to this group focusing on the highly endemic fauna of Ranomafana National Park and fielded questions for nearly an hour.

Back at Antananarivo, I talked to a University of Madagascar class, "*Département Interdisciplinaire de Formation Professionnelle/Filière Traduction*" – in the Faculty of Art I presented them an environmental picture of Madagascar and the efforts of our UDLP course to train Malagasy students The students in this class go on to important jobs translating documents from Malagasy, French and English

My most important activity of this trip to Madagascar was to act as a "membre du jury" for Marie Jeanne RAHERILALAO as she defended her DEA ("Diplome d'Etudes Approfondies") thesis, "*Consequences de la fragmentation de la foret sur les populations d'oiseaux autor dur Parc National de Ranomafana*" Marie Jeanne was a two-time UDLP student, and then a teaching assistant for an UDLP course I acted as her advisor in establishing the questions, study design, and assisting in the logistics of her research. The other members of her committee were University of Antananarivo professors Sylvère L RAKOTOFIRINGA, Professeur Titulaire, and Examinateurs Aimé RAKOTONDRAINY, Professeur Titulaire, and Daniel RAKOTONDRAVONY, Maitre de Conference She recieved high marks from the committee The Malagasy professors were clearly impressed with her work

Marie Jeanne's research reveals a clear and systematic decline in bird species abundance and diversity with the size of the forest fragment at and near Ranomafana National Park. Forest fragments are created when slash-and-burn agriculture ("tavy") isolates a forest patch relative to the core forest. Marie Jeanne determined the abundance and diversity of birds in six such fragments of differing sizes and distance from the contiguous forest of Ranomafana National Park. Her data reveal a significant decline in abundance and diversity with decreasing fragment size More compelling is the observation that endemic Malagasy bird genera, those taxa presumably most closely affiliated with the evolutionary history of flora and fauna, and differentially affected these endemic birds drop out most quickly in fragments. Thus, those species most closely tied to Madagascar are most affected by the fragmentation of forests

I was able to visit with Marc Nestor RABENANDRASANA, and discuss the pending completion of his Memoire for his CAPEN (*Certificat d'Aptitdue Pedagogique de l'Ecole Normale*) entitled, "*Consequences de la deforestation humaine ou "Tavy" sur la composition en densite et diversite de la communaute aviare dans la foret humide aux environs du Parc National de Ranomafana*" Marc's study is the first to document the effect of the prevalent "tavy" agriculture on the rainforest birds of Madagascar.

I have been in regular correspondence with Harison (Hanitriniaina) RANDRIANASOLO concerning the completion of his CAPEN, "*Ecologie alimentaire d'oiseaux dans de group plurispecifique de la sous canopee dans le Parc National de Ranomafana, Madagascar*" I was not able to see him on this trip as he is in the field working on a project at Sakharaha His study of the microhabitat use of understory mixed-species flocking birds will be the first of its kind in Madagascar

Finally, I had discussions with Rosette RALISONMALALA, who is finishing up the data analysis of her project on the comparative foraging ecology and competition between sunbirds (*Nectarinia*) and the endemic Sunbird-Asity *Neodrepanis coruscans* in Ranomafana National Park I helped her with issues of data analysis and interpretation Rosette earned her DEA in Anthropology working with primates, but also spent considerable time in Ranomafana collecting data on these nectarivorous birds

A Summary and Prospectus of my UDLP Activities, 1994-1998 My UDLP contributions have been successful primarily in facilitating the professional development of several Malagasy university students With them, I have developed an "*Equipe Ornithologie*" whose research contributes greatly to the biodiversity and conservation biology issues in Madagascar The importance of the UDLP program cannot be overstated in helping them develop into research professionals ready to contribute to the environmental and research needs of Madagascar Vololontiana (Tiana) RAZAFINDRATSITA earned her DEA through research supported (in large part) by UDLP, is currently employed at Ranomafana National Park, and is being considered for a Ph D. program at Syracuse and other universities in the United States Marc RABENANDRASANA and Harison RANDRIANASOLO will soon finish their CAPENs are are both currently employed in other research projects in Madagascar because of their UDLP training Marie Jeanne RAHERILALAO will soon enter the Doctorate program in Animal Biology at the University of Antananarivo and will pursue further conservation and biodiversity issues raised by her DEA (a UDLP funded project) Rosette RALISONMALALA is being considered for a faculty position in the new Department of Sciences and Techniques of the Environment at the University of Fianarantsoa Malalatiana RANDRIANANALINA is also employed in a research project that resulted from her UDLP training Thus, six of the students enveloped in my "*Equipe Ornithologie*" are underway with professional careers centered on biodiversity and conservation This is an important legacy of the UDLP courses

Overall, I have given numerous lectures and led forest biodiversity walks to nearly 70 UDLP students (the majority of which were Malagasy) over three years of UDLP courses The topics of many lectures biodiversity, forest fragmentation, etc , were made all the more compelling by the location they were given in the environs of Ranomafana National Park There, the threat of ""tavy""is obvious to the rain forest ecosystem I am particularly impressed with the research of both Marie Jeanne and Marc in quantifying the threat to biodiversity of this practice It complements the biodiverisity research of others (including Tiana's and Harison's) in bringing a conservation and management focus to the UDLP training and research

The manuscripts (and eventual publications) that will soon result from my UDLP activities are listed in Appendix I.

Appendix I **Manuscripts being developed on birds, conservation, and ecology in development as a result of Dr Steve Zack's UDLP activities**

- **Steve Zack, Jean Claude RAZAFIMAHAIMODISON, and Loret RASABO. In Press The birds of Ranomafana National Park· Ecological and Conservation consequences of a low-diversity, highly endemic avifauna *In* Ecology and Conservation at Ranomafana National Park (Patricia C Wright, ed) Island Press**

- **Vololontiana RAZAFINDRATSITA and Steve Zack. Soon to be submitted Frugivory and facilitation of seed germination in the endemic Velvet Asity (*Philepitta castanea*) in Ranomafana National Park, Madagascar**

- **Marie Jeanne RAHERILALAO and Steve Zack In Preparation. Rain forest fragments and the differential threat to endemic genera of Madagascar birds**

- **Marc Nestor RABENANDRASANA and Steve Zack In Preparation Rainforest bird communities in and near slash-and-burn agriculture an examination of the "edge-effect" on the endemic avifauna near and in Ranomafana National Park, Madagascar.**

- **Harison and Steve Zack. In Preparation. Microhabitat use of understory mixed-species flocks at Ranomanfana National Park**

- **Steve Zack and Loret RASABO In Preparation Diversity and abundance of birds at Ranomafana National Park, 1994-1997**

- **Steve Zack, Rick Prum, and Loret RASABO In Preparation The nest of *Phedina borbonica* (Hirundinidae) in Madagascar and additional notes on the evolution of swallow nest structure and sociality**

- **Steve Zack and Loret RASABO. In Preparation Predation on *Avahi laniger* (Primates Indriidae) by Malagasy raptorial birds a phylogenetic legacy of roost site choice and behavior?**

- **Steve Zack and Joel RATSIRARSON In Preparation The abundance and diversity of birds in and near Beza Mahafaly Special Reserve, Madagascar the effects of protection and conservation of spiny forest and desert riparian habitats.**

- **Steve Zack, Loret RASABO, Vololontiana RAZAFINDRATSITA and Jean Claude RAZAFIMAHAIMODISON In Preparation Ecology, nesting biology, and songs of the birds of Ranomafana National Park.**

Appendix II

1998 Daily Calendar of UDLP-related activities
for Dr Steve Zack, *ICTE* and *WCS*, in Madagascar

Friday, 20 March. **Arrive in Antananarivo, ca 10·30 p m local time via Redding, San Francisco, and Paris Meet Dr Benjamin ANDRIAMIHAJA and colleagues at airport, and later check in to the Hotel Etape near the ICTE/MICET office in Tsimbazaza, Antananarivo**

Saturday, 21 March. **Meet with Benjamin ANDRIAMIHAJA and plan calendar of activities. Meet student Marie Jeanne Raherilalao and recieve the final version of her DEA thesis.**

Sunday, 22 March. **Read the DEA thesis of Marie Jeanne RAHERILALAO in preparation for the defense and my role as a committee member Meet former UDLP student Tiana RAZAFINDRATSITA and discuss her ongoing research activities at Ranomafana National Park.**

Monday, 23 March **Meet with Benjamin ANDRIAMIHAJA and the MICET staff to go over the logistics of my visit and meetings**

Tuesday, 24 March. **Meet with Marc Marc Nestor RABENANDRASANA, and discuss the pending completion of his Memoire for his CAPEN (*Certificat d'Aptitdue Pedagogique de l'Ecole Normale*) entitled, "*Consequences de la deforestation humaine ou "Tavy" sur la composition en densite et diversite de la communaute aviare dans la foret humide aux environs du Parc National de Ranomafana*" Later, prepare my comments and questions for my participation as a committee member (Jury) of Marie Jeanne RAHERILALAO as she will defend her DEA thesis tommorrow.**

Wednesday, 25 March. **In the morning, sit as a committee member (Jury) of Marie Jeanne RAHERILALAO as she defends her DEA thesis, "Consequences de la fragmentation de la foret sur les populations d'oiseaux autor dur Parc National de Ranomafana " She recieves high marks for her research and passes with distinction We (myself and the MICET staff) have a small reception for her and her family at the MICET office In the afternoon, I present a lecture on "Demystification of the Internet" to university professors, recent UDLP studets, and the staff of MICET at the MICET office**

Thursday, 26 March **Depart with Marie Jeanne RAHERILALAO and Tiana RAZAFINDRATSITA to Fianarantsoa**

Friday, 27 March. **Rendezvous with Benjamin ANDRIAMIHAJA and MICET staff members in Fianarantsoa in preparation of activities at the University of Fianarantsoa.**

Saturday, 28 March **Travel with former UDLP students Marie Jeanne RAHERILALAO and Vololontiana RAZAFINDRATSITA to visit the forest fragments of Marie Jeanne's research and to photograph the increasing forest degradation on the road to the coastal town of Mananjary.**

Sunday, 29 March. **Work with with former UDLP students Marie Jeanne RAHERILALAO and Vololontiana RAZAFINDRATSITA at the Ranomafana National Park museum on their data and interpretation Tiana has recently**

complied a data set on friut plant phenlogy (ca 100 spp) and hopes to give a paper at the upcoming International Primatological Society meetings (August) in Antananarivo Marie Jeanne wishes to pursue her academic career as a Doctorat student at the University of Antananarivo She wishes to more closely examine the "edge-effect" where the rainforest borders "tavy " The "edge-effect" can be examined by loking at diversity and abundance of birds near and distant (deep in the forest interior) from the forest edge abutting "tavy." I helped Marie Jeanne develop a research design with the intent to put together a research proposal capable of funding by non-governmental organizations I will continue to collaborate with her in this endeavor

Monday, 30 March. **Meet with guide Loret RASABO and walk through the forest trails of Ranomafana National park**

Tuesday, 31 March **Meet with Loret RASABO and discuss recent patterns and activities of the birds of Ranomafana National Park Loret has been the main data collector on the abundance and diversity patterns of birds in the park He has followed my research design through the years (1994-1997) of data collection Later, I go to the research and monitoring office and copy the recent records of bird abundance data from the computer there**

Wednesday, 1 April. **With former UDLP students Marie Jeanne RAHERILALAO and Vololontiana RAZAFINDRATSITA, and guide Loret RASABO, we lead a group of 40+ University of Fianarantsoa students into Ranomafana National Park and give examples of ecological interactions of biodiversity in the rainforest We emphasize those interactions that are likely to be affected by the encroachment of slash-and-burn agriculture ("tavy"). Later in the afternoon of the same day, I presented a slide show to this group focusing on the highly endemic fauna of Ranomafana National Park and fielded questions for nearly an hour**

Thursday, 2 April. **Return to Antananarivo with Marie Jeanne RAHERILALAO and Tiana RAZAFINDRATSITA**

Friday, 3 April **I talked to a University of Madagascar class, "*Département Interdisciplinaire de Formation Professionnelle/Filière Traduction*" – in the Faculty of Art I presented them an environmental picture of Madagascar and the efforts of our UDLP course to train Malagasy students Final discussions with Tiana RAZAFINDRATSITA before she returns to Ranomafana National Park concerning her data analysis and future educational interests in the United States**

Saturday, 4 April. **Final discussions with Marie Jeanne RAHERILALOA before she returns to Ranomafana National Park concerning her data analysis and grant proposal.**

Sunday, 5 April. **Work on Final Report**

Monday, 6 April **Finish Final Report and continue discussions of present and future collaborations in Madagascar with Benjamin ANDRIAMIHAJA and MICET staff Depart for airport for 1230 a.m flight to Paris, and eventually to Redding, CA home.**

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Appendix 8 – Students Attending the First Year of the University of Fianarantsoa Institute for Science and Technology of the Environment

...es Universités
...té de Fianarantsoa
...aculté des Sciences

ENVIRONNEMENT PREMIERE ANNEE

1	ANDRIAHAJAINA FORTUNAT BARNABE	
2	ANDRIAMAMONJY JOHANESA TIANA	
3	ANDRIANARISON HERILALAINA JACKY	
4	ANDRIANARIVONY HERVE MICHEL	
5	ANDRIATIANA ZANANORO FANJALALAO	
6	BE KATIUSCIA	
7	DHOUL KAMAL HAIDAR	
8	FETISOANOMENJANAHARY HENRIETTE ROBERTHA	
9	LAPASOA LOVANJANAHARY FENOHERY	
10	RABEZANAHARY RINAH	
11	RAHERINIAINANIRINA JEAN AIME DENIS	
12	RAJAONAH ANNONCIA[illegible]ARTIN	
13	RAKOTOARIMANANA ANDRIAMANJATO ABDON	
14	RAKOTOMALALA DIEU DONALD ROLLAND JEAN PIERRE	
15	RAKOTONIRINA JEAN FRANCOIS XAVIER	
16	RAKOTONIRINA JOSEPH	
17	RAKOTOVOLOLONIAINA FIDINTSOA HERITIANA	
18	RAMANANTSOA RASAMBOMIRINDRA NOROTIANA	
19	RAMANITRARIVO ZAFINISALAMA ONISOA	
20	RAMARATSIALONINA EDDY CHRISTIAN	
21	RAMIANDRISOA ZAFIMBELO FREDELINA	
22	RANDRIAMANANTENA TIANA CHRISTIAN	
23	RANDRIANIAINA HARINIRINA HORTENSE	
24	RANDRIAMBOAVONJISOA CHRISTIAN JOSEPH	
25	RANDRIANDROMILANTOSOA TAHINARINONY MAMINDRAINY RAJOMA	
26	RASAMOELINA RADO ANDRIAMAMENOSOA	
27	RASOAMANANA NICOLE	
28	RASOAMODY ANDRIANIRINA JEAN LUC JUSTIN	

25	RAKOTOMANANTSOA TAHINARINONY MAMINDRAINY	
26	RASAMOELINA RADO ANDRIAMAMENOSOA	
27	RASOAMANANA NICOLE	
28	RASOAMODY ANDRIANIRINA JEAN LUC JUSTIN	
29	RASOAZANAMARIA FANJA CLAUDETTE CHANTAL	
30	RASOLOFO ANDRIANARY TAHIRINIAINA	
31	RASOLOMAMPIANDRY JEAN WILLY	
32	RASOLOMANANA ROTSY NANIENAINA	
33	RASOLONJATOVO ACHILLE JOSE	
34	RAISIMANDRESY HAJARINIAINA	
35	RAZAIIMANDIMBY ANDRY AMBININTSOA	
36	RAZAFIMAHAZO ALIDA GERALDI	
37	RAZAIIMBELO ESTHER MARIE JOSEPHINE	
38	RAZAIINDRAMAMIARIVONY LEA VIOLETTE CAROLINE	
39	RAZAIMBOLA VONJILALAINA FRANCINE ALICE	
40	RAZANAISIMBA NORONIRINA	
41	ROBSON FABRIANOT GILDAS	
42	SOJAVELO MAMY TSIFITAHY	
43	VALERENE CHAN VAVIANY	
44	VOLOLONIAINA ANNE MARIE AGNES	
45	RAHARISOA LAURETTE MARIE ANGE	

ARRETE LA PRESENTE LISTE AU NOMBRE DE 45 ETUDIANTS

Appendix 9 – Liste des Chercherurs au Sein de L'ICTE Durant L'Annee 1998

LISTE DES CHERCHEURS AU SEIN DE L'ICTE DURANT L'ANNEE 1998

NOMS	INTITULE DE LA RECHERCHE	FINANCEMENT	CALENDRIER
Patricia WRIGHT Mirea West,Heather Bond, Kim Hechscher	Etude de comportement, ecologie et parasitologie chez Propithecus diadema edwardsi	National Sciences Foundation, USA	Janvier-Mai-Septembre-Decembre
Peter REINTHAL, John Sparks, Karen Riseng, Mark Westheat	- Etude limnologique et ichthyologique a Madagascar - Ichthyologie et systématique - Prédation et competition dans les ruisseaux du PNR	National Sciences Foundation, USA	Janvier-Juillet-Septembre-Decembre
Steve ZACK	Inventaire et dynamique de la population avienne	UDLP, USAID	Janvier-Fevrier-Mars-Avril
Olli MUSTONEN, Jukka Lethonen	Ecologie des micromammifères dans differents types d'habitats perturbes ou non perturbes	Douroucouli Foundation	Janvier-Decembre
Chia TAN	Etude comparative sur le comportement et l'ecologie chez les trois especes de Hapalemur	National Sciences Foundation, USA	Janvier-fevrier
Beth MIDDELTON	Etude des effets du pâturage de bovins dans le parc	Universite Illinois	Mai-Decembre
Ken EMBERTON	Etude des escargots terrestres dans la Reserve de Namoroka, des grottes d'Anjohibe, de Katsepy, d'Antsingimavo et les regions environnantes	National Sciences Foundation, USA	Mars-Avril-Juillet -
Deb OVERDORFF	Etude sur la dominance des femelles chez les lemuriens	National Sciences Foundation, USA	Janvier-Decembre
Luke DOLLAR Amy DUNHAM	Diversite, abondance, comportement et ecologie des carnivores malgaches Etude et investigation dans toute l'île	Carnivore Conservation and Research Trust (CCRT)	Mars 1998 – Mars 1999

Steig JOHNSON	Ecologie comparative de deux sous-especes d'*Eulemur fulvus* analyse des populations isolees et hybrides du Sud-Est de M/car	NSF, Wemen-Gren Foundation, WCS, USIA Fulbright hays, SigmaXi, Explorers Club, and LSB Leakey Foundation	Mai-Decembre
Lee BRADY	Chameleons, Conservation and local communities in M/car	British governement's Darwin Initiative	Octobre 1998 – Janvier 1999
John CADLE	Inventaire des reptiles et amphibiens	National Sciences Foundation, USA	Janvier-Mars-Novembre-Decembre
Franco ANDREONE	Etude des Reptiles et Amphibiens de Madagascar	Italian Grant	Janvier-Mars
Rachel KITKO	La genetique chez les lemuriens	Primate Conservation Fund	Mai-Decembre
Ted STILES	Etude du regime frugivore chez les lemuriens et les Oiseaux du PNR	Douroucouli Foundation	Mai-Decembre
Ubick, Vindum, Wilkensen, Drewes	Inventaire et systematique des Amphibiens et Reptiles	Academie des Sciences Californie	Janvier -Mars
SCHWEIKERT	Systematique et inventaire chez les insectes	Academie des Sciences Californie	Janvier-mars
KARANAVYK KAVANAUGH	Inventaire des Coleopteres	Academie des Sciences Californie	Janvier-mars
GRISWOLD	Inventaire des Araignées	Academie des Sciences	Juillet-Decembre

