

## Chapter 43

# Conservation of Malagasy Prosimians: A View from the Great Red Island

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**Abstract** Madagascar is a global biodiversity hotspot, with high levels of endemism coupled with a high degree of anthropogenic disturbance. Lemurs are important in maintaining the island's ecosystems. We examine the primary and emerging threats to lemurs, present a brief history of the conservation efforts implemented to preserve Malagasy ecosystems, and discuss the future direction of and prospects for conservation in Madagascar.

**Resume** Madagascar est un point chaud de biodiversité globale, avec un niveau d'endémisme très élevé associé à un fort niveau d'anthropisation. Les lémuriens jouent un rôle important dans le maintien des écosystèmes de l'île. Nous examinons les menaces anciennes et nouvelles pesant sur les lémuriens, présentons un bref historique des mesures de conservation initiées sur les écosystèmes malgaches, et discutons les futures directions et les perspectives offertes pour la conservation à Madagascar.

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## Introduction: Lemur Origins and Diversity

Madagascar is among the most important global biodiversity hotspots, combining high levels of endemism with imminent extinction threats (Myers et al. 2000). Lemurs represent a significant component of Madagascar's mammalian diversity and serve important roles in the island's ecosystems (Birkinshaw 1999; Ganzhorn et al. 1999). Madagascar's history, including its early separation from Gondwana (Masters et al. 2006; Samonds et al. 2012) and unique floral and faunal composition, provided conditions that led to an extensive adaptive radiation of strepsirhine primates across the island. Although the geographic origin and timing of their appearance is debated, most colonization hypotheses involve an African origin in the early Tertiary drawing support from either fossil evidence (Seiffert et al. 2003) or molecular data (Yoder 1996). While a dearth of fossils obscures much of lemur history (Stevens and Heesy 2006), during the last 2,000 years climate change and human colonization have contributed to waves of lemur extinctions (at least 17 species), with the larger taxa disappearing almost completely (Mittermeier et al. 2010). Currently, 99 lemur species are recognized (Mittermeier et al. 2010), a number that has grown from the 32 species recognized in the early 1990s (Chap. 2). This increase in species numbers is controversial (Tattersall 2007, Chap. 2) and mainly reflects the partitioning of existing taxa into new species on the basis of genetic divergence (Rasoloarison et al. 2000). Regardless of the precise number of extant species, it is clear that a substantial proportion of Madagascar's primate diversity faces an extinction crisis.

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## Threats to Lemur Survival

### *Primary Threats*

Habitat loss is rated the highest threat to lemur species (CBSG 2002), with Madagascar having experienced a 90% reduction in its original forest cover (Green and Sussman 1990; Du Puy and Moat 1998; Harper et al. 2007). Deforestation produces habitat fragmentation and edge effects (Lehman et al. 2006), effectively reducing the extent and connectivity of lemur habitats. Traditional slash-and-burn agriculture and the clearing of pastureland with fire are long established causes of forest loss (Gade 1996; Godfrey and Irwin 2007). Selective harvesting for construction materials, crafts, fuel wood, and commercial hardwoods further degrades forests (Patel 2007; Mittermeier et al. 2010) and reduces key lemur resources (Arrigo-Nelson 2006; Irwin 2008). Mining, large-scale plantations, and other new economic projects are also driving habitat loss (Vincelette et al. 2003; Mittermeier et al. 2010). Despite traditional taboos and national laws, hunting for food, the pet trade, medicinal resources, and pest control continues to deplete lemur populations (Mittermeier et al. 2010), and the extent of lemur hunting is probably unsustainable (Golden 2009).

### *Emerging Threats*

Madagascar is prone to extreme seasonality and high interannual variability, including recurrent cyclones (Jury 1993; Dewar and Richard 2007), and short-term declines in lemur populations have been recorded following storms and droughts (Gould et al. 1999; Ratsimbazafy et al. 2002; Johnson et al. 2011). Although Malagasy ecosystems probably evolved under similar climatic conditions (Wright 1999; de Gouverain and Silander 2003), habitat disturbance and projected climate change may combine to exacerbate existing threats (Chap. 39). The frequency of cyclones and droughts may increase with global warming (Emanuel 2005; Ingram and Dawson 2005; Elsner et al. 2008) and fragmented forests may be less resilient to these stochastic events (Catterall et al. 2008). In addition, anticipated increases in fragmentation and the isolation of remaining forests due to climate change (Hannah et al. 2008) may further hinder lemur dispersal among suitable habitats, and rising sea levels threaten to decimate littoral forests containing locally endemic species (Consiglio et al. 2006). In fact, climatic impacts are already observable in south-eastern Madagascar, where changes in phenology and food supply are associated with declining lemur populations (Wright 2006).

