

UNIVERSITÀ DEGLI STUDI DI TOR

## Can Lemurs save Madagascar?

Università degli Studi di Torino  
November 23, 2012

Alison Jolly

*Laurea Honoris Causa in  
"Evolution of animal and human behaviour"  
for her seminal works on social intelligence and female role in primates societies,  
and for her determinant support to biodiversity conservation in Madagascar.*



Alison Jolly and ringtailed lemurs, *Lemur catta*. (Photo by Cyril Ruoso)

I am deeply grateful and honoured by the invitation of the Università di Torino to receive the award of *Laurea Honoris Causa*. Many thanks to the rector Prof. Ezio Pelizzetti, to the Headmaster of the Faculty of Mathematical, Physical and Natural Sciences Prof. Alberto Conte, to the Director of Department of Life Sciences and Systems Biology Prof. Gianfranco Gilardi, to all officials and to the honoured guests.

In particular, I would like to thank my colleague Professoressa Cristina Giacoma, who has contributed so much both to the study of lemurs and to conservation in Madagascar. In discussing with her the topic of my discourse today, it seemed right to address two related topics: first, something about what we can learn from lemurs, and then how concern with lemurs has led primatologists into active conservation. Unlike physics or chemistry, biological science is rooted in particular species which live in particular places. One very special place is special as Madagascar, a mini-continent where over 80% of forest species are endemic.

Primatologists commonly take up their studies with an interest in the past: how primates and other humans evolved, and how the ecology and behaviour of a given clade reflects the long-term evolutionary pressures of a "pristine" environment untouched by humanity. However, when we find that there is no modern environment untouched by humanity, we are forced to turn around and face the future. Primatology today necessarily combines the search for long-term biological principles with immediate conservation activism.

Lecture outline:

1. Ringtailed lemurs—where I started
2. History of Madagascar: why so special
3. Primatologists changing history?
  - a. National politics
  - b. New reserves
  - c. Industry and activism
  - d. Education: changing the future

### 1. Ringtailed lemurs: *Lemur catta*.

I began to study ringtailed lemurs at Berenty in 1963, and have been returning there at frequent intervals ever since. This reserve is private, founded in 1936 by the de Heaulme family and maintained on their sisal plantation until today (Jolly 2004). The reserve is small, only 200 ha of forest beside the Mandrare River in southern Madagascar. However, in the censused 140 ha it holds



*Lemur catta*.

(Photo by Daniela Antonacci)

about 450 ringtailed lemurs, 550 brown lemurs (*Eulemur rufus* x *E. collaris*), 350 sifaka (*Propithecus verreauxi*) plus uncounted mouse-lemurs (*Microcebus griseorufus*, *Microcebus murinus*) and lepilemurs (*Lepilemur leucopus*) (Razafindramanana, Rasamimanana, Palagi, Norscia, pers comm.). These are very unequally distributed, with an *L. catta* density ranging from 500/ha at the tourist front to 250/ha in gallery forest (before the growth of the introduced brown lemur population) to 100/ha in spiny forest.

Highly erratic climate shapes much of Madagascar's ecology (Dewar and Wallis 1999; Dewar and Richard 2007). Malagasy mammals tend to be long lived, slow to mature, and to have only one infant per year as compared to mammals of their body size and phylogenetic groups on other continents (Eisenberg 1966; Wright 1999; Richard et al. 2002). This "Life in the Slow Lane" or "Energy Frugality Strategy" may be a bet-hedging strategy which preserves breeding adults from year to year, even with wildly fluctuating infant and juvenile mortality. For Berenty ringtails, this relates to long-term reliance on particular fruiting trees, especially tamarinds. One year mortality varies from 25% to 50% in different years. The high mortality years seem to be not usually drought, but cyclone years that disrupt flowering and fruiting. Madagascar is one of the most vulnerable countries to climate change with increasing cyclone intensity, which implies further stress on its fauna.

Lemurs are extraordinary among primates for their female dominance over males. The degree varies between species but in many species, including ringtailed lemurs, the dominance is near 100%. Males can be aggressive toward each other but an adult male cannot challenge an adult female over food or spatial priority or even mating access. The multimale, multifemale troops have a core of related matriline, who bequeath territories from one generation to the next. The cumulative reproductive success of female territory holders may be a

clue to the evolution of female dominance ((Jolly 1966; Jolly and Pride 1999; Jolly et al. 2006; Koyama et al. 2006; Mertl-Millhollen 2006; Pride et al. 2006) .



Ringtailed lemurs troop walking down road in the *Berenty Reserve*.  
(Photo by Cyril Ruoso)

Berenty continues to be a very active study site. Its six species of lemurs and its other fauna and flora are currently being investigated by scientists and students from Madagascar, Japan, Germany, France, Italy, England and Canada. (Jolly 2012).