		Californie	
PULAWSKI	Inventaire des Guêpes	Academie des Sciences Californie	Juillet-Decembre
PENNY	Inventaire des Neuropteres	Academie des Sciences Californie	Juillet-Decembre
ALMEDA	Inventaire des Melastomacees	Academie des Sciences Californie	Juillet-Decembre
DANIEL	Etude des Acanthacees	Academie des Sciences Californie	Juillet-Decembre
FRITSCH	Etude des Ebenacees	Academie des Sciences Californie	Juillet-Decembre
KOCIOLEK	Etude des Diatomees d'eau douce	Académie des Sciences Californie	Juillet-Decembre
FERRARIS	Inventaire des poissons d'eau douce	Academie des Sciences Californie	Juillet-Decembre
Mc COSKER	Biologie aquatique	Academie des Sciences Californie	Juillet-Decembre
Cathy PRINGLE	Predation et compétition dans les ruisseaux du PNR	Universite de Sengin	Mai-Decembre
Jonathan BENSTEAD	Comportement et ecologie du Limnogale	Douroucouli Foundation	Janvier-Decembre
Frances KERRIDGE	Etude comparative des petits carnivores dans le PNR et dans la RS de Manombo	Bolton Institute Fund	Janvier-Decembre
Stephanie MADSON	Etude des invertébres dans le sol (substratum)	Universite de Georgia Fund	Janvier-Decembre
Kristin EIDENBACH	Etude de comportement, ecologie et parasitologie chez Propithecus diadema edwardsi	Knox College	Avril-Juin
Jonah Ratsimbazafy Larry RABIN	Etude de comportement et ecologie de Varecia variegata	Wenner Gren Fund	Mai-Août-Septembre
Sarah KARPANTY	Etude des oiseaux Rapaces predateurs des Lemuriens	Stony Brook Fund	Mai-Septembre

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Chris TILDEN	Etude du comportement maternel chez les especes de Hapalemur	Bookfield Zoo	Juiullet-Decembre
Christina GRASSI	Etude du regime alimentaire et de comportement chez l'espece Hapalemur griseus dans deux sites Vatoharanana et Talatakely	National Sciences Foundation, USA	Mai-Decembre
Beth ERHART	Etude d'interaction chez Propithecus	National Sciences Foundation, USA	Mai-Decembre
Jari NIEMELEN	Ecologie des Scarabees	Universite d'Helsinki Funds	mai-Decembre
Don DUSCYNSKI, Kim HECHSHER, Lydia Rabetafika	Parasites des Lemuriens dans différents habitats	National Sciences Foundation, USA	Septembre-Decembre
Jukka LAAKKONEN	Parasitologie chez les micromammifères	Université d'Helsinki	Janvier-Fevrier
Jessica GURVICH Kerry BROWN	Etude de la propagation des plantes dans le PNR	Stony Brook Funds	Mai-Decembre
Bruijninckx Julie	Influence de la deforestation sur la population des lemuriens	Universite de Bruxelles Funds	Mars-Decembre
Doyle Mc KEY	Inventaires des plantes medicinales de Ranomafana	Stony Brook funds	Fevrier-Mars-Mai
Bill BALLARD	Host-endosymbiot co-evolution and host speciation Wolbachia pipientis et Drosophila simulans fruit flies	National Sciences Foundation, USA	Mars-decembre
Manda Blair Jost	Etude des Orthopteres		
Ambroise DALECKY	Analyse et gestion de bases de donnees en suivi-ecologique pour en faire un outil de travail pour la gestion du PNR	Stony Brook Funds	Janvier-Decembre
Louis JR Edward Emile	Conseiller Technique	USA	03 ans

Appendix 10 – Letter from the California Academy of Sciences

3 August 1998

Dr Patricia Wright Director
Institute for the Conservation of Tropical Environments (ICTE)
SBS Building, 5th Floor
State University of New York
Stony Brook NY 11794-4364

Dear Patricia

My life has slowed just long enough for me to finally have a chance to write to you concerning my and my Academy colleagues' experiences during our five-week stay in Madagascar in April May of this year all but a few days of which were spent at Ranomafana Everything can be summed up quite simply really we had a fantastic time both scientifically and personally!

I must compliment you and absolutely every member of the ICTE staff both in Stony Brook and in Madagascar for facilitating one of the smoothest and most productive research expeditions that any of us has ever been a part of Rickie and her staff arranged everything very well on their end and we felt well prepared for what we would encounter on the expedition before we left the U S The staff in Antananarivo were absolutely wonderful! We expected to have to spend perhaps up to a week in Tana fighting through the paperwork and bureaucracy there before actually getting on our way to Ranomafana In fact Benjamin and his staff had essentially everything we needed in hand when we arrived and it took us just a couple of hours to be processesd and ready to go We ended up spending one additional day in Tana shopping for last minute items, a chore that was again greatly facilitated by ICTE staff Everyone there was extremely helpful resourceful and generous with their time and expertise

We were also very much impressed with the staff facilities and procedures at the research station in Ranomafana The food was excellent good solid food that was tasty varied attractively prepared and plentiful The campsites were well contructed and very nicely located far enough apart to permit a measure of privacy and solitude, but handy for all group activities and the trails The support we received from Aimee Tiana and the cooks guides and drivers was exceptional We were I m sure a very demanding bunch, but Aimee and Tiana were up to each task and each challenge whether it was arranging transportation or finding some item that we found we needed but failed to bring with us (we still don t know how they came up with 20 litters of ethanol for us in Ranomafana!) What s more impressive is that they did all this efficiently and in unwavering good humor Actually we found just about everyone we met in the country to be open and friendly, and we felt very comfortable everywhere we went

We had an excellent debriefing session with the Park's chief administrator and his department heads at the end of our stay It lasted about two hours, and although we were a bit apprehensive going in about what we might be able to contribute from our 'basic research perspective it was I think and enjoyable and worthwhile experience for all We expressed our strong support for the directions the park was taking and for the excellent facilities that are beginning to be developed We were particularly impressed with the quality and maintenance of the trail system in the park with the guides that work with the scientists and with tourists and with the quality wilderness experience that the park provides We stressed that maintenance of a fine trail system was the best insurance against tourists feeling the need to

move off the trails and out into the forest Everything that tourists come to see is visible from the trails Our occasional conversations with tourist led us to suggest that additional information on the invertebrates (particularly the conspicuous spiders beetles and butterflies) of the park would be welcome and marketable, and we agreed to provide the park with text and graphic materials for use in developing one or more additional brochures featuring invertebrates We also discussed our preliminary findings concerning observed insect and spider associations with particular plant species (e g *Pandanus* spp) and this seemed of great interest to the park staff Apparently, use of the *Pandanus* resources in and around the park is a major concern to park officials, and rightly so Our botanists planning to work in Ranomafana later this year, will be prepared to discuss this matter more fully with park staff

I hope that, from the above, you can appreciate how well treated and accomodated we felt before during and after our stay in Ranomafana On behalf of our entire contingent I want to thank you and all those involved at ICTE for doing so well by us and for us I received from Rickie a brief synopsis of the proposal you are preparing to submit for support to upgrade the research station at Ranomafana Certainly all the improvements you intend to make will be welcome additions to facilities there I m glad to see that researchers will still have the option of staying in tents in the forest near the upgraded research facilities because this was one of the most enjoyable aspects of our stay there I can appreciate however that not everyone shares this view of tent lodgings The availability of electricty and a ready supply of water and toilet facilities at the research buildings will make necessary lab work much more efficient and productive If there is anything else beyond these few favorable comments that I can do in support of this proposed upgrade, please let me know

I certainly look forward to meeting you sometime in the near future perhaps even here at the Academy, and to discussing further with you plans for the future

Your sincerely

Dave

David H Kavanaugh
Curator and Chairman of Entomology

Appendix 11 – Publications Resulting from ICTE Research

Publications, Reports, and Theses Resulting from ICTE Research
(Updated December 1, 1998)

Publications

1 Abraham, J P , Rakotonirina, B , Randrianasolo, M , Ganzhorn, J U , Jeannoda, V , & Leigh Jr , E G (1996) Tree diversity on small plots in Madagascar A preliminary review Rev Ecol (Terre Vie), 51 93-116

2 Andreone, F (1991) Conservation aspects of the herpetofauna of Malagasy rain forests Societa Zoologica 'La Torbiera' - Scientific Reports, 1 1-45

3 Andreone, F (1993) Two new tree frogs of the genus *Boophis* (Anura Rhacophoridae) from central-eastern Madagascar Bollettino del Museo Regionale di Scienze Naturali - Torino, II (2) 289-313

4 Andreone, F (1993) Kommentierte liste von amphibienfunden auf Madagaskar Salamandra, 29 (3/4) 200-211

5 Andreone, F (1994) The amphibians of Ranomafana rain forest, Madagascar - preliminary community analysis and conservation considerations Oryx, 28 (3) 207-214

6 Anonymous (1988, September 6) Newly discovered fish New York Times

7 Anonymous (1994) Lemurs and locals The Economist, p 44, April 2

8 Asher, R J (1997) African and Malagasy tenrecs A biogeographic parallel with lemuriform primates? American Journal of Physical Anthropology, Supplement 24 (Annual Meeting Issue) 69-70

9 Atsalis, S , Schmid, J , & Kappeler, P M (1996) Metrical comparisons of three species of mouse lemur Journal of Human Evolution, 31 61-68

10 Atsalis, S (1996) Feeding ecology of the brown mouse lemur, *Microcebus rufus* (family Cheirogaleidae), at Ranomafana National Park, Madagascar American Journal of Physical Anthropology, Supplement 22 (Annual Meeting Issue) 64

11 Balko, E A , Chambers, R Wright, P C , & Underwood, B (1995) The relationship of logging disturbance to forest composition and to population density and distribution of black-and-white ruffed lemurs (*Varecia variegata variegata*) in Ranomafana National Park, Madagascar In B D Patterson, S M Goodman, & J L Sedlock (Ed), Environmental Change in Madagascar (pp 36-37) Chicago The Field Museum of Natural History

12 Balko, E A (1996) Intraspecific variation in the foraging ecology of *Varecia variegata variegata* at Ranomafana National Park, Madagascar American Journal of Physical Anthropology, Supplement 22 (Annual Meeting Issue) 64

13 Benstead, J , Stiassny, M L , Loiselle, P V , Riseng, K J , & Raminosoa, N (in review) Current status and conservation of Madagascar's river ecosystems In P J Boon, B R Davies, & G E Petts (Ed), Global perspectives on river conservation New York Wiley

14 Bohlen, J T (1993) For the Wild Places Washington, D C Island Press

15 Boyd, R , & Silk, J (1997) How Humans Evolved New York W W Norton & Company

16 Bradley, B & Stumpf, R M (1997) Morphometrics of *Eulemur fulvus albocollaris* in Vevembe Forest, Madagascar American Journal of Physical Anthropology, Supplement 24 (Annual Meeting Issue) 79-80

17 Brady, L D , Griffiths, R A , Jenkins, R , & Kauffmann, J (1997) Chameleons, Conservation and Local communities in Madgascar Third World Congress of Herpetology Prague

18 Burger, J F (1992) Notes on some *Tabanidae* (Diptera) from Madagascar, with description of two new species of *Aegophagamyia* Austen, subgenus Triclida Enderlein Annls Soc Ent Fr (N S), 28 (3) 303-315

19 Cadle, J E (1995) A new species of *Boophis* (Anura Rhacophoridae) with unusual skin glands from Madagascar, and a discussion of variation and sexual dimorphism in *Boophis albilabris* (Boulenger) Journal of the Linnean Society, 115 (4) 313-345

20 Cadle, J E (1996) Snakes of the genus *Liopholidophis* (Colubridae) from eastern Madagascar New species, revisionary notes, and an estimate of phylogeny Bulletin of the Museum of Comparative Zoology, 154 (5) 369-464

21 Cadle, J E (1996) Systematics of snakes of the genus *Geodipsas* (Colubridae) from Madagascar, with descriptions of new species and observations on natural history Bulletin of the Museum of Comparative Zoology, 155 (2) 33-87

22 Carleton, M D , & Goodman, S M (1996) Systematic studies of Madagascar's endemic rodents (Muroidea Nesomyinae) A new genus and species from the central highlands Fieldiana, Zoology, N S (85) 231-256

23 Cooke, R (1988, November 1) Primitive species in a fishbowl Newsday, Discovery Section, p 3

24 Crovella, S , & Rumpler, Y (1992) Confirmation of the specific status of *Hapalemur aureus* (Primates, Strepsirhini) by restrictive genomic DNA binding patterns Human Evolution, 7 63-67

25 Dagosto, M (1989) Locomotion of *Propithecus diadema* and *Varecia variegata* at Ranomafana National Park, Madagascar American Journal of Physical Anthropology, 78 (Annual Meeting Issue) 209

26 Dagosto, M (1994) Testing positional behavior of Malagasy lemurs A randomization approach American Journal of Physical Anthropology, 94 189-202

27 Dagosto, M (1995) Habitat and seasonal variation in locomotor behavior in Malagasy lemurs at Ranomafana National Park In B D Patterson, S M Goodman, & J L Sedlock (Ed), Environmental Change in Madagascar (pp 29) Chicago The Field Museum of Natural History

28 Dagosto, M (1995) Seasonal variation in positional behavior of Malagasy lemurs International Journal of Primatology, 16 (5) 807-833

29 Dagosto, M , & Yamashita, N (1998) Effect of habitat structure on positional behavior and substrate use in three species of lemur Primates, 39 (4) 459-472

30 Demes, B , Jungers, W L , Fleagle, J G , & Wunderlich, R E (1995) Leaping kinematics of indriid primates American Journal of Physical Anthropology, Supplement 20 (Annual Meeting Issue) 83

31 Demes, B , Jungers, W L , Gross, T S , & Fleagle, J G (1995) Kinetics of leaping primates Influence of substrate orientation and compliance American Journal of Physical Anthropology, 96 (4) 419-430

32 Dew, L , & Wright, P C (1994) Conservation implications of seed dispersal by primates in a Malagasy rainforest (Ranomafana National Park) XVth Congress of the International Primate Society,

33 Dew, J L , & Wright, P C (1998) Frugivory and seed dispersal by four species of primates in Madagascar's eastern rainforest Biotropica, 30 (3) 425-437

34 Dobson, A , & Merenlender, A (1990) Primate conservation through comparative population biology of two lemur species American Journal of Physical Anthropology, 81 (2) 216

35 Dollar, L J , Forward, Z A , & Wright, P C (1997) First study of *Cryptoprocta ferox* in the rainforests of Madagascar American Journal of Physical Anthropology, Supplement 24 (Annual Meeting Issue) 102

36 Emberton, K C (1994a) Thirty new species of Madagascan land snails, Mollusca, Gastropoda Proceedings of the Academy of Natural Sciences, Philadelphia, 145 147-189

37 Emberton, K C (1994b) Morphology and aestivation behaviour in some Madagascan acavid land snails Biological Journal of the Linnean Society, 53 175-187

38 Emberton, K C (1994c) Distributional differences among acavid land snails around Antalaha, Madagascar Inferred causes and dangers of extinction Malacologia, 36 67-77

39 Emberton, K C (1995) Land-snail community morphologies of the highest-diversity sites of Madagascar, North America, and New Zealand, with recommended alternatives to height-diameter plots Malacologia, 36 43-66

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16 Rahamafaly (1995) Conservation Management in Ranomafana National Park DEA, University of Antananarivo

17 Rahanjaona, L (1995) L'education a l'environment dans les ecoles primaire publiques autour du Parc National de Ranomafana CAPEN, Universite de Fianarantsoa

18 Rahanvololona, J (1994) Contribution a l'etude botanique et palynologique des vanetes de riz DEA, Universite d'Antananarivo

19 Rahanvololona, M B (1997) Impact de l'exploitation selective de la foret et la variation saisonniere sur la composition de la population de rongeurs et d'insectivores dans une foret seche de l'Ouest de Madagascar DEA, University of Antananarivo

20 Rahenniramy, B F (1996) Le FRAM et la conservation de la biodiversite CAPEN, Universite de Fianarantsoa

21 Rahenniramy, B F (1997) Le FRAM et la Conservation de la Biodiversite - cas des EPP autour du Zone Peripherique du PNR CAPEN, University of Fianarantsoa

22 Rakotoarisoa, B (1996) La famille et l'education environmental du Parc National de Ranomafana CAPEN, Universite de Fianarantsoa

23 Rakotoarisoa, B (1997) La famille et l'Education a l'Environment au sein du Parc National de Ranomafana CAPEN, University of Fianarantsoa

24 Rakotondrabe, G A (1994) Etudes matenelle et logicielle du systeme de positionnement par satellites - Global Positioning System (GPS) pour la delimitation du Parc National de Ranomafana DEA, Universite de Fianarantsoa

25 Rakotondramanana, V (1995) L'education environmentale et les mathematiques CAPEN, Universite de Fianarantsoa

26 Rakotoniaina, V (1992) a La croissance et la menarche des filles Tanala, b Etude comparee ethoecologique de *Eulemur rubriventer* et de *Eulemur fulvus rufus* DEA, Universite d'Antananarivo

27 Rakotoniaina, S N (1994) Contribution a l'etude des impacts des troupeaux sur l'ecosystem forestier du Parc National de Ranomafana Ingeniorat, Universite d'Antananarivo

28 Rakotoniaina, N (1997) Contribution a l'etude des impacts des troupeaux bovins sur l'ecosysteme Forestier du Parc National de Ranomafana DEA, University of Antananarivo

29 Rakotosamimanana, L R (1991) Etude de la variation saisonniere du cycle de l'epithelium seminifere chez *Avahi* (JOURDAN, 1834), un primate prosimian de Madagascar DEA Universite d'Antananarivoo

30 Rakotoson L N E (1994) La rencontre du decret de creation du Parc National de Ranomafana avec les coutumes et traditions locales Universite de Fianarantsoa

31 Ralimanana, H (1994) Contribution a la connaissance de l'apiculture et a la melisso palynologie dans le Parc National de Ranomafana DEA, University of Antananarivo

32 Ralisoamalala, R (1997) Etude du role de Propithecus verreaxi verreauxi (Grandidier, 1867) et de Eulemur fulvus rufus (Audebert, 1800) dans la dissemination des graines de la foret de Kirindy (Morondava), Madagascar DEA, University of Antananarivo

33 Ramahafaly (1995) Contribution de la conservation a la mise en place d'un P C D I , cas de Ranomafana Memoire d'Ingeniorat, Universite d'Antananarivo

34 Ramanankandraina, L (1997) Schema directeur informatique du Ministere de l'Enseignement Superieur DII, University of Fianarantsoa

35 Raminoarisoa, V (1997) Contribution a l'etude comparative des morphotypes de Rattus de Madagascar par l'etude des caracteres morphologiques et des caracteres anatomiques des os craniens DEA, University of Antananarivo

36 Rampanana, M H (1993) Impact economique du tourisme dans la region de Ranomafana-Ifanadiana DEA, Institut Superieur de la Communication, des Affaires et du Management (ISCAM)

37 Ranalison, O (1994) Contribution l'etude de l'alimentation du lemurien en captivite *Hapalemur aureus* Memoire d'Ingeniorat,

38 Rananjaona, H L T (1993) L'exploitation des fougeres arborescentes (Cyatheacees) du Parc National de Ranomafana DEA, Universite d'Antananarivo

39 Randriamaholy, Z B (1993) Projet d'une operation de recherches routine appliquee a Madagascar Memoire d'Ingeniorat, Universite d'Antananarivo

40 Randriamanalina, M (1997) Contribution a l'etude des relations sociales chez deux groupes de
propithecus verreauxi verreauxi (Grandidier, 1867) dans le site d'interet biologique de Kirindy, Morondava (Madagascar) DEA, University of Antananarivo

41 Randriamanantenaina, H (1994) Consequence de la destruction de l'environment Maitrise, Universite de Fianarantsoa

42 Randrianandrasana, D (1995) Plantes medicinales antidiabetiques du Parc National de Ranomafana Memoire de Maitrise, Universite de Fianarantsoa

43 Randrianary, J (1997) Le Dina et l'ecotourisme dans les Aires Protegees et leurs zones peripheriques Droit de passage et statuts des guides locaux, facteurs de developement humain et economique Maitrise, University of Fianarantsoa

44 Rasamoelina, A (1993) Inventaire des legumineuses a nodosite dans le Parc National de Ranomafana CAPEN, Universite d'Antananarivo

45 Ratovohery, A T (1993) Etudes des utilisations de bambuseae dans la region du Parc National de Ranomafana CAPEN, Universite d'Antananarivo

46 Ratsimbazafy, H J (1992) a Etude comparative de deux prosimiens malgaches *Propithicus diadema edwardsi* et *Hapalemur aureus* b Etude de la croissance biometrique des garcons Tanala du Firaisana de Ranomafana c Epidiemiologie de la malnutrition proteino-energetique du jeune enfant du fokotany d'Ambatolahy DEA, Universite d'Antananarivo

47 Ratsirahonana, S (1997) Contribution de l'Anthropologie Nutritionnelle dans la Conservation de la Biodiversite dans Deux Aires Protegees le Parc National de Ranomafana et le Parc National Isalo DEA, University of Antananarivo

48 Ravaoarisoa, J (1996) Study of the relationship between diet and misticatory apparatus in rain forest lemurs in Ranomafana National Park DEA, Universite d'Antananarivo

49 Ravelomanantsoa, L (1997) La mission de service public d'un Projet de Conservation et de Developpement Integres cas du Projet Parc national de Ranomafana Memoire de Maitrise en Droit Public et Sciences Politiques, University of Antananarivo

50 Razafimahaimodison, J C (1993) Niche separation in the vanga shrikes of the rain forest in Ranomafana National Park DEA, University of Antananarivo

51 Razafimahefa, A A (1995) Les plantes medicinales "Ampody" du Parc National de Ranomafana Memoire de Matrise, Universite de Fianarantsoa

52 Razafimamonjy, D (1987) Contribution a l'etude de la dynamique du savoka de la region de Ranomafana, Ifanadiana DEA, Universite d'Antananarivo

53 Razafindrabe, B H N (1997) Etude des filieres Miel, Pandanus, Bambou et Ecrevisses dans les peripheries du Parc National de Ranomafana dans une perspective de mise en place d'une gestion commu-nautaire Ingeniorat en Agronomie, University of Antananarivo

54 Razafindramanana, S E (1993) Exemple de mise en place d'une infrastructure d'accueil dans une aire protege DES, Institut Superieur de la Communication, des Affaires et du Management (ISCAM)

55 Razafindratsita, V R (1995) Etude biologique et ecologique de *Philepitta castanea* (Muller, 1776) son role dans la regeneration du sous-bois forestier du Parc National de Ranomafana DEA, Universite d'Antananarivo

56 Razafindravao, M J (1995) Le permis de construire Memoire de matrise, Universite de Fianarantsoa

57 Razafinirina, H I (1997) Informatisation de la Direction de la promotion du Commerce exterieur DII, University of Fianarantsoa

58 Roth, O (1996) Ecology and social behavior of *Avahi laniger* MS, Universitate Basel, Switzerland

59 Tan-Alkis, J V (1997) Factors affecting the abundance and distribution of a chameleon assemblage in Ranomafana National Park, Madagascar University of Kent, UK

Undergraduate Honor's Theses

1 Dina, C (1995) Forest structure, vegetative analysis and selectivity of food choice in an endangered primate species (*Hapalemur griseus*) Undergraduate Honors Thesis, State University of New York at Stony Brook

2 Szatanek, P J , Wright, P , Masters, J , & Tattersall, I (1995) A comparative study of feeding biology and implications of reproductive energetics in *Eulemur rubriventer* Journal of Undergraduate Research, SUNY Stony Brook, 1 (1) 13-22

Appendix 12 – Program of the University of Fianarantsoa Institute for Science and Technology of the Environment

INSTITUT DES SCIENCES ET TECHNIQUE DE L'ENVIRONNEMENT

MODALITE ET PROGRAMME DE FORMATION

Deux aspects principaux peuvent etre degagés de l'ensemble des cours

Familiariser avec les eléments fondamentaux de l ecologie pris au sens large

+ Notion fondamentale d'ecosysteme de biosphere et d ecosphere
+ Cycles biologiques, biogeochimique, equilibre dynamique
+ Facteurs humains
+ Paysages naturels et paysages modeles par l'homme
+ Facteurs physico-chimiques
+ Etudes des impacts sur l'environnement de l utilisation et de la destruction du milieu naturel en particulier des sources d energie

Degager des solutions adequates dans la mesure du possible

La formation comprend 5 modules d'enseignement Leur importance est definie en fonction des pourcentages d horaire attribues dans l enseignement de chaque module

Module Sciences Naturelles	30 %
Module Technologie	30 %
Module Sciences exactes	20 %
Module Sciences Humaines	15 %
Module Communication	5 %

Chaque module comporte un certains nombres de matieres dont l enseignement sont repartis sur 2 ans (1400 heures) a savoir

Module Sciences Naturelles

+ Ecologie
+ Biologie generale (animale vegetale physiologie)
+ Sciences du sol
+ Microbiologie

Module Technologie

+ Technique agricole
+ Technique forestiere
+ Biotechnologie
+ Gestion durable des ressources naturelles
+ Secourisme
+ Economie gestion - comptabilite

- Module Sciences exactes

+ Mathematiques
+ Physiques
+ Chimie
+ Informatique

Module Sciences Humaines

+ Education environnementale
+ Droit de l Evironnement
+ Anthropologie sociale

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Module communication
+ Langues Vivantes
+ Technique de communication , soit 17 matieres dont 8 en premiere annee et 9 en deuxieme année avec stages et rapport de stage

Le module communication est enseigne a la fois en premiere et deuxieme annee

3 REPARTITION DES MATIERES DANS CHAQUE MODULE (Titres et plans)

Les matieres enseignées dans chaque module sont donnees a titre indicatif Le conseil scientifique d etablissement en concertation avec les enseignants fixeront les programmes d enseignements de formations et les modalites des examens tous les 2 ans et pour chaque promotion en fonction du marche de l emploi

3 1 MODULE SCIENCES NATURELLES
(Premiere Annee)

TITRES	PLANS
3 1 1 ECOLOGIE GENERALE (80 Heures)	I Definition Division de l ecologie - Méthodes II Notion d ecosysteme - Les écosystemes terrestres (delimitation caracteristique fonctionnement) Les principaux ecosysteme du monde (ecosystemes terrestres ecosystemes aquatiques)
	III Biospheres Organisation fonctionnement
	IV Problematiques de l environnement
	V - Application de la connaissances des ecosystemes
	VI - Paleontologie La fossilisation (processus et conditions) - Stratigraphie (fossiles de facies fossiles directeurs datation) CONFERENCE Interets des fossiles
3 1 2 BIOLOGIE GENERALE (100 Heures)	I Theorie de l evolution Progres et evolution dans le monde organique
	II - La cellule - Organisation de la cellule (propriete et fonction - Structure et fonction de la cellule (des proteines glucides, lipides)

- Les métabolismes et les échanges d energie dans la cellule

III - La reproduction et le developpement des organismes

IV - Principe de genetique et de selection

V Biologie vegetale
- Introduction du monde vegetal procaryote eucaryote,
Organisation d'une plante angiosperme
- Physiologie de la plante (germination Photosynthese respiration)
Biodiversite specifique (systematique des vegétaux superieurs, les bases de la classification)

VI Biologie animale
Systematique et biologie des vertebres (poissons reptiles) etudes axees sur la particularite de la faune malgache

VII Physiologie animale
Processus physico chimique fondamentaux de la vie
Physiologie cellulaire (role physiologique de la membrane cellulaire)
- Notion de milieu interieur chez les etres pluricellulaires
+ compartiments liquidiens de l organisme
+ echanges liquidiens
Role physiologique du sang
+ defense immunitaire
+ groupes sanguins
+ allergie greffe d organes
+ hemostase
+ coagulation sanguine

ENSEIGNEMENT DIRIGE ET PRATIQUE

VIII - Etude des cellules excitables
+ cellules nerveuses
+ cellules musculaires

IX - Etude des fonctions physiologiques
+ nutrition et digestion
+ rein et equilibre hydro electrolytique

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MODULE SCIENCES NATURELLES
(Deuxieme Annee)

3 1 3 SCIENCES DU SOL
(100 Heures)

I - Geologie
Systeme solaire et la terre
- Structure de la terre et son enveloppe
Les processus geologiques exogenes et endogenes
- Stratigraphie et histoire geologique de la terre

II - Pedologie
- Etude de milieu naturel (climat vegetation hydrologie)
Les processus physiques et chimique dans le sol
- Formation, Evolution, Degradation du sol
Classification des sols

III Cartographie
Lecture de carte
Observation et lecture des photoaeriennes
photo-interpretation
teledetection

TRAVAUX PRATIQUES

etudes des bases echangeables
capacite d echange cationique
etude du rapport C/N
dosage du carbone et azote
analyse mecanique

3 1 4 MICROBIOLOGIE
(80 Heures)

I Methode de travail
Microscopie
Sterilisation
Milieu de culture
Technique d ensemencement
Isolement et purification des souches

II Notion de pathologie vegetale
Les maladies bacteriennes
- Les maladies fongiques
Les maladies virales
- Impact économique de ces maladies

III Microbiologie fonctionnelle
- La nitrification
L ammonification
- La denitrification

IV - Fixation symbiotique de l azote

3 - 2 MODULE TECHNOLOGIE
(Premiere Année)

3 2 1 TECHNIQUE AGRICOLE (80 Heures)	I - Bases scientifiques de la production vegetale II Les facteurs de milieu III La plante vue sous l'angle agricole (semence, germination) IV -Technique de la production vegetale Amelioration de profil, cultures lutte contre les mauvaises herbes) V Les travaux saisonniers (travaux d entretien de sol et des cultures lutte contre les mauvaises herbes) VI Conservation des sols Lutte contre les erosions (defense et restauration des sols arables) VII Production vegetale Les differents types de production vegetale (multiplication asexuee) Les maladies des plantes et moyens de lutte VIII Connaissance de quelques productions vegetales (cultures vivrieres cultures d' exportation)
3 2 2 TECHNIQUE FORESTIERE ET ELEVAGE (100 Heures)	I Notion d ecosysteme forestier Fonctionnement Methode de conservation et de protection Les ecosystemes ruraux Technique de releve ecologique (methode d inventaire technique de synthese) - Les ecosystemes urbains II Reboisement - Les operations en pepiniere - Technique de reboisement (plantation pare feu) Entretien sylvicole III - Technique en agroforesterie L objectifs en agroforesterie Gestion et amenagement du terroir Les differents systemes agroforestieres (approche systematique, choix des especes) IV - Systeme agro sylvicole (but et choix du systeme modes et pratique culturale)

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V Systeme agro sylvo-pastorale
- Choix des essences ligneuses plantes fourrageres

VI - Les avantages des systemes agroforestieres

VII - Elevages
- Aviculture
- Apiculture
- Aquaculture Pisciculture

MODULE TECHNOLOGIE
(Deuxieme Annee)

3 2 - 3 BIOTECHNOLOGIE
(80 Heures)

I Production de biomasse
- Productivité du monde vegetal
Biomasse disponible a des fins energetiques

II - Procedes de conversion pyrolitique de la biomasse
Carbonisation
Production de chaleur
Hydrolyse chimique

III Traitement biologique et enzymatique
- Fermentation alcoolique
Fermentation methanique

IV Traitement et conversion enzymatique
Utilisation industrielle des micro organismes

3 2 4 GESTION DURABLE DES RESSOURCES NATURELLES
(80 Heures)

Voir M Benjamin

3 2 5 SECOURISME

I Conduite a tenir en presence d un accident
- Prevention de l aggravation de l accident
- Alerte et secours Publics
Examen de l accidente

II - Les detresses respiratoires
- La respiration
- Les causes de detresses respiratoires
Signes de detresses respiratoires et principe d action

III - Les hémorragies
- La circulation
Les hemorragies externes
Les hemorragies internes

IV Bandages et Emballages
La toile adhesive
- Les bandes
- Les frondes

V Ramassage
- Principes generaux de ramassage
Les methodes de ramassage
- Methode en pont

VI - Le Brancardage
Principes generaux de brancardage
Les brancards matelas portions
Le brancardage

VII Le degagement des accidentes
Automobile
Chemin de fer
Ecroulement d immeuble

VIII - Les atteintes du squelette
Le squelette et les muscles
Les fractures
Les luxations et entorses

IX - Que faire en attendant le Medecin ?
Accidents digestif
Accidents urinaires
Maladies infectieuses

X Premieres secours psychologiques
La peur
La panique
La depression

XI - Le feu
- Le triangle de feu
Que faire devant un debut d incendie ?
Comment utiliser un extincteur ?

XII Protection de la sante
- La nutrition
- La pollution
Le tabac

XIII Secours aux populations sinistrees par les
- Catastrophes naturelles
Catastrophes artificielles

XIV Preventions des accidents
- Comment se produit un accident ?
- Prevention des accidents de travail

3 2 6 ECONOMIE GESTION
COMPTABILITE
(60 Heures) Voir D E R

MODULE SCIENCES EXACTES
(Premiere annee)

3 3 1 MATHEMATIQUES
(50 Heures)

I Notion d'algebre
- Rappels sur les nombres complexes
Application lineaires matrices systemes lineaires
- Calcul matriciel en dimension 3

II - Analyse
- Limite Continuite
- Rappels sur les fonctions trigonometrique
Fonctions reciproques de fonctions trigonometriques
Derivees Formules de Taylor
Développements limites
- Applications a l etude des fonctions
Rappels sur les fonctions logarithme et exponentielle
Fonctions de plusieurs variables derivees partielles
- Differentielle d une fonction d une ou plusieurs variables

III Etude du cercle parabole hyperbole ellipse
Integrale definie et indefinie
Calcul d integrales simples
- Applications aux calculs d aires planes
Equations differentielles du premier ordre a variables separees lineaires
Equations differentielles du second ordre lineaires a coefficients constants

3 3 2 PHYSIQUE
(50 Heures)

I Optique Geometrique
Loi de Descartes
Miroirs sphériques et Plans
Dioptres spheriques et Plans
- Lame a faces paralleles
Instruments Lo ipe et microscope
II Hydrostatique - Hydrodynamique
- Electrocinetique
+ courant electrique
+ intensite
+ densite de courant
+ energie et puissance electrique
+ loi d Ohms
+ loi de Joule generateurs recepteurs

III Circuits electriques lineaires en courant continu
Loi de Kirkoff, Theoremes de superposition
- Théoreme de Thevenin Norton
- Regime quasi-stationnaire sinusoidal

IV - Electrostatique
- Electromagnetisme

V Ondes dans un milieu materiel
- Interférence
- Ondes electromagnetiques

VI Propagation de la chaleur
+ conduction
+ rayonnement
+ convection

ENSEIGNEMENT DIRIGE ET PRATIQUE

3 3 3 CHIMIE GENERALE
(50 Heures)

I Atomistique
Constitution de l atome (nombre de charge nombre de masse representation d un element)
Element masse atomique notion d isotope isobare
+ Configuration electronique nature des elements classification periodique
Liaison chimique ionique covalente notion de valence liaison hydrogene

II - Oxydo reduction

III- Acides bases sels

IV Etude de quelques elements chimiques (sodium potassium bore calcium)

V - Elements de la chimie organique (les grandes fonctions)
Les elements elaborees par les plantes
+ Hydrates de carbones (oses et osides)
+ Terpenoides (huiles essentielles oleoresines, gommes)
+ Flavonoides et les composes phenoliques
+ Alcaloides
+ Acides amines (proteines)
+ Matieres grasses (lipides)
+ Pigments
+ Nucleosides nucleotides acides nucleiques

VI - Mecanismes reactionnels observes dans la chimie des produits naturels

VII - Role de phosphate en biogenese

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ENSEIGNEMENT DIRIGE ET PRATIQUES

Dosages (acide base) (oxydo reduction)
Titration par precipitation
- Mineralisation
- Screening phytochimique

MODULE SCIENCE EXACTE
(Deuxieme Annee)

3 3 4 MATHEMATIQUE

I - Algebre et analyse
Series numeriques series entieres
- Complement de calcul integral (integrales doubles et triples)
Complement d algebre lineaire (valeurs propres vecteurs propres)

II Probabilites et statistiques
Elements de calcul des probabilites Lois usuelles
- Estimation Test d hypothese

III - Statique interferentielle
Tests usuels test du khi deux Student de Fisher
Analyse de la variance
Initiation a l analyse en composantes principales

IV Statistique descriptive
Initiation a l analyse en composantes principales

3 3 5 INFORMATIQUE
(70 Heures)

I Le langage algorithmique

II - Analyse et programmation en Basic (initiation)

III Utilisation d un micro ordinateur compatible PC
emploi d un editeur professionnel
gestion sous MS - DOS
initiation au langage Basic

IV Fichiers et gestionnaires de bases de donnees (initiation)

V - Initiation au langage Pascal

MODULE SCIENCES HUMAINES
(Premiere Année)

3 4 1 EDUCATION ENVIRONNEMENET
(50 Heures)

Objectif : "Alphabetiser en matiere environnementale c est a-dire faire acquerir les savoir les habiletes et les savoir etre que tout honnete ' citoyen doit posseder a propos de l environnement proche ou lointain