## 2. Origins and history of Madagascar

Madagascar separated from Africa ~150 Ma, and from India ~88 Ma. Its fauna has either evolved in isolation since the breakup of Gondwanaland, or derived from very infrequent rafting, mostly from Africa. It has also moved northward in latitude, such that the semi-arid spiny forest of the south is probably the oldest vegetation type, followed later by deciduous forest and rainforest. It is now highly dissected, with more sedentary forms separated by rivers whose sources lie on the central plateau over 1500 meters above sea level. Some 103 different lemur species are now recognized: between 6 and 13 in any one forest. A practical result is that to conserve a representative sample of all ecosystems, the reserve system must be spread round the periphery of the island-continent, as a “necklace of pearls” (Burney 2003; Wells 2003; Wilmé et al. 2006; Mittermeier et al. 2012).



*Propithecus verreauxi* in the spiny forest.  
(Photo by Viviana Sorrentino)





A chameleon, symbol of Madagascar.  
(Photo by Daniela Antonacci)

Madagascar was one of the last large places to be settled by humans, who proceeded to exterminate some 11 genera of giant lemurs, along with elephant birds and giant tortoises. The process continues today through swidden (slash and burn) clearing of forest for fields, and repeated burning of the resulting grasslands for a green bite for livestock. Only 10-15% of Madagascar remains forested.

Madagascar's population is about 21 million. Per capita income in 2012 is <\$400. 80% of people are rural, 77% under a poverty threshold of \$1.25/day, and child malnutrition 45% of under 5's. The poverty results in part from environmental degradation and population growth, but also from both internal and external political pressures. Like many other sub-Saharan African countries, during the period of "Structural Adjustment" of the from 1980 to 2000 Madagascar underwent 20 year slump which halved per capita income.

In 1985 the bankrupt government realized it had one major fish-hook for foreign aid: *Biodiversity!* It held a donors' conference on Environment and Sustainable Development which led to National Action Plans for the Environment, and to ever-increased involvement of primatologists in active conservation.

### 3. Primatologists changing history:

**a)Government-level action:** e.g. Russell Mittermeier and Léon Rajaobelina of Conservation International. Identification of global "hotspots", including Madagascar. The IUCN Species Survival Commission for Primates in July 2012 identified 92% of lemur species as under threat. Six lemurs are on the 2012 list of worlds' most threatened primates. Conservation International played a major role in launching the multidonor Environmental Action Plans, \$385.5 Million over 15 years. Marc Ravelomanana, President of Madagascar 2002-2009, tripled the nominal reserve area of Madagascar, influenced by CI. [www.sommetjohannesburg.org/initiatives/gouvernance-cas2.html](http://www.sommetjohannesburg.org/initiatives/gouvernance-cas2.html)  
[www.conservation.org/](http://www.conservation.org/)

**b)Reserve founding and support:** eg Bezà Mahafaly, founded in 1975 by Alison Richard, Robert Sussman, and Guy Ramanantsoa. A small reserve dedicated to research with the support of the School of Forestry of Antananarivo University, and to development with the surrounding local communities. Eg Ranomafana National Park, founded 1987, after Patricia Wright discovered the golden bamboo lemur (*Hapalemur aureus* ) and has devoted all her energies to creating a huge research enterprise there.  
<http://bezamahafaly.commons.yale.edu/>  
[www.parcs-madagascar.com/fiche-aire-protegee\\_en.php?Ap=26](http://www.parcs-madagascar.com/fiche-aire-protegee_en.php?Ap=26)  
[www.stonybrook.edu/commcms/centre-valbio/](http://www.stonybrook.edu/commcms/centre-valbio/)

**c)Political activism:** Eg. Erik Patel. A coup in 2009 toppled the Ravelomana presidency. All non-humanitarian foreign aid was suspended, although environmental aid was restored in 2011. The new government enriched its leaders by massively logging rosewood from the National Parks. Foreign visibility and pressure has been maintained through the immense courage of Erik Patel and his Malagasy associates, with their study animal, the critically endangered silky sifaka (*Propithecus candidus*) as flagship species. [www.simpona.org/cv.html](http://www.simpona.org/cv.html)

Ironically, another form of external political influence comes from the large mining companies. Although venal mining companies destroy the environment, the major multinationals are under international pressure to resist fiscal corruption and to restore environmental damage. These companies enlist scientists, including primatologists like myself, to advise their actions eg. [www.riotintomadagascar.com](http://www.riotintomadagascar.com)

**d)Education:** e.g. Cristina Giacoma and Hantanirina Rasamimanana, with the SCORE project: an international Conservation MSc degree. This project is an ACP EDULINK Programme financed by the European Union and it is run by the University of Torino, the University of the Comoros, the University of Mahajunga, and the École Normale Supérieure of the University of Antananarivo. 28 masters' students graduated from the 2 year course in 2012, some of them working on Giacoma's main study species *Indri indri*. [www.score.unito.it](http://www.score.unito.it)



Cristina Giacoma teaching to students of Mahajanga. (Fotografia di Marco Gamba)

At primary level, the Ako Project, with Alison Jolly, Hantanirina Rasamimanana, and artist Deborah Ross, have produced illustrated story books and accompanying posters. The books tell adventures of young lemurs of six different species: aye-aye, Mme Berthe's mouselemur, ringtailed lemur, Decken's sifaka, red ruffed lemur, and indri. UNICEF has printed 30,000 of each book for Malagasy schools, and 6,000 of each poster. With teacher training and teachers' guides, this is an ongoing project. (The indri book was inspired by Dr. Viviana Sorrentino of Turin).