- Developper des outils d'analyse, de reflexion et d'action pour la comprehension la prevention et la correction des dommages subis par l environnement (recherche d'action concrete ou tout eu mois d une reflexion approfondie avec les solutions preventives curatives ou alternatives aux problemes environnementaux)

I Situation de l education environnementale
Education formelle (enseignement generale enseignement technique specialise)
Education non formelle

II Problematiques de l education environnementale
Genese et philosophie du PAE
Complexite du phenomene environnemental
- Contraintes et opportunites

III Strategie pour l elaboration d une politique de l education environnementale
Le contexte
Le contenu
Strategies et objectifs

IV - Psychosociologie
Definition
Quelques concepts de base (normes et modeles sociaux)

V Problématiques du changement
Le concept de personnalite de base
Transformation des contextes et des rapports humains
Modeles traditionnels et progres technique

VI L intervention psychosociologique (theorie methodologie les moyens)

MODULE SCIENCES HUMAINES
(Deuxieme Annee)

3 4 2 DROIT DE L ENVIRONNEMENT
(50 Heures)

I - Introduction
- Definition et champ d application
Sources du droit de l environnement

II Caracteres generaux du droit de l environnement
- Problemes et politique de l environnement
- Grands principes du droit de l environnement
Droit de l homme et de l environnement

III Organisation administrative de l environnement
- Administration administrative de l environnement
Administration territoriale
O N G et la protection de l environnement

IV Droit de la nature et de la pollution industrielle
Protection des especes animales et vegetales
Les bois et forets
Le droit de la pollution industrielle

3 4 3 ANTHROPOLOGIE GENERALE
(50 Heures)

I Definition

II- Esquisse historique

III Les grandes disciplines

IV- Fondement de l Anthropologie sociale et culturelle

V Emergence des societes humaines a partir des societes animale
notion de prolongement de l organisme humaine
- notions d evolution de l espece biologique humaine

VI Evolution des societes humaines depuis les plus primitives (australopithecus et Homo habilis) aux formes modernes (Homo sapiens fossilis)

VII La societe et sa structure definition et generalite

VIII Aspect ecologique de la societe

IX Aspect demographique de la societe

X Les activites economiques

XI Les rapports sociaux

XII Les superstructures

XIII Les pressions humaines
les relations entre l homme et son environnement
le rapport entre le developpement d une population et la protection de la nature

ENSEIGNEMENT DIRIGE

I Les methodes d approche d une population les techniques d enquetes
L observation participante et systematique
L interview (entretien non directif et dirige)

II - Etablissement des fiches d enquetes

III Conscientisation d une population

IV Sensibilisation d une population

V- Analyse de documents

VI Projections

VII Debats

MODULE COMMUNICATION
(Premiere et Deuxieme Annee)

3 5 1 FRANCAIS
Premiere semestre

- Rappel des formulations grammaticales courantes
Les liens sociaux (saluer se presenter s excuser se plaindre ect)
- Les liens sociaux (tenir une conversion discuter argumenter convaincre etc)
Rediger les lettres (plusieurs formes de lettres de base)
L identite portrait physique et moral occupations
- La societe realites et changements
L environnement realites bienfaits mefaits des actes sociaux solutions
- Recapitulation generale

3 5 2 Deuxieme semestre

- Renforcement des liens sociaux (conseiller suggerer refuser se justifier manifester ses opinons

Rediger des lettres (commenter, faire des compte rendus rediger des rapports ecrire des lettres administratives lettres officielles)
- L'identite affirmation de l age aspect psychologique et virtuel du Soi , identite sociale et culturelle connaitre et affirmer sa personnalite

La profession se connaitre connaitre son travail competence concurrence bataille pour la qualite echec
- L'environnement approche pratique de theme et négociation strategique des solutions
Recapitulations generales

3 5 3 ANGLAIS

LEVEL ONE

I - Themes topics

1 Environnement
Definition/ The malagasy environmental heritage

2 Environmental degradation
Its causes bush fire deforestation excessive farming ect
Pollution soil erosion

3 Environmental protection / conservation
The importance of national parks / protected areas and nature reserves
Free plantations on a wider scale
Environmental education
Conservation and local communities
- Sustainable development and conservation ect

II FUNCTIONS

Greetings / welcoming / leave taking
- Introductions
- Closing conversation
Asking for / giving information
Asking for / giving directions
Apologizing / Thanking
Expressing opinions
- (Dis) likes
Telephoning

III STUCTURES

Will be dealt with in context i e as they come up in the different texts or situations presented to the students

LEVEL TWO

1)

I Themes / Topics
- Case studies on themes / topics seen earlier (level
The greenhouse effect
Greenhouse gases
- The ozone layer at risk
Environmental protection on a global basis
On the Rio Earth Summit
Threats to nature
- On the Amazone rainforests / the antaretica

II Functions
Review of functions seen at leves one
(Dis) agreeing
Making suggestions
- Enquiries about language
- Asking for clarification
Offering food and drink
Ordering at a restanrant
Inviting

III Structures
Will be dealt with in context

COMMUNICATION
(Premiere et deuxieme semestre)
PLANS D ENSEMBLE

I Notion theorique
Theorie generale sur la communication (types de communication)

II La communication avec les petits groupes (inter personnelle)
Communication orale
Communication ecrite

III La communication des masses (mass media)

Propagande Publicite

RECTIFICATION DU PLAN DE COURS PROPOSE

MODULE SCIENCES EXACTES

Etant donne le but vise par la formation (formation professionnelle de courte duree) nous avons choisi et selectionne des cours entierement pratiques permettant d acceder directement dans la vie active

Plan de cours propose'(premiere et deuxième annee)

3 3 1 - MATHEMATIQUE (50 Heures)

I Generalite sur le calcul des erreurs
Application aux determinations courantes du Laboratoire

II Les methodes statistiques
Notion de hasard de frequence de probabilite
Variation des resultats individuels a l interieur d une population
Epreuves d ajustement d independance d homogeneite
Notion de precision experimentale Calcul du nombre de repetitions necessaires pour obtenir une precision donnee

III Principes generaux de l experimentation scientifique

IV Application aux recherches de physique et de chimie de l environnement

3 3 2 CHIMIE (50 Heures)

I Amenagement d un Laboratoire

II Recommandations preliminaires
Echantillonnage et stabilisation de l echantillon en vue de l analyse
Expression et representation de graphique des resultats

III Pesee

IV Chauffage fusion calcination sublimation et refrigeration

V Dessiccation

VI Precipitation decantation, filtration et centrifugation

VII Decoloration clarification et defecation

VIII Solvants dissolution mesure des solubilite

IX Distillation

X Extraction

XI Cristallisation

XII Dialyse et electrodialyse, ultrafiltration

XIII Poids specifique

XIV - Point de fusion

XV Point d ebullition

XVI - Viscosimetrie

XVII - Polarimetrie et saccharimetrie

XIX Colorimetrie

XX Determination du pH

3 3 4 INFORMATIQUE (70 Heures)

1 Le langage algorithmique
2 Analyse et programmation en Basic (initiation)
3 Utilisation d un micro ordinateur compatible PC
emploi d un editeur professionnel
gestion sous MS DOS
initiation au langage Basic
4 Fichiers et gestionnaires de bases de donnees (initiation)
5 Initiation au langage Pascal
6 Bureautique Traitement de donnees

4 SANCTION DES ETUDES

A l issue de la formation un diplome de techniciens superieurs en environnement est delivre aux etudiants admis (Moyenne generale superieur ou egale a 10/20 sur l ensemble des 5 modules) y compris les memoires de fin de stage

Appendix 13 – Presentations by PI Dr Patricia C Wright

Presentations by Patricia C Wright

1998 Invited Lectures

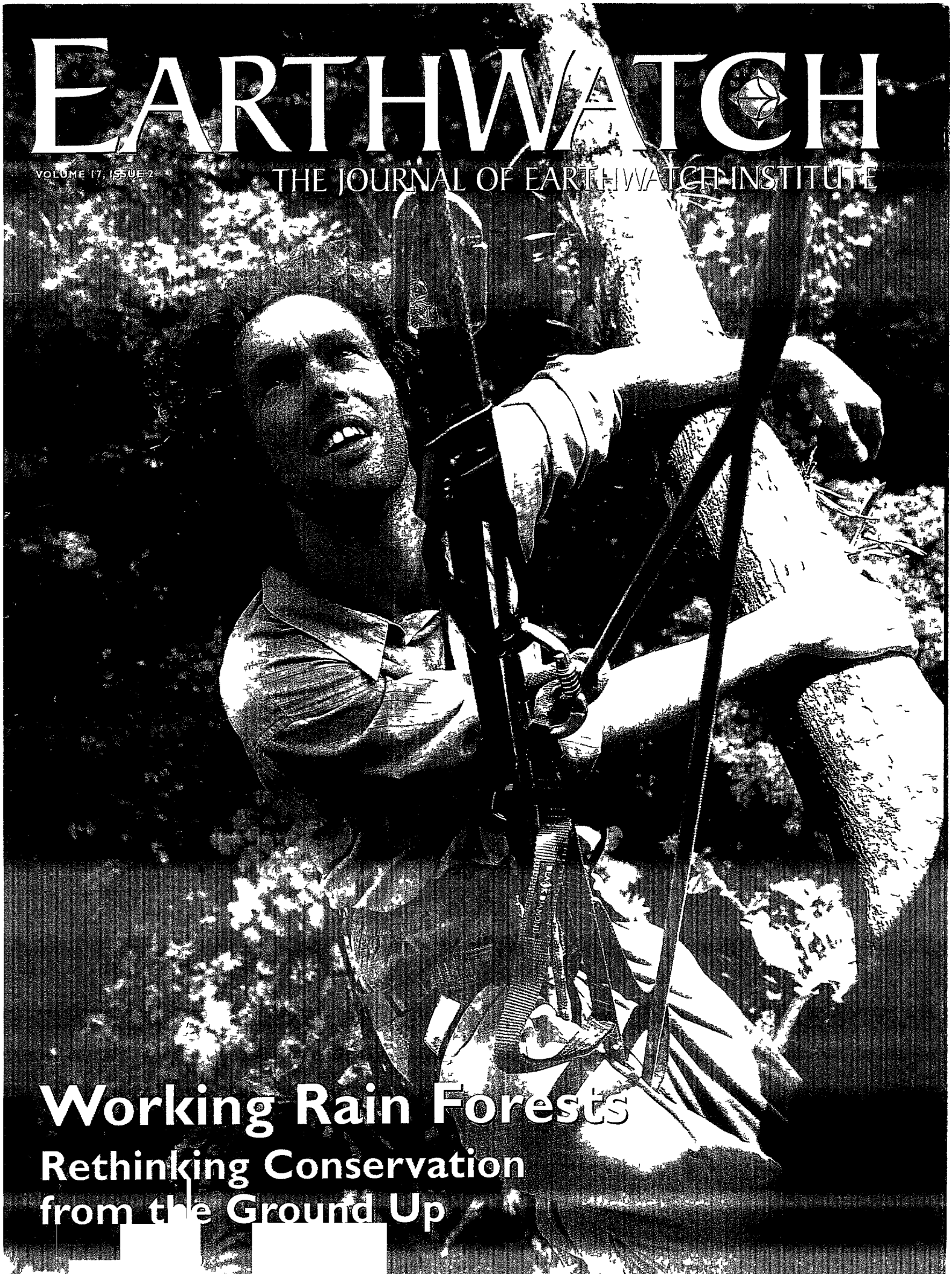
March 2	Biodiversity in Madagascar Ranomafana National Park, Yale University Forestry School, New Haven
March 9	The Social Lives of Lemurs Treasures of the Malagasy Rain Forest, Smithsonian Institution and Audubon Society, Washington DC
March 12	Field Museums Linking People with the Environment in Madagascar, The Field Museum, Chicago
March 19	Ancient Human Cousins Lemurs of Madagascar, American School of Santa Fe, New Mexico
May 7	Lemurs Research in Madagascar, American Museum of Natural History, New York
May 12	Biodiversity and Conservation in Madagascar, Institute of biotechnology, University of Helsinki
May 13	Biodiversity of Madagascar, Royal Geographic Society, London
May 14	Ranomafana National Park, Jersey Trust, Channel Islands, UK
October 6	Saving the Lemurs and Rain Forests of Madagascar, Woodland Park Zoological Gardens, Seattle

Appendix 14 – *Earthwatch* article A Park for the People, by Peter Tyson

EARTHWATCH

VOLUME 17, ISSUE 2

THE JOURNAL OF EARTHWATCH INSTITUTE



Working Rain Forests

Rethinking Conservation from the Ground Up

A Park for the People

by Peter Tyson

Eighty percent of Madagascar's plants and animals are found nowhere else. Yet slash-and-burn farmers have destroyed 80 percent of the island's forests and other habitats, together with the species that live there. To stop the ongoing destruction, scientists need to find ways for humans and wildlife to live sustainably on remaining resources. To do that, they need comprehensive data on habitat requirements of animals like lemurs, and they must offer people advice on alternative means of making a living. With her Earthwatch teams, Dr Patricia Wright is doing both—and is changing the course of conservation in Madagascar.

©FRANS LANTING / MINDEN PICTURES

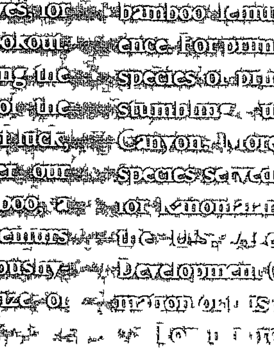
Tanala woman carrying goose to market.

A golden bamboo lemur in Ranomafana National Park.

"You have all the luck," said Dr. Patricia Wright, standing in the dappled sunlight of the rainforest floor, arms crossed, beaming. With her slightly Oriental eyes and relaxed pose, she seemed as serene as a Buddha, though her outfit of green field pants, tan field shirt, and binoculars ran more toward Smokey the Bear. She was leading an Earthwatch team on an orientation hike through her research site at Ranomafana National Park in southeastern Madagascar. A mountain rain forest covering some 100,000 hectares of steep ridges and [illegible] Ranomafana lies on the eastern edge of the escarpment that runs [illegible] down the center of Madagascar [illegible] the home of two tribes of Malagasy, as the people of Madagascar are known. [illegible] the country's [illegible] [illegible]

The newly arrived team was there to further Wright's behavioral study of the Milne-Edwards sifaka (*Propithecus diadema edwardsi*), a beautiful black-and-white lemur with crimson eyes, for which we were then on the lookout. But only a half hour after leaving the research cabin on the edge of the Namorona River, we had a bit of luck, as Wright said. For right over our heads, in a stand of thin bamboo, a group of golden bamboo lemurs appeared. Round-eyed and bushy-tailed, they were about the size of house cats, and just as [illegible]

[illegible] golden bamboo lemur is an [illegible] proportions. [illegible] only from this rain forest and another farther south in Madagascar. It is one of the rarest [illegible]



mates on Earth. Before Pat Wright and German biologist Bernhard Meier, working independently, discovered it in these forests in 1986, the golden bamboo lemur was unknown to science. For primatologists, finding a new species of primate is like an explorer stumbling upon another Grand Canyon. More importantly, the new species served as a [illegible] symbol for Ranomafana that helped convince the U.S. Agency for International Development (USAID) to fund a [illegible] [illegible]

PETER TYSON

I stared in awe for the golden bamboo lemur is an animal of almost mythic proportions

already have biographies written about her, for her life story is remarkable A Brooklyn housewife, mother, and part-time social worker for ten years after graduating from Hood College in 1966, Wright had two experiences that would radically change her life The first was the day she casually stepped into a Manhattan pet store and, smitten by a South American night monkey, bought it for $40 She became fascinated with the monkey and even went to Peru to find it a mate Two weeks after she gave birth to her daughter Amanda, the female night monkey too, gave birth The second event was tragic When Amanda was two Wright gave birth to another baby girl, but she died within days As I lay there in the hospital, I made a decision, Wright says "If I couldn't do what I wanted to do—have two kids—I would do what I second most wanted to do, study night monkeys "

Wright made up for lost time Between 1976 and 1985, when she earned a doctorate in primatology from the City University of New York, she studied the ecology and behavior of primates ranging from yellow-handed titi monkeys in Peru to tarsiers in the Philippines She first began working in Madagascar in 1984, and in 1989 was awarded a MacArthur "genius grant" to help her realize her goals at Ranomafana

An hour into our jaunt, just after we descended a sheer ridge and came out in a clearing by a marsh, a group of "Props" suddenly materialized 'Props' is how Wright abbreviates the Milne-Edwards' sifaka's scientific name, *Propithecus*, pronouncing it with a long 'o' One settled down in a bush not three meters into the forest and watched us as it languidly munched berries Its dense fur was a dark chocolate brown, save for an off-white band around its midsection, and it had a long thin tail It also had a red collar and a red tag for easy identification Red Red as he is known is an older male But he is not dominant That role is reserved for females, not just in this species but in all lemurs As each of us familiarized ourselves with our research subject, which we were to follow all day for five straight days, once the first week and once the next Wright told us about a young male Prop that left its group to join a group of females

As the relationship was developing he would get lost in the territory and get panicked,' she said, sweeping her eyes conspiratorially over the group "He would call and call, and the females would just sit there They knew he was really getting lost, and they could see how panicked he was But they didn't answer He d get more panicked, and they'd just sit there Finally, when he was just becoming frantic, they'd give one answer and he'd come back, acting like Thank God I found you, I found you ' And they'd act like, 'Yeah, we're dominant, we're the leaders Don't ever forget that "

Glancing at Wright speaking with easy confidence to the team, I couldn't help but feel that story is, to a large degree, autobiographical

Conservation has a long pedigree in Madagascar Seeing how fast his country's forests were falling Radama I, one of the Malagasy monarchs that reigned until the French colonized the island in 1895, forbade the cutting of trees in the early 19th century A century later, in 1927, the French created a protected areas system, preserving select habitats around the island

But after independence in 1960, concern for the environment dwindled, as the new Malagasy government and its people struggled to make ends meet Things only got worse in the 1970s, when successive political revolutions ended with the installation of a socialist regime in 1975 Most foreigners were forced out of the country, and a 17-year period of isolation began Conservation groups declared Madagascar, a 1,600-kilometer-long ark of plants and animals found nowhere else on Earth, an international conservation priority Yet all hope for stemming the deforestation, which has consumed some 80 percent of the island's original habitat, seemed lost

In the early 1980s, scientists and conservationists finally began making headway with the Malagasy government These efforts eventually led to the world's first national environmental action plan in 1989 and, a year later, the founding of the National Association for the Management of Protected Areas Known by its

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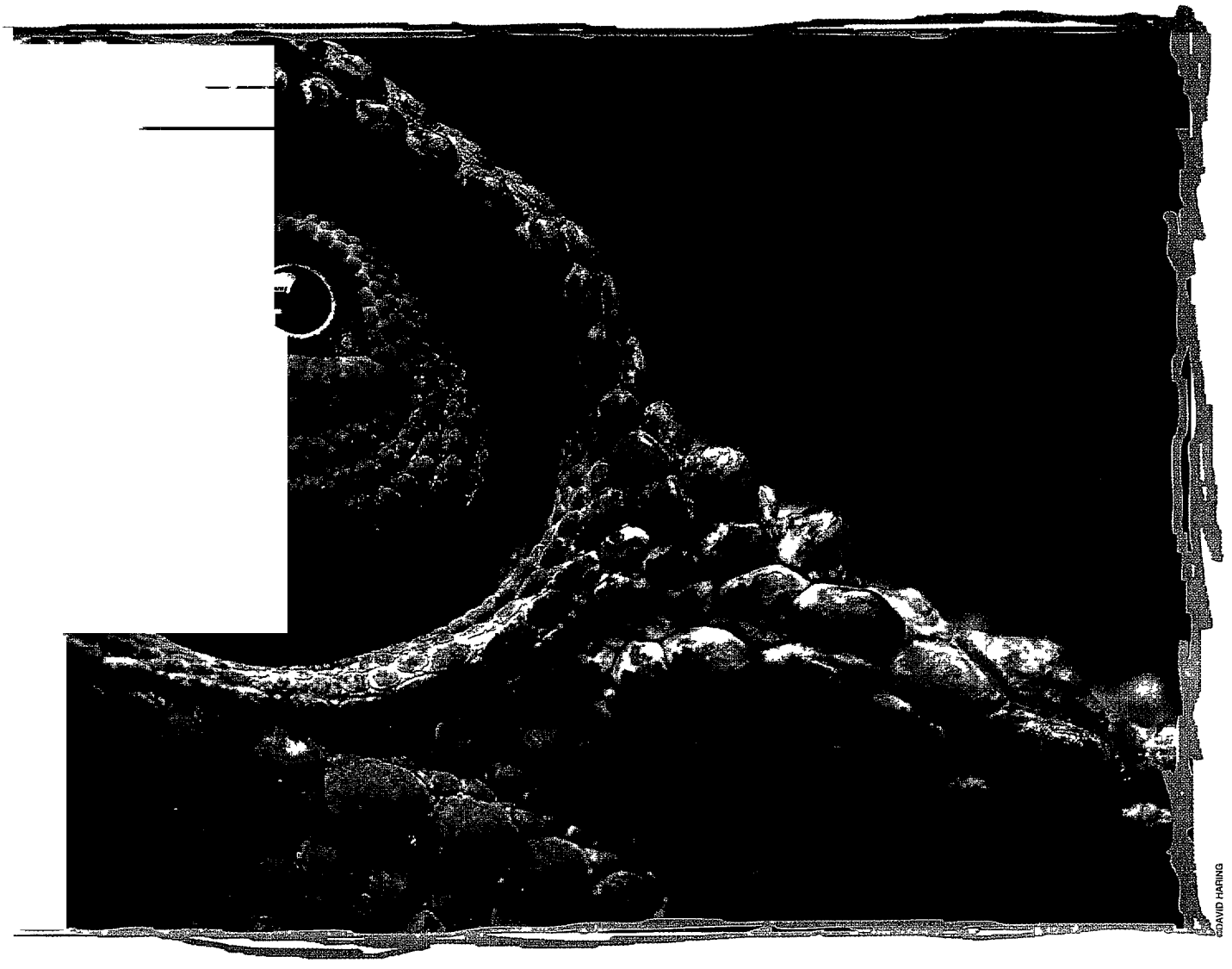

Malagasy acronym ANGAP, the organization serves as the national park service ANGAP selected nine protected areas, including Ranomafana, as sites for so-called integrated conservation and development projects

In many ways, Ranomafana, with its riches and its problems, is a microcosm of Madagascar And if one wants to see a model of sustainable development—that is a place where poor people can improve their lives without compromising their natural resources —one can hardly come to a better place than Ranomafana Or so Pat Wright would have you believe

Protecting some 41 000 hectares of lowland and montane rain forest Ranomafana is surrounded by a "peripheral zone ' a three-kilometer-wide area in which the residents of 93 Betsileo and Tanala villages are able to make use of forest resources for house building, fuelwood, and medicines Within the park and peripheral zone, Wright and her Ranomafana National Park Project which she launched in the late 1980s and now ANGAP which officially assumed management control over the park in 1997, focus on three areas park management, biodiversity research and community development I had come to investigate each of these key elements to see if what Wright says is true

One sunny afternoon our Earthwatch team visited the Technicians for Ecological Monitoring Made up entirely of Malagasy recruited from local villages the technician program is one of Wright's chief successes at Ranomafana and an important component of park management At seven sites at different elevations, the five technicians and their assistants monitor the health of the park by checking periodically on five target subjects—birds insects, chameleons, small mammals, and plants—to see how Ranomafana and its visitors affect them over time They supply these data to ANGAP to improve park management

The project van drove us up the escarpment along a serpentine road Thick rain forest pressed down onto the road to the right, while to the left far below, the frothing Namorona crashed through a gorge We arrived at a metal bridge over a Namorona tributary where the technician team by prearrangement with Wright, led us

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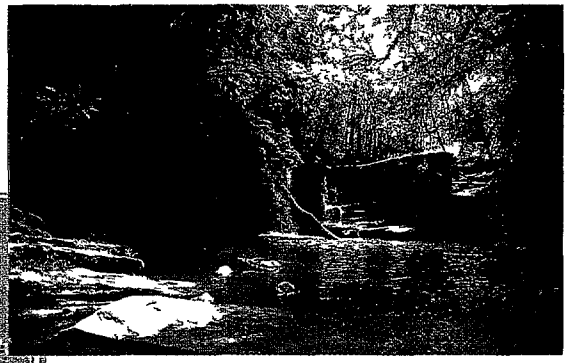

PFEFFER TYSON

> Who better to take the pulse of a place than the people for whom it is home?

into the forest We were at a higher altitude there—perhaps 1,200 meters — and the forest canopy was lower, only 12 meters high or so It was montane forest as opposed to the lowland forest around the research cabin where we were encamped Many of the trees had lost their leaves, and the tall bamboo grass that covered the ground was dead, killed by a rare hail several weeks earlier It was a tinder box in there, and so unlike typical rain forest that it was eerie

Before I had a chance to work up a sweat we stopped at a black-mesh net strung between two trees Here the technicians explained what they do in English, which they learned from years of working with Western researchers Twice a year in the wet and dry seasons, they descend on such sites to monitor the five target subjects There are seven sites within the park, each representing different habitats, elevations, and degrees of human disturbance, and each is paired with a companion site in the adjacent peripheral zone

Most of the technicans were endearingly shy about speaking in English before a dozen foreigners But not Emile Rajeriarison, a 30-something local Malagasy Wearing a Zoological Society of San Diego sweatshirt and green Ranomafana cap he looked the part of native field researcher, and he played it with aplomb With his mildly pointed face and unshaven cheeks angling down to a bushy goatee, he looked more Arabic than Indonesian or African (the two dominant ancestral groups of the Malagasy) He explained that the black net is a malaise trap for catching flying insects at night They fly into the net, then instinctively fly up, where they are stopped by an overhanging portion of the net This flap arcs upward to a light attached to a branch When they fly toward the light, they end up as specimens in a bottle affixed to the corner of the net He takes all insects back to the lab, where he identifies them by family

Peering into the bottle, Rajeriarison stuck his finger in and began vigorously scraping out ants that had crawled inside

"I like ants, but I don't like them to eat my specimens," he said gently and was surprised when he got a laugh out of his audience He then yielded the forest floor to the other technicians

Looking at those modest men, those largely self-taught naturalists, I thought if anyone will save Madagascar, it will be these people Not foreign scientists or development experts or conservationists, even ones as well-meaning and hard-working as Pat Wright Not even university-trained Malagasy from the capital, but these regular people, these local people Their enthusiasm for their work and their implicit understanding of its value shone through in their brief speeches Who better to take the pulse of a place than the people for whom it is home?

When the speeches were over, Rajeriarison led the way back to the road down a different path The unobstructed sun we'd had for several days shared the sky with some threatening cumulus clouds Would I finally see some rain in this rain forest? I chatted with Rajeriarison about the Malagasy wildlife he knows so well When I told him that the leaf-tailed gecko is my favorite animal in Madagascar, he turned, flashed a knowing smile, and nodded

"And how about the leaf-nosed snake, I asked with the females having those wonderfully pointed noses?

Rajeriarison said nothing I followed him down an incline and over a narrow stream slightly disappointed that our banter had ended Had he heard me?

Actually' he said quietly almost as an aside, 'I think the male has the pointed nose and the female has the leaf-like nose '

I had to smile He was right, of course Rajeriarison may not have a university degree, or any formal education past the third grade for that matter But he arguably knows as much as any Western-trained naturalist How many specialists with his depth of knowledge would be so self-effacing? When I told Wright about the incident later, she laughingly said, "He was deciding whether to be polite, but the scientist in him won out "

Ecological monitoring is but one piece of the pie when it comes to biodiversity research at Ranomafana Researchers have flocked to the park, for even within Madagascar, one of the world's top five megadiversity countries according to Conservation International, it is extraordinarily species-rich Botanists from the Missouri Botanical Garden, surveying in one-hectare plots in Ranomafana, counted 37 families and 105 species of trees That is more diverse than lowland rain forest in Madagascar's vast neighbor, Africa, where botanists in Gabon counted 29 families and 99 species

One of the animals I came across in Ranomafana's rain forest is, curiously enough, the domestic cow Wright told me that locals have hidden their cattle in the forest ever since nonlocal Malagasy, brought in during the mid-1980s to help cut timber, stole virtually every cow in every village During initial planning of the park, villagers pleaded with Wright to allow them to keep their livestock in the forest She agreed on a five-year moratorium to study the bovine impact

A visiting scientist identified seeds

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The annual per-capita income in Madagascar is less than $250 making participation in conservation efforts by local people such as the Malagasy man at right difficult even with the best intentions To help preserve Ranomafana, left and other intact ecosystems in Madagascar scientists and conservationists are striving to give local people an economic take in conservation

and leaves within cow patties and determined that the cows hang around marshes and eat very few plants in the forest proper So Wright and village elders agreed to allow all cattle currently in the park to stay but not to add any more "So everybody's happy," she said "Research said it was okay'

Ah, I thought, if this is what biodiversity research is all about, I'm all for it I'd been sitting on my duff watching Yellow Silver, a young male Milne-Edwards' sifaka, for an hour He was perched on a vine that stretched horizontally from one thin tree to another a half meter away, so he could lean against one while putting his feet up on the other One hand was draped lazily over a twig I was close enough to see his eyelids (his amber eyes had been closed most of the previous hour) Every five minutes, Ursula Brandon, one of the Earthwatch volunteers, took note of what Yellow Silver was doing sleeping sleeping sleeping Her beeper went off and she scribbled in her notebook again, laughing that it was the same sleeping

"I like ants, but I don't like them to eat my specimens," he said and was surprised when he got a laugh.


PETER TYSON

Wright's study of the demography, behavior, and ecology of the Milne-Edwards' sifaka began in 1986, and it's the first continuous, long-term study of a Malagasy rainforest primate ever undertaken. Like all lemurs, the Milne-Edwards' sifaka has a severely restricted range—in its case, the moist eastern highland forests of Madagascar The species has gone extinct outside a small range centered on Ranomafana, but there in the park itself the species is well-protected and can be easily studied Wright and her helpers have observed the behavior of 33 individuals from 3 groups They also captured 21 of those 33 by shooting them with tranquilizer darts, then, before releasing each one, they fitted it with a colored collar and tag for easy identification

Wright is gathering valuable information on population density, territory size, and habitat needs for this little-known species—data that is essential for wildlife managers to maintain a viable population The Earthwatch volunteers are furthering Wright's long-term effort Each team member follows a selected lemur all day for five consecutive days, taking note every five minutes of what their charge is up to grooming, calling, eating, playing, scent-marking, and so forth

Yellow Silver continued doing but one thing sleeping The sky was clear, and the temperature was a comfortable 22 degrees C Through the thin tree trunks and lightly leaved canopy, I could see a distant hillside of rain forest as well as discrete patches of blue overhead My notebook was brightly lit by direct, warm sun Its warmth, and the monotony of watching that lazy lemur, made me sleepy The soil—dark, moist, richly aromatic—was bed-soft, too The only thing that kept my eyelids aloft was a pretty little paradise flycatcher, a small, orange-breasted bird with blue rings around its eyes, which was flitting about nearby

Eventually, I gave in Breathing in the oxygen-rich air I allowed myself the luxury—one Brandon didn't have poor girl—of dozing off

By the early 1980s, a new conservation ethic had swept the world, including Madagascar It holds that, when preserving places like Ranomafana it is as vital to identify the needs and improve the welfare of local people as it is to improve that of wildlife and ecosystems The two—people and nature—go hand in hand From the start, the Ranomafana project has reflected that philosophy, focusing on four areas of community-based development within the 93 peripheral-zone villages health, agriculture, education, and ecotourism

Despite its natural riches, Ranomafana is not exempt from the poverty that makes Madagascar the eleventh poorest nation on Earth Most people in the area are subsistence farmers who practice *tavy*, or slash-and-burn farming With the regional population having risen 111 percent over the past quarter century, the time fields are left fallow, which should be a minimum of 15 years to let soils recover has decreased to a mere 2 Erosion of the already nutrient-poor soil is widespread, making subsistence living increasingly difficult Yet supplementing income is equally difficult daily wages in the area are pitifully low, running between 2,000 and 4,000 Malagasy francs, or 40 to 80 U S cents

Such poverty shows up in health and education statistics An early health study of 18 villages in the peripheral zone around Ranomafana revealed that households averaged six children, more than 60 percent of whom were underweight, with 17 percent severely malnourished Half suffered from malaria, and eight out of ten had intestinal parasites Education was equally bleak Fully 70 percent of Ranomafana's 6- to 9-year-old children, for instance, had no formal education

In the early 1990s, the Ranomafana Project set up special teams to help improve health and education in the peripheral-zone villages Every other month, the health team delivers medi-

Uroplatus ebenaui right is one of three species of leaf tailed gecko found in the rain forests of Ranomafana National Park At left, Emile Rajeriarison, a Malagasy from the local village of Ambatolahy who monitors insects in the park displays the tools of his trade before leading the Earthwatch team to his montane research site high on a forested ridge

PETER TYSON

"At once I felt overcome with emotion for him."

PETER TYSON

cal care and basic first aid to villages and offers advice on nutrition, sanitation, and immunization They built two new health clinics and renovated the hospital in Ranomafana Town, the largest settlement in the area They also built schools and donated books, blackboards, chalk, and other supplies, the national government furnished the teachers The team teaches children to plant trees and gardens, sing conservation songs, and read stories about Malagasy animals and plants

Wright and the Ranomafana Project also sought to improve villagers' lives by getting them plugged into ecotourism and helping them to increase their agricultural output They hired and trained them to be research assistants and guides inside the park and encouraged them to lead tourists to surrounding villages To promote projects such as building tourist campgrounds and artisan cooperatives, ANGAP splits park-entrance fees which at Ranomafana are about $10, with a committee of representatives from the 93 villages, this amounts to about $10,000 a year Finally, project personnel trained local Betsileo and Tanala to be Agents for Conservation and Development, who visit local farmers and work with them to increase yields and plant crops that do not require cutting down the forest

To learn about some of these farming alternatives, I stopped one afternoon by the office of the agricultural development team As luck would have it, Dr Norman Uphoff was visiting for a few days Uphoff has run the program since 1992 out of his office at Cornell University, where he directs the Cornell Institute for Food, Agriculture, and Development (CIIFAD) A tall, fit-looking man who reminded me of a college football coach, he talked a mile a minute

'How do we get away from this linear model where scientists develop the technology, give it to the extension agents to give to farmers and get them to accept it?' he asked, not waiting for an answer It's a one-way street We're saying, Let's start with farmers own sense of need and bring to bear whatever technology we can, but experimentally Not here's what you should do, but let's try these two things, or you try one and your neighbor tries another We're trying to change the relationship between holders of scientific knowledge and holders of local knowledge, which is important for finding an efficient solution "

Uphoff described some of the alternatives his group offers farmers through the conservation agents To discourage *tavy*, the agents help farmers plant mixed crops, including fruit trees and vegetables other than rice These plants help retard erosion and provide crops that farmers can sell in the market in the lean months before the rice harvest Uphoff's team is looking at off-season crops, such as beans and potatoes, that allow farmers to get another 60-day crop in and also augment their nutrition and income The agents help the farmers build ponds to raise tilapia, carp, and the meaty local crayfish, which are as big as half-pound lobsters Learning has been that two-way street Uphoff implied For example, rice intensification, in which rice seedlings are replanted earlier than usual, enabling farmers to double or even triple their rice production, was discovered by local farmers during a drought and later improved upon by Uphoff's team

As Uphoff began feverishly packing his briefcase—he had to catch a flight to Antananarivo, the Malagasy capital—he suddenly paused and spoke slowly for the first time

"I remember when I first went to the CIIFAD board with this opportunity to work in Madagascar One board member said to me, 'Just remember, Norman, Madagascar is the graveyard of dreams' " Uphoff looked at me and smiled humorlessly "That's the reputation it has, and I can see why We've had our disappointments But we're making a lot more headway than we ever expected "

Just as suddenly, Uphoff returned to his staccato delivery, his hands rapidly slicing the air "There's this farmer we work with He's got fish ponds, fruit trees, mixed cropping I wish I had my photo album to show you where he lives It's a squalid little house, but this guy's got ideas, he's got plans "

One rainy morning I stood before that "squalid little house " It was made of mud and wood, with a thatch roof, and it was small enough to fit comfortably in the bed of

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PETER TYSON

a dump truck The house sat on the only level area on a rain-slicked hillside high above the Namorona Ranomafana National Park began right behind the house I went there with a Betsileo conservation agent named Paul Rakotonirina along with two of Uphoff's staff Earthwatch volunteer Will Wilson and one of Wright's graduate students Beginning about 6 A M , we hiked up there from the road to meet the farmer who had agreed to show us around his two-hectare spread A cold rain was falling and I could barely see the terraced fields all around me from a thick fog that filled the air

The farmer came out of his house He was a small scraggly man Despite the chilling rain all he wore was a woven straw hat a pair of threadbare shorts and a t shirt picturing two bearded black musicians below the logo 'Sly and Robbie World Tour His bare legs and feet were caked in mud His mouth lay twisted open in a leer He had bad teeth, and his expression gave him the look of a simpleton Can this be the farmer Uphoff raved about, I thought—"hes got ideas, he's got plans"?

Rakotonirina, the agent, introduced him as Rakoto Pierre using the last name first as Malagasy do When I told the farmer my name was Pierre too, he smiled nervously and looked at the ground Rakoto stood with his arms crossed against the cold and I could see goosebumps on his biceps I wondered what it would feel like to trade places with him How deep a chill would I feel? Would I be screaming hungry? What would I be thinking?

Suddenly Rakoto spoke He welcomed us to his farm and apologized that his house was too small to accommodate us so that we had to stand out in the rain And he was sorry that his wife and children could not come out to greet us but several of his kids were sick He gestured back toward the house where his wife peered from a tiny window a baby perched on the sill I said *Salama*, and she returned it with a smile Turning back, Rakoto said he would be happy to show us around and answer any of our questions He looked at me for the first time letting his eyes linger as if to say 'Fire away

I immediately regretted my ungenerous thinking about him. Humbled I began asking questions through Rakotonirina Standing in his slippery

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Despite its protected status, the park still suffers incursions by local people.