[www.lemurreserve.org/akoproject2012.html](http://www.lemurreserve.org/akoproject2012.html)

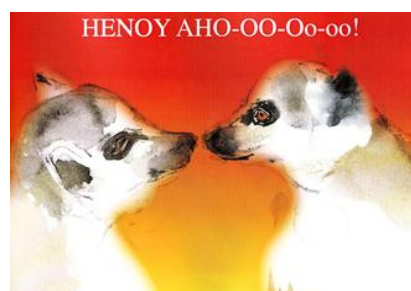


Illustration by Deborah Ross for the Ako Project

In summary, an anthropologist may begin her career with a passion for nature and its evolution, but almost inevitably, she continues with a passion for the survival of natural habitats, and the support and joy that they bring to people.



Alison Jolly in Berenty Reserve. (Photo by Cesare Avesani – Parco Natura Viva, Verona)

### Brief Bibliography:

- Burney, D. A. (2003). Madagascar's prehistoric ecosystems. The Natural History of Madagascar. S. M. Goodman and J. P. Benstead. Chicago, University of Chicago Press: 47-51.
- Dewar, R. E. and A. F. Richard (2007). "Evolution in the hypervariable environment of Madagascar." PNAS **104**: 13723-13727.
- Dewar, R. E. and J. R. Wallis (1999). "Geographical Patterning of Interannual Rainfall Variability in the Tropics and Near Tropics: An L-Moments Approach." American Meteorological Society: 3457-3466.
- Eisenberg, J. F. (1966). "The social organization of mammals." Handbuch Zool. **8**(1-92).
- Jolly, A. (1966). Lemur Behavior. Chicago, Univ. Chicago Press.
- Jolly, A. (2004). Lords and Lemurs: Mad Scientists, Kings with Spears, and the Survival of Diversity in Madagascar. Boston, Houghton Mifflin.
- Jolly, A. (2012). Berenty Reserve, Madagascar: A long time in a small space. Long-Term Field Studies of Primates. P. Kappeler and D. P. Watts. Heidelberg, Springer: 29-44.
- Jolly, A. and R. E. Pride (1999). "Troop Histories and Range Inertia of *Lemur catta* at Berenty: a 33 year perspective." Int. J. Primatol. **20**: 359-373.
- Jolly, A., H. Rasamimanana, et al. (2006). Territory as bet-hedging: *Lemur catta* in a rich forest and an erratic climate. Ringtailed Lemur Biology: Lemur catta in Madagascar. A. Jolly, R. W. Sussman, N. Koyama and H. Rasamimanana. New York, Springer: 187-207.
- Koyama, N., T. Soma, et al. (2006). Home ranges of ring-tailed lemur troops and the density of large trees at Berenty Reserve, Madagascar. Ringtailed Lemur Biology: Lemur catta in Madagascar. A. Jolly, R. W. Sussman, N. Koyama and H. R. Rasamimanana. New York, Springer: 86-101.
- Mertl-Millhollen, A. (2006). "Scent marking as resource defense by female *Lemur catta*." Amer. J. Primatol **68**: 605-621.
- Mittermeier, R. A., W. R. Konstant, et al. (2012). Lemurs of Madagascar. Washington, Conservation International.
- Pride, R. E., D. Felantsoa, et al. (2006). Resource defence in *Lemur catta*: the importance of group size. Ringtailed Lemur Biology: Lemur catta in Madagascar. A. Jolly, N. Koyama, H. R. Rasamimanana and R. W. Sussman. New York, Springer: 208-232.
- Richard, A. F., R. E. Dewar, et al. (2002). "Life in the slow lane? Demography and life histories of male and female sifaka (*Propithecus verreauxi verreauxi*)." J. Zool., Lond. **256**: 421-436.
- Wells, N. A. (2003). Some hypotheses on the Mesozoic and Cenozoic paleoenvironmental history of Madagascar. The Natural History of Madagascar. S. M. Goodman and J. P. Benstead. Chicago, University of Chicago Press: 16-40.
- Wilmé, L., S. M. Goodman, et al. (2006). "Biogeographic evolution of Madagascar's microendemic biota." Science **312**: 1063-1065.
- Wright, P. C. (1999). "Lemur traits and Madagascar Ecology: Coping with an island environment." Yrb. Phys. Anthropol. **42**: 31-72.