PETER TYSON

mud yard, Rakoto answered in brief, almost whispered responses The rain smeared the ink on my notebook until Will Wilson handed me one of the Rite-in-the-Rain pens Wright gave out for the *Propithecus* study I felt guilty standing there in my expensive rain gear and waterproof boots while Rakoto shivered in half a layer

He led us around his farm, walking barefoot on the field's raised edges All the things Uphoff talked about were there paddies where Rakoto practices rice intensification, fields of alternative crops such as beans, corn, and cassava, stands of breadfruit, lychee, and other fruit trees There were ponds for fish and crayfish, which bristled with a dark, green reed locals use to make mats Rakoto pointed out other plants I would have missed entirely—lemon grass for making tea, a bushy plant with pink flowers to retard erosion

What he accomplished on two hectares was truly astonishing, yet I couldn't help but wonder how much all his efforts were really doing to improve his life Clearly he remained poverty-stricken. Like most people around the park, Rakoto has no electricity, running water, or material wealth, and he must collect fuelwood at least every other day He told us that he must supplement his meager income from selling his produce by working part-time on another farm.

Before we left, I asked Rakoto if I could take his picture He smiled shyly and prepared to pose before his house Suddenly thinking of something, he shuffled past me to the base of a banana tree, where 15 or 20 seedlings of coffee plants sat in pots fashioned out of black plastic He picked one up and returned to stand in front of the house Looking through the camera's viewfinder, I realized with a start that, having composed himself for the photo by closing his mouth and removing the cold-induced grimace from his face, he was strikingly handsome He stood confident and proud and even managed an impish smile, the first I'd seen

At once I felt overcome with emotion for him The struggle he has to make every single day of his life is heartbreaking Again it struck me, as it has on other occasions in other lands, how close and yet how immeasurably far apart this man and I were I could touch him, he could touch me, we both ate, slept, talked, raised families Yet our lives could not have been more divergent if we had come from different planets Seeing him shiver in the rain, I thought of giving him my rain pants as a gift but wondered if it would be inappropriate I settled on a few pieces of candy for his kids, and with *misoatras* (thank yous) and *velomas* (goodbyes) all around, we set off back down the mountain.

Wright told me she considers herself largely a figurehead at Ranomafana, now that management has been turned over to ANGAP and all these programs—from biodiversity research to ecotourism—are in place and under the control of Malagasy, most of them locals I don't believe her however and I don t believe she believes herself That s not to say Ranomafana would collapse without Pat Wright But she has been the driving force behind most of the park's successes One does have to ask, Will it work over the long term?

It's a difficult question Wright admits there are many problems to solve at Ranomafana Communication, both between project personnel and villagers, and between development experts and scientists, needs constant massaging The tourist infrastructure is woefully inadequate to deal with the 6,000 visitors to the park today, much less the 15,000 to 20,000 expected by 2002 It is hard to find qualified local people to fill administrative posts, and a lack of governmental priority has meant social programs such as family planning are progressing slowly And despite its protected status, the park still suffers incursions by local people Deep in the forest I came upon fresh stumps of trees cut solely to obtain honey, and farmers on the park's fringes continue to practice *tavy* Honey collecting and *tavy* remain significant problems, partly because the success at Ranomafana has lured immigrants into the peripheral zone, and partly for lack of resources to adequately police the park.

Finally, there's the perpetual problem of funding When I asked Wright how the Malagasy government plans to spend funds currently coming in from the World Bank-funded Global Environment Facility, she shook her head "Will they use it to make five more Ranomafanas? That's not what we hear They're going to spread it out all over "

"Too thin?" I asked

"Too vague When you make big money like that too vague, the pirates come out and take it And nothing gets done "

Wright has ideas about what should get done She suggests building a national biodiversity institute to offer centralized training in biology and technology to the future Emile Rajeriarisons of Madagascar Five bio-

Suspended in a world all their own tadpoles above a Ranomafana pond right await their metamorphosis into frogs On Madagascar, all frogs are found nowhere else on Earth At left Tanala villagers hike through the defor ested peripher l one abutting the park As recently s 1992 the landscape pic ured here onsisted c uninter rupted rain fo est

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"What I really want to do is make all of Madagascar a World Heritage Site."

©DAVID HARING

diversity research stations should be established, using as models existing ones such as the Smithsonian Tropical Research Institute in Panama Built within protected areas, these stations would cover the major habitat types, including wet and dry forests, coral reefs, freshwater wetlands, and mangrove forests At each station, Malagasy biologists would oversee biodiversity research, ecological monitoring, protected-area management—all the things Wright has overseen at Ranomafana Malagasy should be given more opportunities to train overseas and more tools to manage their country's biological riches, such as geographic information systems and specimen reference collections Wright also suggests making ANGAP into a bona fide national parks system, with standardized infrastructure, uniforms rules, fees and brochures

To my eyes, the greatest accomplishment Wright and her colleagues have achieved at Ranomafana is the degree to which they have brought local people into the process of conservation and development All the outside funding and experts in the world won't save Madagascar's treasures unless local people have a personal, financially secure stake in conservation People like Emile Rajeriarison and Pierre Rakoto and Paul Rakotonirina Ranomafana is their home Again, who better to safeguard a place than the people who live there?

"What's this? Hi guys!" "What are we looking at?" I asked Wright. We were on a night walk together up the trail from the camp, scoping the foliage for nocturnal creatures, and she was training her headlamp on something high in a tree

"*Avahi*, two They're in a Dombea tree They love Dombea leaves "

I caught sight of them one clump of reddish-brown fur in the cleft of a tree, with two pairs of startled amber eyes aimed ten meters down at us *Avahi laniger*, the eastern woolly lemur The species has very short ears almost lost in its head fur, and a very long red tail But all I could see was one rounded blob of fur Woolly lemurs are nocturnal, our friends were sleeping in

I knew the feeling, it had been a long day I had risen early to join the Earthwatch team on a guided, all-day hike to a Tanala village For several hours we had watched as the village's goateed, 70-something *mpanjaka*, or king, demonstrated his tribe's sacred rituals and then led some elders in a spirited traditional concert featuring dancing, bamboo drums, and an 83-year-old man playing the *valiha*, the zither-like instrument of Madagascar We hadn't gotten back to the camp until about 11 PM Being my last night at Ranomafana, however, I had asked if anyone wanted to accompany me on a night walk. The Earthwatch volunteers had looked at me like my stairs didn't reach the attic and had shuffled off toward their tents without a word But Wright hadn't hesitated for a moment

So there we were, on the trail known as "X" Except for the lemurs, we weren't finding much Perhaps the deepening chill in the air had convinced most creatures to keep a low profile, like those woolly lemurs I began to feel cold myself The trail kept twisting and turning rising and falling through a close marshy forest, like something out of Tolkien Suddenly I felt utterly spent the 19-hour day was finally taking its toll I suggested we turn back and Wright agreed

Irritated by exhaustion and by seeing so few animals, I asked Wright in a cynical tone about the "humanist/ecology" platform on which Madagascar's current president, Didier Ratsiraka, won the election in 1996 During Ratsiraka's first administration, a brutal socialist regime that lasted from 1975 to 1992, human rights and the environment lay at the bottom of the totem pole in Madagascar

"What a joke, eh?" I spat out

But Wright surprised me

'You know what he told me?" she said in a high-pitched, almost incredulous voice, referring to a recent meeting she had had with the President He said 'I've seen the light, and I know the environment is important What I really want to do is make all of Madagascar a World Heritage Site'" Wright spoke the last three words slowly, almost in a whisper "I just listened and I couldn't believe it Because, actually, that's a really cool idea' And she laughed, shaking her head

"Think he's sincere?" I asked

'Oh, yeah, I think he's very sincere It's a crazy idea, but, you know' She paused and looked at me expectantly, her eyes glistening in the indirect light from my headlamp

"Crazy ideas often change the world," I offered

"Yeaaaaah," she said, nodding, and moved off along the trail ■

Peter Tyson is a senior editor of *Earthwatch* With this article, we say goodbye to Peter after nine years of dedicated service He is moving on to work for the internet version of the *Nova* television program Peter produced many wonderful articles for Earthwatch and has been an indispensible player in the steady improvement of our publications He will be sorely missed as a friend and a partner, and we wish him the best. Earthwatch's Endangered Ecosystems Program is supported in part by the Rockport Company To participate on lemur projects at Ranomafana, see page 67 of the 1998 *Earthwatch Research and Exploration* guide

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Hanging on for dear life a juvenile white-fronted brown lemur (*Eulemur fulvus albifrons*), right, clings to a Malagasy man Though this species is at low risk of extinction, other lemurs which are found only on Madagascar, face dire threats from habitat loss and hunting At left, life begins anew on the rainforest floor of Ranomafana

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Appendix 15 – Publicity for DCIHE student Jonah Ratsimbazafy

WILDLIFE PRESERVATION TRUST INTERNATIONAL

The Field Conservationists of Wildlife Preservation Trust International

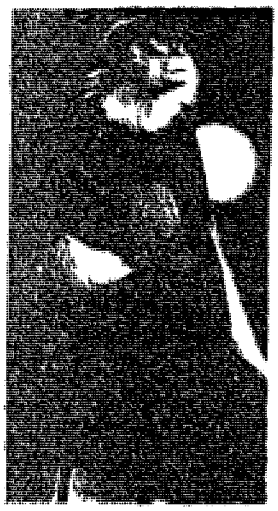
As one of our members wrote recently "It is so encouraging to see the dedication and enthusiasm of the people who have been helped by WPTI, and its supporters and to know what a difference they are making in their countries It is important to keep alive that spark of hope that one person can make a difference, sometimes against overwhelming odds They are proving it can be done!'

Jonah Ratsimbazafy

Here are some of the special people of WPTI, who live alongside the endangered wildlife they are striving to save

Jonah Ratsimbazafy Madagascar Jonah leads a new generation of Malagasy scientists who are studying the effects of forest composition and habitat disturbance on their country's endangered species Last year with WPTI s help he studied the conservation status of black and white ruffed lemurs at Manombo Reserve Next year Jonah will follow up on his discovery that his lemurs may be using medicinal plants to cure themselves when they are sick or injured His finding could result in a whole new rationale for conservation in his country

Garfield Jimmy Basant Jamaica Jimmy Basant s passion in life is to save Jamaica s bird life With a WPTI scholarship Jimmy received his Bachelor s degree as Valedictorian from Grambling University and is now on a full scholarship in a doctoral program at the University of Miami WPTI continues to support Jimmy in his field work on olive-throated parakeets a bird only found in Central America and Jamaica Most parakeet species in the Caribbean have gone extinct Jimmy is conducting a comprehensive study of the breeding biology of the Jamaican population to identify their critical habitat requirements in his home country In the coming year Jimmy would like to expand the scope of his study to include the remaining Central American population of olive-throated parakeets He plans to analyze the DNA from the two groups to determine whether the Jamaican population is a distinct species If it is, it would fall under more stringent wildlife protection laws in Jamaica



PRIMATE CONSERVATION INC. UPDATE

1998

Director's Report

This summer PCI will celebrate our fifth year of giving support to research and conservation projects on the least know and most endangered primates To date we have awarded funding to 75 projects in 23 different countries Over 86% of our budget goes directly to field projects in habitat countries Projects in Asia have received 42% of our funding, African projects 27%, Madagascar 25%, and South America 6% Our grants have gone to study monkeys (43%), apes (22%), lemurs (19%), loises (6%),and tarsiers (5%)

We couldn't have done this without generous contributions Thank you for helping us assist primate researchers in their important work They are some of the hardest working people I know Without their dedication under difficult physical conditions some of these endangered primates will be lost We must do all we can to prevent the extinction of primate taxa Please continue to give generously

Selected Reports from the Field

West Africa

Perhaps the saddest news we have to report is that both the Ivory Coast survey by Scott McGraw and the Ghana survey by Michael Abedi-Lartey for Miss Waldron's red colobus were unable to locate a single individual of this subspecies of red colobus which is known only from this region Although it is not possible to say with certainty that this is the first primate taxon to disappear this century, the likelihood of finding this taxon seems to diminish with time Even the local hunters interviewed had not encountered it recently Though the forests where it thrived 10 years ago are degraded, they are still intact Overhunting for the commercial bushmeat trade has taken a heavy toll on the mammalian inhabitants of these forests and throughout much of Western and Central Africa

Kelly (right) with her field research team and camp staff Photo by T Oates

163 TOWN LANE EAST HAMPTON, NEW YORK 11937 5000 PHONE 516 267 6856 FAX 516 267 2024

Kelly McFarland is studying gorillas in Nigeria This isolated population is found in the most western part of the range of lowland gorillas Kelly is currently studying the diet of these wary gorilla by following their trails, and analyzing fecal samples She is also collecting hair samples from sleeping nests for genetic analysis A recent reanalysis of skull measurements suggests that this gorilla population may have been isolated for a long time DNA studies of its hair may help substantiate the hypothesis that this is a fourth subspecies of gorilla

These gorillas are threatened by local hunters who kill primates, smoke the meat, and sell it Kelley, who's project was partially funded by PCI in 1996, has managed to stop the poaching for the last 2 years She has asked PCI for a renewal grant to continue her research and conservation work into 1999 If you would like to help sponsor her project please call the director

Katy Gonder has been studying the chimpanzees that inhabit parts of Nigeria Western Cameroon Her preliminary results, which were published in the journal "Nature" last fall, indicate that this population of chimps is genetically quite different from the three known subspecies of chimpanzee and maybe recognized as a fourth subspecies when the analysis is completed

Madagascar

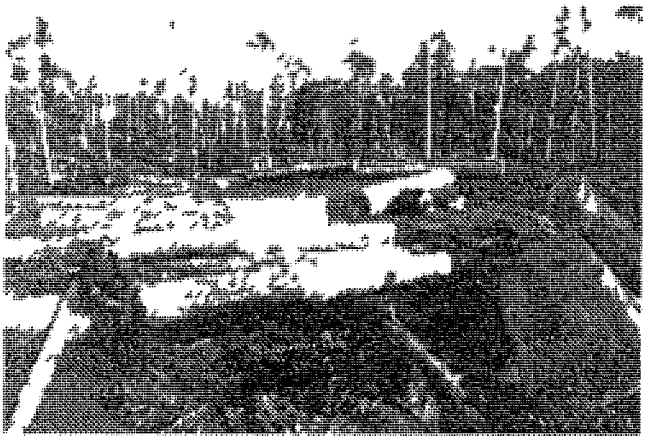
Jonah Ratsimbazafy is a researcher from Madagascar who is working toward a Ph D at SUNY Stony Brook With partial funding from PCI he returned to Manombo Special Reserve in the southeastern part of his country to assess the effects of a cyclone which knocked down 60% of the trees in this reserve The lemurs that inhabit this forest, Including *Eulemur fulvus albocollaris* which is found only in this and one other reserve, are having a difficult time finding enough food They have been seen crossing large grassy areas to get to small patches of forest This is very uncommon behavior for arboreal lemurs Detailed results of his study will soon be published in the journal "Conservation Biology"

It is sobering to realize how vulnerable endangered species are to natural disasters when they are confined to the little islands of habitat that we humans have left for them

Jonah giving a talk to the Springs School in East Hampton New York The class has adopted a school near Manombo Special Reserve and sent pens pencils and other educational materials for their school

Asia

Lisa Pachulli was awarded a grant in 1994 to study the simakobu which is the local name of the pig tailed langur This odd nosed monkey is found only on the Mentawai Islands off the west coast of Sumatra in Indonesia She established the Betamouga Field Station on the remote southwestern part of North Pagai Island which was accessible only by boat, canoe and a 45 minute walk She managed to habituate these monkeys and she is collecting data on their ecology and social system This is one of the few primates that has been reported to commonly live in both monogamous groups and multimale multifemale groups



Lisa sitting on trees that were part of her study site until illegal logging took place in early 1997

In April of 1997 while in the US consulting with her thesis committee, she got word that illegal logging was taking place near her study site She immediately returned to Indonesia to find the loggers had built a road to her study site and had logged half of it Unwilling to give up on the forest and the monkeys she is studying, she persuaded the loggers to stop cutting and negotiated with the owners, the forestry department and the central government She was successful in establishing a 1700 acre protected research area with demarcated boundaries She is continuing her research and doing conservation work with the local villages so that they can make a living without cutting down the forest One idea being pursued is the cultivation of a plant from which patchouli oil perfume is made PCI funds will be used to buy equipment so that the villagers can process this product efficiently

Donations

PCI is funded by tax deductible donations In March PCI received a large cash donation from Pogonias Press which is the publisher of *The Pictorial Guide to the Living Primates* Abigail Barber, the treasurer of Pogonias Press reports that sales of the book have been steady and the book turned a profit in late 1997 and the company was able to make donations to 4 different organizations which help protect endangered primates in their natural habitats

If you aren't familiar with this beautiful book, it is the only book to treat each of the 234 species of primates separately with over 500 color photographs It can be ordered directly from the publisher by calling 1 800 296 6310 If you mention PCI and you will get a 10% discount

Books for Conservation

Tom Plant, one of PCI's supporters, initiated a book distribution project in 1997 and 1998 Primate field researchers and conservationists were contacted and asked to nominate people in habitat countries who would find *The Pictorial Guide to the Living Primates* useful for their work but who were unable to afford it Copies of the book were then sent to the people nominated To date over 80 books have been given to people working to protect primates in 20 countries If you would like to help this or any other project please call the director

Tax Advantages for Donors

Until June 30, 1998 Congress allows a charitable deduction for the full value of a gift of appreciated stock to private 501 (c) (3) foundations like PCI Although it is hoped that this provision will be renewed for another year, this is by no means certain If you would like to make a contribution of stock, please call the director before the end of June

We need your support so we can continue to fund the many projects which are helping to protect and study the least know and most endangered prosimians, monkeys and apes

Sincerely,

Noel Rowe Director

PCI 163 TOWN LANE EAST HAMPTON, NEW YORK 11937-5000 PHONE 516 267 6856 FAX 516 267 2024
EMAIL INTERNET 74227 2342@COMPUSERVE COM

Appendix 16 – LIST OF UDLP STUDENTS WHO HAVE JOBS

UDLP STUDENTS WHO HAVE ENVIRONMENTAL JOBS
Compiled 98/11

UDLP 1994 :

- RANDRIAMANALINA Malalatiana In charge of Ecological Monitoring in Andohahela
- RAJARISON Antoine In charge of Ecological Monitoring in Zahamena
- RAZAFINDRATSITA Tiana Technical Advisor in Ranomafana National Park, ICTE/Stony Brook
- RAKOTOSAMIMANANA Tiana Executive Secretary of IPS/Madagascar
- RAKOTONDRABE Georges In charge of both SIG and Monitoring and Evaluation in Moramanga, working for LDI (Landscape Development Intervention)
- ANDRIAMAMPIANDRASOA Christian In charge of accounting in Ranomafana National Park, ANGAP
- RASOLOARISON Rodin Park Manager in Kirindy (Morondava)
- RASOLOARIJAONA Solofonirina In charge of Monitoring at ORGASYS
- RATSIMIALA RAMONTA Isabelle Professor at the University of Antananarivo (Faculty of Sciences/Botanical Department)
- RAHERILALAO Marie Jeanne ICTE/Stony Brook research assistant
- RANDRIANASOLO Harison Consultant at ONE and ORGASYS, research assistant at ICTE/Stony Brook
- RABENANDRASANA Marc Research assistant at 'Birdlife International', and ZICOMA
- ANDRIAMIHAJA Felicite Maître Assistant at the University of Antananarivo (Faculty of Science, Department of Biological Anthropology and Paleontology)
- RAHARIVOLOLONA Brigitte Marie ICTE/Stony Brook research assistant

UDLP 1995

- RAJOHARISON Liva In charge of Biodiversity at ICTE/Tana
- RAKOTONIAINA Jean Claude Biologist at Institut Pasteur Antananarivo/Madagascar
- RAJERISON Roger In charge of "Monographie Nationale" at ANGAP
- RAZAFINIRINA Ignace Engineer in computer science at 'Ateliers de Capricorne'
- RATSIRAHONANA Serge research assistant at ICTE/Stony Brook
- RAZAFIMBELO Louis Nicolas Inspecteur de police in Antananarivo

UDLP 1996 :

- RANDRIANANDRASANA DENIS ASSISTANT AT THE 'DEPARTEMENT DES SCIENCES ET TECHNIQUE DE L'ENVIRONNEMENT', UNIVERSITY OF FIANARANTSOA

UDLP 97

- TIANA Andriantsihoarana Manantsoa Assistant in Environmental Education at MICET
- RAHAJANIRINA Voninavoko ICTE/Stony Brook research assistant
- RANDRIAMIADAMANANA Fiankinantsoa Mampiandra ICTE/Stony Brook research assistant
- RANDRIANARISOA Jean Samuelson ICTE/Stony Brook research assistant
- SOARIMALALA Regis L ICTE/Stony Brook research assistant, consultant at ONE (Office Nationale pour l'Environnement)

Appendix 17 – *California Wild* article

No Time for Lemurs

by Keith K Howell

Click on the images for full, large view

© 1998 DONG LIN

Over half the world's chameleon species, including this *Calumma sp*, are found only in Madagascar Their eyes operate independently so they can see all around them yet still have binocular vision as they focus on their prey–before zapping out their near-body length tongue in 0 04 of a second

As the Air Madagascar plane crosses the coastline of its homeland, the on-board TV screens come to life to show a men's chorus singing sentimental folksongs There are few Malagasy in the audience, but I see one or two passengers briefly wipe their eyes Below us an expansive plume of red silt stretching far out into the Mozambique Channel overshadows the coastal features It marks the mouth of the Betsiboka, one of the country's major rivers

We follow the course of the river south toward the capital, Antananarivo, and the international airport The water never loses its pomegranate tone, and, from the ruddy scars that mark the steep sides of the tributaries feeding the river, it is easy to see why

These scars, clearly recent, are signs of a landscape in transition It's hard to imagine that this central high plateau was ever forested There is little sign of any vegetation beyond a coarse grassland, and nothing to suggest that this is a land famous for its unique wildlife There is a legend of a conflagration that destroyed vast areas of forest hundreds of years ago But what isn't legendary is the common practice of what the Malagasy call *tavy*–slash-and-burn agriculture As with most tropical rainforests, the soil is severely leached even while the protective canopy is in place What little nutriment that does exist in the ashes of the burned trees is exhausted after a year or two's cultivation.

Today, farmers light their fires higher and higher on steeper ravines, so that much of the exposed topsoil soon slips away Some soil finds a home in the cultivated valleys the rest ends up in the ocean

Madagascar's distinctive plants and animals make the island a magnet for biologists

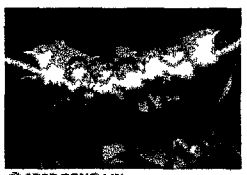
Most of the valley floors and gentler slopes were long ago covered by a network of irrigated rice terraces which, from the air, shimmer in vivid chartreuse The scene is more reminiscent of Asia than Africa, and reflects the origins of the first inhabitants The original Madagascans came to this island not from the adjacent continent, some 250 miles to the west (and populated with modern humans for over 100,000 years), but from southeast Asia, probably from what is now Indonesia Some have argued they came directly, but more likely they leapfrogged around the coast of the Indian Ocean until, only about 2,000 years ago, they discovered this large, fertile, and unpopulated land

Madagascar is a world unto itself When the large southern continent of Gondwanaland began breaking up, about 150 million years ago judging from the age of the Mozambique Channel seabed, the split separating the island and the African continent came quite early in the process Only later did Madagascar part company with what is now India

For some 100 million years the fauna and flora of this island have evolved almost utterly independently of

the rest of the world Estimates suggest that 80 percent of the plants and over 90 percent of the insects are found nowhere else, which is what makes the country a magnet for biologists

The larger animals have long gone, easy prey to early humans Here once lived, *Aepyornis*, the flightless elephant bird standing ten feet tall and perhaps the largest bird that ever lived, the ground-dwelling, gorilla-sized lemur, *Megaladapis*, and the pygmy hippo Today there are few wild mammals, perhaps no more than 100 species, and the largest, a lemur, the diademed sifaka, and the predatory cat-like fossa, weigh less than 20 pounds All the mammals, except those brought by people, and some species of bat, are endemic



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One evening, the expedition members stumbled upon this huddle of sleeping white-throated oxylabes, endemic to Madagascar's undisturbed rainforests

It is the threat to Madagascar's native fauna and flora brought about by the country's burgeoning population–currently 14 million–the practice of *tavy* together with the country's limited economic resources that has created the urgency for biological exploration The Malagasy government, prompted by a report by the World Wide Fund for Nature, and supported by international aid organizations, has begun to conserve and, in places, try to restore the remaining natural habitat, particularly the rainforests

Prominent among the organizations committed to preserving the wildlife is the Institute for the Conservation of Tropical Environments (ICTE), based in Stony Brook, New York The institute was critical in providing the impetus and finding the funds necessary to establish Ranomafana National Park in 1991

Spurred by reports of species diversity and, even more, by the high endemism, it is to Ranomafana, in the country's eastern rainforest that we have set our course I am here to dog the footsteps of a crew of entomologists from the California Academy of Sciences They have come on an expedition, funded in part by the Oracle Foundation, to inventory the park's arthropods spiders and insects The specific focus of the Academy's team is to study the spiders, carabid beetles, Neuroptera–lacewings and ant-lions–and Megaloptera–alder-flies and fish flies

It is appropriate that a computer company should offer its assistance The task of compiling a matrix which will compare the many critical, defining characteristics among the hundreds of thousands of arthropod species is beyond the grasp of mere humans

Nowadays, in every country–and the United States is among the most exacting–the act of collecting animals or plants, alive or dead, is corralled by bureaucracy Permits One to enter a country, another to do research, a third to collect, and, hardest of all, a last to export, for, when foreigners are involved, the bar is raised There are ample reasons why Developing nations recognize that their biota is an economic

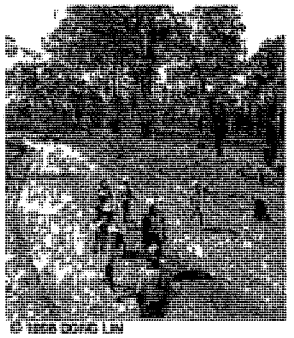
Because the hillsides around Ranomafana are so steep, the original rainforest has remained relatively intact

resource, and one that will become more and more valuable And many of their endemic species are likely to soon become endangered, if they aren't already If animals and plants are to leave their native shores it better be to a good home and for a good reason

Madagascar is no exception to the permit rule We are, after all, expecting to leave the country with up to 15,000 specimens Nevertheless when we meet with National Coordinator Benjamin Andriamihaja, ICTE's main man in Madagascar, the day after our arrival, he assures us that all the permits have been taken care of "There is no reason," he says, "why you can't leave tomorrow " Zoologist Gerald Durrell accurately described Andriamihaja in his book, *The Aye-aye and I*, as "Mr Fixit "

It turns out there was one permit still outstanding, the one for alcohol Many of the specimens, those with "soft parts," need to be preserved in a liquid that will prevent decay Of all the various alternatives, ethanol–ethyl alcohol–is the most efficient, easy to work with, and most easily obtainable Except on a Friday afternoon in Tana (Madagascar's towns all have long names, so most, like Antananarivo, are routinely abbreviated) First, the application requires a justice's approval The first judge told us to come back on Monday, but a trip across town found someone more sympathetic Then comes the harder task of finding ethyl alcohol in sufficient quantities–20 liters Instead we had to make do with rubbing alcohol, the far more lethal methyl alcohol, and four liters of Malagasy rum.

Although most of the journey is on the country's main north-south road, the eleven-hour ride south to Ranomafana deserves to be a PBS special As we leave the city, the road is a river of people It is like a Breugal painting, as though the whole population work, play, and live beside the road, or on it Everyone is individually occupied–washing clothes, fishing, planting rice in one field, harvesting it in another, and hawking between the vehicles everything from fruit to bathroom scales



After the rainforest has been burned, the land is often replanted with non-native conifers or eucalyptus which grow quickly, even in poor soils Their wood is used for charcoal

The road is where two centuries intertwine Beside the 60-foot Mercedes Benz tractor trailers and utility vehicles are rickety carts pulled by hand, lean zebu cattle and even leaner horses, rickshaws ("*pousse-pousse*," locally), ancient vehicles, every one exuding smothering black diesel smoke, and a thousand pedestrians, many, especially the women, balancing baskets and boxes on their heads Of course, there are no sidewalks and even the major roads are only wide enough for two cars to pass How it all gets through unscathed is a mystery, and often it doesn't Accidents are not uncommon

We emerge periodically, untangle ourselves from a morass of limbs and luggage to eat, stretch, and watch our Malagasy companions haggle for fruit and vegetables from roadside venders The food is all displayed precariously potatoes, apples, persimmons in carefully balanced spires

Wherever we stop, we are surrounded by wide-eyed children Half the population of Madagascar is under 16 and the life expectancy of males is only 52–close to the average age of this strange band of bearded biologists The curiosity is mutual

Eventually, we leave the maintained road, and turn east along a 15-mile switchback to be tossed about like a rowboat in ten-foot seas At the edge of the rainforest, we are greeted, appropriately, by a torrential

downpour. By the time we reach the entrance to the park some two hours later, we disembark in pitch darkness and, with our raingear inaccessible, hike, slip, and slide down to the research station, along a trail illuminated by lightning.

Next morning there is not a cloud in the sky. It is a day to recuperate and dry out, not only last night's clothes but most of the stuff still packed in the luggage. Fortunately, the tent sites are well-made and dry beneath oversized tarpaulins.

It's not difficult to find the park's celebrities. Our first lemurs appear in the branches above the tents before breakfast. They are golden bamboo lemurs (*Hapalemur aureus*), a species which was only discovered by science in 1986 and is not thought to exist anywhere else. It was the discovery of *H. aureus*, by primatologists Bernhard Meier and Patricia Wright, founder and head of ICTE, that led, after considerable fund-raising and assurances to the local population that the benefits would outweigh any inconvenience, to the creation of this national park.

The lemurs attract their own band of year-round, round-the-clock researchers, most of them operating under Wright's direct guidance. Besides researchers from America and Europe, a platoon of Malagasy guides monitor the lemurs' movements, socialization, and, with the help of droppings from on high, diet and internal parasites.

But the entomologists have not come here to look at lemurs. Although Griswold has suggested everyone take a day off to acclimatize and reconnoiter, it is hard to hold an enthusiastic entomologist down–and I have yet to meet an entomologist who is not enthusiastic, especially in a forest teeming with undiscovered treasures.

Before the region around Ranamofana could be declared a National Park, the local farmers needed to be persuaded that a park would be in their best interests. Because the hillsides are so steep, they are unsuited to cultivation, and the forest has remained relatively intact.

The Madagascar rainforest is uniquely benign at this time of year. No large mammals, no crocodiles, poisonous snakes, or vicious insects, no armed flora waiting to stab and scratch. There are only two potential adversaries–mosquitoes and leeches. We didn't see, hear, or feel many mosquitoes. They don't come out much in the daytime anyway, and everyone was wrapped in repellent. Leeches, however, were taken seriously, though they're quite harmless and only about an inch long with the diameter of a pencil lead–before they dine, that is. There are two approaches to confronting leeches. One is to be blase, and wear shorts and sandals. The leeches find you, but you can find them equally easily. That's the Malagasy approach. That, and a pouch of tobacco powder to sprinkle on the transgressors so they drop off. The alternative approach is to attempt a defense with long trousers, wool socks, and boots. If it works, fine, if it doesn't... you find out later.

There was one notable occasion where that second approach clearly didn't work. The researcher lifted his

trouser leg after a morning in the forest to reveal 30 bloated monsters gorging at the top of his boot

The scientists will spend almost every day of the next five weeks, from seven in the morning till nine at night, midnight if the collecting is good, scratching trees, turning over rocks and searching through the detritus of the forest for their elusive prey. At one point Griswold, flat on his back for two days in his tent with severe cramps and a temperature of 102° F from one of those microscopic bugs the tropics are infamous for, still could not resist the occasional capture on his necessary excursions.

Charles Griswold's dedication has helped establish him as one of the world's leading experts on spiders. Holder of the Schlinger Chair in Arachnida at the Academy, Griswold has been instrumental in discerning some critical clades–evolutionary relationships–of arachnid families. This part of the world is particularly interesting to him, as one of his specialties is the montane spiders of Africa. He is on the lookout for four particular families: lace-web builders, or Phyxelididae, trapdoor spiders, or Migidae, sheet-web building spiders or Cyatholipidae, and burrowing spiders, or Ududidae.

Each entomologist has his preferred collecting technique. Griswold is a sifter of litter. He carries, folded up in a backpack, an umbrella and a canvas bag that has wire netting across its base. Arriving at a promising spot with lots of leaf litter, Griswold grabs a handful and quickly pushes it into the bag, then shakes the bag over the umbrella, and waits for spider nuggets to fall.

To capture a fallen spider, which might be no more than one or two millimeters long, requires a "pooter," a contraption he has wound around his neck and which looks something between a stethoscope and the Caterpillar's hookah in *Alice in Wonderland*. At the sight of the prey scurrying to the edge of the umbrella, Griswold puts one end of the pooter in his mouth and sucks. The scuttling spider disappears, to reappear a moment later as Griswold blows it into a vial. He will study it later, right now there's another victim to intercept. Griswold can spend most of the day in a single spot. There could be a hundred spiders of a dozen different species all within an arm's length. But most will need to be coaxed from hiding.

Sifters of litter, gleaners of leaves, and ticklers of trees, each entomologist has his preferred collecting technique

Even the webs are not always obvious. Nearby, Darrell Ubick, Griswold's assistant, is contemplating an assortment of epiphytes growing within a buttress of one of the few large trees. Within their folds glisten the threads of a sheet-web. Ubick removes a "puffer" from his vest. A puffer is something like a turkey-baster with its rubber base half-filled with corn starch. A few squeezes of the ball and the gossamer web materializes white as fine snow, revealing by its shape the location of the builder. The suction tube is engaged and another vial is occupied. Ubick wears a safari vest that seems to hold a limitless supply of vials. Their tops are color-coded: green, for spiders found in the trees, brown for those discovered on the ground, and black for those captured at night.

Ubick discovered his affinity for spiders fresh out of high school at an Arizona field station. It took about 15 years to turn his avocation into a career. He is now a curatorial assistant at the Academy.

He slips out a magnifying glass and studies his latest addition. Only adult animals are collected. Although, unlike insects, immature spiders look pretty much like their parents, it is not until that final molt, the last instar, that they emerge in their adult skeleton with their tell-tale genitals. Without the genitals, there is no

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This primitive wolf spider belongs to the genus *Uduba*, found only in Madagascar Shown about life size, this species, which lives in burrows along cliff faces, has yet to be scientifically described

way to accurately compare this find with the descriptions of other spiders

"A juvenile," Ubick sighs, but pockets it anyway, hoping it might mature in the month before he leaves

Meanwhile, David Kavanaugh, tickler of trees, is using a tool like a hand garden fork, its prongs bent at 90 degrees, to scratch the trunk of a ficus tree in ardent search of his favorite quarry Carabid beetles are generally thought of as ground-dwelling creatures, using their strong legs to push through the leaf litter and their speed to overtake their prey But here, Kavanaugh has found that they have moved up into the trees, perhaps outcompeted by ants on the ground In Ranomafana they seem to prefer the recesses of tree bark, and the clumps of dead leaves caught in the branches They need to be unmasked swiftly and deftly if they are not going to crawl even further into the crevices Kavanaugh catches the detritus, the moss, and lichen on his unfolded platform A cockroach–not one of Madagascar's hissing species–scurries for safety unheeded An interrupted ant patrol is ignored, but a lone longhorn wood-boring beetle gives its life for science

Kavanaugh had planned on becoming a medical doctor, but he began collecting carabid beetles on a trip with entomologist and Academy Fellow Terry Erwin and has never stopped He stuck with medical studies a while longer, but his penchant for finding new species proved overwhelming He had found a career "that combined my two favorite activities, mountaineering and insect collecting "

Well over 90 percent of the estimated 20,000 beetle species in Madagascar are endemic Moreover, many of them are thought to be relicts–Gondwanaland fauna which have evolved little over the last 100 million years, so they still resemble ancestors to species found elsewhere in the world, and throw light on the branching of the evolutionary tree

Elsewhere in the forest, Norman Penny, armed with an oversized sweep net, is in search of other prey–not just any insects but delicate lacewings and ant-lions Penny, Senior Collections Manager at the Academy, set his sites on an entomological life while still in grade school Impressed with the fragility and beauty of the Neuroptera, he settled on his unusual specialty 30 years ago in Brazil

Penny calls himself "a gleaner of leaves " He strolls slowly through the forest, swinging his net at patches of foliage With each swing he disturbs a score of bouncing leafhoppers, but he's had his fill of them, and they go unmolested Only the sight of the tell-tale flight of a dusky lacewing will energize his net A swing, a quick twist of the handle, and the catch is landed Penny puts head and shoulder into the opening to block any chance of escape and reaches deep inside to claim his prize Few are keepers

"The Park is already responsible for 25 percent of the local economy "

Nearby, Jere Schweikert, net poised, is concentrating, like a chameleon, its tongue at the ready, on a stick insect At 45, Schweikert is the youngest member of the team and, like most entomologists, he has been an inveterate collector as long as he can remember "I began with coins and stamps," he says Despite graduating in entomology, he spent many years in the urban wilderness before returning to his calling Then after seven years of volunteering, he joined the Academy's staff as a curatorial assistant Schweikert is a generalist, assisting the specialized collectors, but also on the lookout for the interests of other scientists back at the Academy–a wasp here,

a true bug there He even gathers up slime he knows to be rich in diatoms

The first evening, Penny sets out the light trap It's a simple device a white sheet hung vertically in a clearing and illuminated by a bright mercury-vapor lamp and a black light powered by a generator The only difficult part is finding some open space in the tangled forest

It must be quite a shock for the insects in a land empty of electricity to discover this eerie beacon lighting up the woods The sheet was soon aswarm in silhouettes The most conspicuous visitors were the hundreds of moths colorfully striped moths that looked like the flags of nations, moths that resembled geometrical puzzles, one utterly convincing as a fallen leaf, and still others with wings that appeared delicately embroidered No two, it seemed, were the same

It's a pity no one was collecting moths Penny stood there unimpressed, waiting, vial in hand, for a neuropteran to settle At the bottom of the vial are a few drops of nail polish remover, not enough to dampen delicate wings but sufficient to produce a mortal vapor In the lab, scientists would use ethyl acetate, but airlines discourage the transportation of lethal chemicals In the field, nail polish remover works fine


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Expedition leader Charles Griswold uses a "puffer" to highlight a spider's web and reveal the location of the spider

Meanwhile, Schweikert closes in on a hawkmoth, *Xanthopan morgani praedicta*, with a five-inch wingspan and a 9 5-inch proboscis designed for delving the deepest orchids It is reminiscent of an elephant seal's nose The term "praedicta" in the moth's name acknowledges the prediction Charles Darwin made when he came across the deep nectar spur of a star-of-Bethlehem orchid (*Angraecum sesquipedale*), he speculated that for the plant to be pollinated, such moths as this must exist

Nighttime proves the best time to collect ududid spiders Ubick, accompanied by two Malagasy students, Samuelson Randrianarisoa and Marie Jeanne Raherilalao, all become adept at discovering their burrows, small cracks in the ground or the clay walls of steep ravines One species likes to line the entry with silk, another builds a turret of silk above its cave By the end of the trip the spider team has discovered eight ududid species, some previously undescribed, and a rare and undescribed migid, a trapdoor spider

For three members of the group, the next day is Larium day Larium, mefloquine hydrochloride, is the prophylaxis of choice against malaria because in parts of Africa, at least, the other drugs can't be relied on The Larium pill is taken before, during, and for three weeks after the stay Malaria is endemic here and we are given a vivid picture of its effects as, within the first two weeks, three of the Malagasy employees at the park have short, painful relapses, while Randrianarisoa is kept to a makeshift bed for a week, hardly able to move. It is a convincing argument in favor of taking our medicine, and some of us need convincing Larium day looms like a prospective root canal Anxiety, paranoia, and depression have all been reported by people who take it over a long period Sometimes the effect comes sooner Otherwise easygoing, Kavanaugh recalls the heart palpitations after he took his first dose, and the dreadful sense of foreboding that accompanied him the next morning

Larium's specialty seems to be vivid, scary dreams After his first pill in Ranomafana, Kavanaugh went to sleep to find his whole house had been rearranged and all the furniture that his parents and in-laws had discarded over decades was stockpiled in his office My Larium days passed uneventfully, although I do recall one night when someone gave me the head of a lemur It had no fur on it, but was still alive I tried

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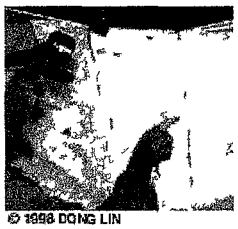
to find someone to give it to, but all the policemen I approached turned out to be doormen from local hotels who were lining the route that some V I P was about to travel I tried the railway station, but wound up in the freight department Finally, I found the passenger platforms, but the stairs which seemed to lead to offices brought me to the top of a double-decker bus

The following morning everyone is feeling better, and we set up Malaise traps–especially "malaise" for the unlucky insects These traps consist of an expanse of thin netting about six-feet wide stretched across a trail Unsuspecting insects that bang into the netting typically crawl upward looking for a way out As they climb they are funneled into a corner of the netting until, just when relief seems at hand, they stumble into a plastic bottle variously filled with ethanol or, if you want to keep your specimens dry, a cyanide chamber To lessen the likelihood of escape, the netting is anchored at the bottom and has sides and a roof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Powered by a generator, the expedition's light trap is the brightest source of illumination for miles around Dave Kavanaugh and Jere Schweikert inspect the evening's insects that have been drawn to the flame

A day later we are traipsing in crocodile fashion through the forest looking for a suitable place to install another type of passive snare, pit traps These consist of a series of small cups, about four inches in diameter, that are put in the ground and filled with a cocktail of water, a couple of drops of formaldehyde, plus a dash of liquid soap to break the surface tension About three inches above each trap, supported by thin wires are lids, which, like the tops of pitcher plants, are designed to prevent rain from diluting the mixture or overflowing the cups, and to deflect falling leaves

Just as the light trap and the Malaise traps require a site hard to find in a crowded jungle–an open clearing–so, in this forest, the pit traps are demanding, too They require level land If Ranomafana had been flat, the trees would have been burned down decades ago But a couple of miles of ascents and descents (in the one-hundred percent humidity) and we reach the bed of a stream and what passes for a plain The pit traps, like the Malaise traps, will stay up for the duration

The cabin where we spent our first bedraggled night has been transformed into a field station a microscope set up for some preliminary identification, and hundreds of vials unpacked, many already half-filled with alcohol The smell of cheap rum pervades the room. On one table Schweikert is painstakingly pinning the insects–flies, wasps, beetles–into what looks like a large cigar box If the insect is more than about five millimeters long, the pin goes adroitly through the thorax Smaller specimens are glued to a tab Each insect gets a label, the date and location of its discovery, attached in minute, yet quite readable handwriting

A week after our arrival we are joined by two Fellows of the Academy, Evert Schlinger, retired professor of entomology at the University of California at Berkeley, and Michael Irwin, professor of entomology at the University of Illinois, and one of Schlinger's ex-students

They descend on us like wolves on the fold, emerging from the truck already dressed in kepi hats, boots, the mandatory multi-pocketed vests and carrying sweep nets Irwin takes a swipe at a traveler's palm, and inspects his first catch of the day Although Irwin makes his living researching the insect pests of America's soy fields, his first love is the study of fast-moving stilleto flies, whose predatory larvae swim through sand like sharks in the sea, snapping up the soft-bodied larvae of other species

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Irwin and Schlinger are only in the country for two weeks and expect to visit sites throughout the south To maximize their time they have coopted the use of a troop of Malaise traps And not just the six-foot variety, some of them are 20 feet wide with death traps at either end Their modus operandi is to traverse a trail–flies, too, prefer trails to dodging tree trunks–until they find an open clearing Flies like the sun Across the trail goes the net, with just enough space for people and understanding zebu to get around

Schlinger is the man responsible not only for creating Griswold's academic position but also for inspiring Griswold's, and Irwin's, passion for entomology He, in turn, was inspired half a century ago on a trip to Africa with the Academy's curator emeritus, Edward Ross who, at 83 years old, still comes to the office every day when he isn't traveling in South America Entomologists, as a whole, are among the most dedicated of scientists They never seem willing to retire and hang up their nets Work and play are all the same

Collections Manager Norman Penny reaches deep into a sweep net to retrieve a lacewing

It's hard to imagine what impression seven single-minded entomologists must have made on the inhabitants of the hamlets which border the park and the nearby village of Ranomafana But the park itself has been well received Despite the difficult access and, until recently, limited accommodation, ecotourists are journeying here in greater numbers each year The park provides employment for guides, *agents de conservation*–who monitor the park's border to prevent forest destruction–and craftspeople Park manager Jocelyn Rakotomalala is very optimistic about its future "The park is already responsible for 25 percent of the local economy," he says "Now, if only we can get the road fixed "

After two weeks, a subtle change in the weather apparent only to insects has improved the prospects for collecting, which up until then had been disappointingly dim That night, with no Moon to distract them, Penny's light trap is crowded with visitors, giant spittle bugs, too many to count, and, finally, carabids, five different species, but the elusive lacewings remain at bay

It is not just the insects that are out Schweikert nets a passing boa–for photography only–and we discover animals watching us from the recesses of the forest, their eyes reflected in the beam of the headlights strapped on our brows

First a nocturnal striped civet, *Fossa fossana*, peers at us as we finish dinner, its long pointed nose smelling the chicken Later, at the limit of the flashlight's beam, I see two pairs of round orange circles glowing from deep within the black jungle They seem to symbolize the uniqueness of Madagascar's wildlife and all the unexplored mysteries of its forest Kavanaugh comes over His headlight, fed by a battery power-pack, is far stronger He follows my gaze and the four burning rings vanish Two mouse lemurs, ideally named, scurry away along a vine back into darkness and safety

But the mongooses, snakes, and lemurs do not distract the entomologists from their mission "We're here to add to that big database and lending library which we call our collection," says Griswold "We are like medieval scholars, beholden to studying the work of our predecessors And some of the people who will one day be most interested in what we find are not even born yet They will be studying the specimens we gather long after we are gone "

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Ongoing Inventory

It will be months before the fruits of the expedition can be accurately assessed, before the voluminous sediment of some 120 pit traps can be painstakingly pulled apart and analyzed However, preliminary results suggest that the scientists have collected up to 150 new spider species, and about 20 previously unknown carabid beetles They uncovered rigid spiders that live in trees, and an undescribed genus of ululbid that lives in the leaf litter without making a burrow

They discovered the critical importance of the Pandanus tree to insect diversity Sheltered under the palm's fronds is a whole community of arthropods, many of them found nowhere else Pandanus, unfortunately, is particularly useful to the local Malagasy, both for making roofs and floor mats

Penny's prizes, though few, may be critical In one genus of ant-lions, only two species were known from Madagascar, and he found three, one new to science And the single alder fly collected might show the relationship between the Madagascan species and those in the rest of the world

Keith K Howell *is the editor of* California Wild

natural connections

For more information about Madagascar and the research referred to in this article, visit the following websites

Vascular Plants of Madagascar

Biodiversity and Conservation in Madagascar

For biographic infomation on the researchers referenced in this article, visit any of these websites

Charles Griswold

Norman Penny

Michael Irwin

Jere Schweikert

Dave Kavanaugh

UNIVERSITY DEVELOPMENT LINKAGES PROJECT

Recipient SUNY Stony Brook

Agreement Number PCE-5063 A 00 3035 00

Date Prepared 11/18/98

SEMIANNUAL EXPENDITURES	Objective Total of all 5 Semiannual Report No 10							
	Previous Six Month Period (corrected figures)				Current Six Month Period			
	Begin 10/01/97		End 03/31/98		Begin 04/01/98		End 09/30/98	
Cost Element	A I D	Recipient/ Others (Non-Fed)	Recipient/ Others (Federal)	Total	A I D	Recipient/ Others (Non Fed)	Recipient/ Others (Federal)	Total
Salaries & Wages	25 511	0	0	25 511	5 721	0	0	5 721
Fringe Benefits	7 526	0	0	7 526	1 683	0	0	1 683
Indirect Costs	0	65 959	0	65 959	0	45 057	0	45 057
Consultants	0	0	0	0	3 972	0	0	3 972
Travel Transportation & Per Diem	1 223	0	0	1 223	112	0	0	112
Nonexpendable Equipment	0	0	0	0	0	0	0	0
Participant Training	0	0	0	0	0	0	0	0
Other Direct Costs	14 157	0	0	14 157	60 020	0	0	60 020
Subagreements (U S Institutions)	3 625	0	0	3 625	55 328	0	0	55 328
Subagreements (Dev Country)	0	0	0	0	0	0	0	0
TOTAL	$52 042	$65 959	$0	$118 001	$126 836	$45 057	$0	$171 893

Signature Federica Haan Berkum Name/Title Program Officer Date 12/2/98

UNIVERSITY DEVELOPMENT LINKAGES PROJECT

Recipient SUNY-Stony Brook

Agreement Number PCE 5063-A-00-3035-00

Date Prepared 11/18/98

SEMIANNUAL EXPENDITURES

Objective 1 of 5

Name Field Training in Madagascar

Semiannual Report No 10

	Previous Six Month Period (corrected figures)				Current Six Month Period			
	Begin 10/01/97		End 03/31/98		Begin 04/01/98		End 09/30/98	
Cost Element	A I D	Recipient/ Others (Non Fed)	Recipient/ Others (Federal)	Total	A I D	Recipient/ Others (Non-Fed)	Recipient/ Others (Federal)	Total
Salaries & Wages	7 654	0	0	7 654	2 162	0	0	2 162
Fringe Benefits	2 258	0	0	2 258	636	0	0	636
Indirect Costs	0	19 788	0	19 788	0	17 032	0	17 032
Consultants	0	0	0	0	1 502	0	0	1 502
Travel Transportation & Per Diem	734	0	0	734	42	0	0	42
Nonexpendable Equipment	0	0	0	0	0	0	0	0
Participant Training	0	0	0	0	0	0	0	0
Other Direct Costs	4 247	0	0	4 247	22 687	0	0	22 687
Subagreements (U S Institutions)	1 088	0	0	1 088	5 532	0	0	5 532
Subagreements (Dev Country)	0	0	0	0	0	0	0	0
SUBTOTAL	$15 981	$19 788	$0	$35 769	$32 561	$17 032	$0	$49 593

UNIVERSITY DEVELOPMENT LINKAGES PROJECT

Recipient SUNY-Stony Brook

Agreement Number PCE-5063-A-00-3035-00

Date Prepared 11/18/98

SEMIANNUAL EXPENDITURES

Objective 2 of 5

Name Training in the U S for Malagasy Faculty and Students

Semiannual Report No 10

	Previous Six Month Period (corrected figures)				Current Six Month Period			
	Begin 10/01/97		End 03/31/98		Begin 04/01/98		End 09/30/98	
Cost Element	A I D	Recipient/ Others (Non Fed)	Recipient/ Others (Federal)	Total	A I D	Recipient/ Others (Non Fed)	Recipient/ Others (Federal)	Total
Salaries & Wages	5 102	0	0	5 102	338	0	0	338
Fringe Benefits	1 505	0	0	1 505	99	0	0	99
Indirect Costs	0	13 192	0	13 192	0	2 659	0	2 659
Consultants	0	0	0	0	234	0	0	234
Travel Transportation & Per Diem	489	0	0	489	7	0	0	7
Nonexpendable Equipment	0	0	0	0	0	0	0	0
Participant Training	0	0	0	0	0	0	0	0
Other Direct Costs	2 831	0	0	2 831	3 541	0	0	3 541
Subagreements (U S Institutions)	725	0	0	725	41 496	0	0	41 496
Subagreements (Dev Country)	0	0	0	0	0	0	0	0
SUBTOTAL	$10 652	$13 192	$0	$23 844	$45 715	$2 659	$0	$48 374

UNIVERSITY DEVELOPMENT LINKAGES PROJECT

Recipient SUNY-Stony Brook

Agreement Number PCE-5063-A-00-3035 00

Date Prepared 11/18/98

SEMIANNUAL EXPENDITURES	Objective 3 of 5 Name Training in Research Methods and Grant Writing Semiannual Report No 10							
	Previous Six Month Period (corrected figures)				Current Six Month Period			
	Begin	10/01/97	End	03/31/98	Begin	04/01/98	End	09/30/98
Cost Element	A I D	Recipient/ Others (Non Fed)	Recipient/ Others (Federal)	Total	A I D	Recipient/ Others (Non Fed)	Recipient/ Others (Federal)	Total
Salaries & Wages	2 551	0	0	2 551	761	0	0	761
Fringe Benefits	753	0	0	753	224	0	0	224
Indirect Costs	0	6 596	0	6 596	0	5 992	0	5 992
Consultants	0	0	0	0	528	0	0	528
Travel Transportation & Per Diem	0	0	0	0	15	0	0	15
Nonexpendable Equipment	0	0	0	0	0	0	0	0
Participant Training	0	0	0	0	0	0	0	0
Other Direct Costs	1 416	0	0	1 416	7 983	0	0	7 983
Subagreements (U S Institutions)	362	0	0	362	2 766	0	0	2 766
Subagreements (Dev Country)	0	0	0	0	0	0	0	0
SUBTOTAL	$5 082	$6 596	$0	$11 678	$12 277	$5 992	$0	$18 269

UNIVERSITY DEVELOPMENT LINKAGES PROJECT

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Agreement Number PCE-5063 A 00 3035-00

Date Prepared 11/18/98

SEMIANNUAL EXPENDITURES	Objective 4 of 5 Name Production of Publications on Research and Development Semiannual Report No 10							
	Previous Six Month Period (corrected figures)				Current Six Month Period			
	Begin 10/01/97		End 03/31/98		Begin 04/01/98		End 09/30/98	
Cost Element	A I D	Recipient/ Others (Non-Fed)	Recipient/ Others (Federal)	Total	A I D	Recipient/ Others (Non Fed)	Recipient/ Others (Federal)	Total
Salaries & Wages	2 551	0	0	2 551	761	0	0	761
Fringe Benefits	753	0	0	753	224	0	0	224
Indirect Costs	0	6 596	0	6 596	0	5 992	0	5 992
Consultants	0	0	0	0	528	0	0	528
Travel Transportation & Per Diem	0	0	0	0	15	0	0	15
Nonexpendable Equipment	0	0	0	0	0	0	0	0
Participant Training	0	0	0	0	0	0	0	0
Other Direct Costs	1 416	0	0	1 416	7 983	0	0	7 983
Subagreements (U S Institutions)	362	0	0	362	2 767	0	0	2 767
Subagreements (Dev Country)	0	0	0	0	0	0	0	0
SUBTOTAL	$5 082	$6 596	$0	$11 678	$12 278	$5 992	$0	$18 270

UNIVERSITY DEVELOPMENT LINKAGES PROJECT

Recipient SUNY-Stony Brook

Agreement Number PCE-5063-A-00-3035 00

Date Prepared 11/18/98

SEMIANNUAL EXPENDITURES

Objective 5 of 5

Name Revise Curriculum

Semiannual Report No 10

	Previous Six Month Period (corrected figures)				Current Six Month Period			
	Begin 10/01/97		End 03/31/98		Begin 04/01/98		End 09/30/98	
Cost Element	A I D	Recipient/ Others (Non-Fed)	Recipient/ Others (Federal)	Total	A I D	Recipient/ Others (Non-Fed)	Recipient/ Others (Federal)	Total
Salaries & Wages	7 653	0	0	7 653	1 699	0	0	1 699
Fringe Benefits	2 257	0	0	2 257	500	0	0	500
Indirect Costs	0	19 787	0	19 787	0	13 382	0	13 382
Consultants	0	0	0	0	1 180	0	0	1 180
Travel Transportation & Per Diem	0	0	0	0	33	0	0	33
Nonexpendable Equipment	0	0	0	0	0	0	0	0
Participant Training	0	0	0	0	0	0	0	0
Other Direct Costs	4 247	0	0	4 247	17 826	0	0	17 826
Subagreements (U S Institutions)	1 088	0	0	1 088	2 767	0	0	2 767
Subagreements (Dev Country)	0	0	0	0	0	0	0	0
SUBTOTAL	$15 245	$19 787	$0	$35 032	$24 005	$13 382	$0	$37 387