As the human population grows and forest fragmentation increases, conservationists must also consider cross-species disease transmission. Although no outbreaks have been documented to date, potential pathogens include toxoplasmosis, arboviruses, and herpesviruses (Junge and Sauter 2006).

## History of Conservation Practices in Madagascar

Various approaches have been adopted over time to combat the threats to Madagascar's flora and fauna: primary among these is area-based conservation. The first substantial roots of Madagascar's protected area network lie in ten "Réserves Naturelles Intégrales" (RNI) covering 560,181 ha, gazetted in 1927 under the French colonial regime (Andriamampianina 1987). These areas followed a "preservationist" philosophy and were exclusionary: scientists were allowed to enter but local people were prohibited from using the reserves in any way. Three decades later, two new kinds of protected areas were established: "Réserves Spéciales" (RS) in 1956 and "Parcs Nationaux" (PN) in 1958 (Andriamampianina 1987). These areas dominated during the remainder of the twentieth century, gradually giving way to the Integrated Conservation and Development Projects (ICDPs) of the 1990s. These ICDPs featured a more "conservationist" philosophy and essentially followed the "Yellowstone" model (Marcus and Kull 1999). People were still physically excluded from the core areas, but an effort was made to ensure that local populations were included in the planning process and benefited from tourism revenues and/or development projects to offset the cost of their exclusion (Wright and Andriamihaja 2002).

In 1989 the Malagasy government developed Africa's first National Environmental Action Plan (NEAP), arguably the most ambitious and comprehensive African environmental program to date. It was implemented in three phases over 15 years (Razafindralambo and Gaylord 2006). The first phase (1991–1997) aimed to create an official environmental policy with a regulatory and institutional framework that would foster ownership of the environmental agenda by the country rather than by donors. This period saw significant growth of the protected area system with the establishment of several new protected areas, visits from unprecedented numbers of tourists, and the creation of the parastatal ANGAP ("Association Nationale pour la Gestion des Aires Protégées") charged with balancing conservation with research, education, ecotourism, and community development (Randrianandianina et al. 2003). With the creation of ANGAP came the formalization of a revenue distribution mechanism, with 50% of tourist revenue returning to local communities for development projects and improved land stewardship. The 1990s also saw a shift toward local enfranchisement with GELOSE legislation ("Gestion Locale Sécurisée"), which allowed local community organizations to apply for rights to manage local resources (Bertrand 1999). GELOSE and the revised GCF legislation ("Gestion Contractualisée des Forêts de l'État") represented a clear shift away from the "Yellowstone" model, with communities clustered around parks, toward a "landscape" model, in which humans and wildlife overlap in a single managed landscape.

The second phase of the NEAP (1997–2003) consolidated first phase programs by putting national institutions more firmly into leadership positions. During this period, the government created COAP ("Code des Aires Protégées de Madagascar"), which streamlined guidelines for protected area creation.

The final phase (2003–2008) aimed to mainstream environmental thinking more broadly into macroeconomic management and sector programs, including mechanisms for sustainable financing (Razafindralambo and Gaylord 2006). During this

phase, the government launched a new era in Malagasy conservation. In 2003, President Marc Ravalomanana announced the “Durban Vision”, pledging to increase Madagascar’s protected area network from 1.8 to 6.0 million hectares (10% of the country’s surface area; Randrianandianina et al. 2003) through a new system of protected areas—SAPM (“Système des Aires Protégées de Madagascar”). Under the direction of the Ministry of Environment, Forests and Tourism, SAPM’s goals were even broader than those of ANGAP: conservation of Madagascar’s biodiversity and cultural heritage, maintenance of ecological services, and the promotion of sustainable use of natural resources to reduce poverty and promote development (SAPM 2006). The SAPM mandate also included protected areas with less strict protection, not seen before in Madagascar: IUCN Categories 5 (“Protected Landscape”) and 6 (“Managed Resource Protection Area”). The potential creation of “protected areas principally managed for the goal of sustainable use of natural ecosystems” (Category 6; SAPM 2006) raises the concern that some species could face extirpation if the economic value of forest resources is given higher priority than wildlife protection. Thus, despite the evolution of conservation in Madagascar, the fundamental conflict remains: biodiversity maintains a significant standing value (i.e., its value if preserved) but has a more easily perceived and rapidly available economic value if exploited.

## Future Directions for Conservation in Madagascar

Conservation actions and initiatives in Madagascar have been shifting to address emerging threats, while at the same time increasing support for local people. In twenty-first century Madagascar, the fate of biodiversity is dependent not only on the resilience of the ecological systems but also equally on the system by which resources are managed. With an annual population growth rate of 2.8% and 44.7% of the population 14 years of age or younger (DESA 2001), the island’s natural resources are facing unprecedented threats. Against this backdrop, the Malagasy government developed an integrative model promoting biodiversity conservation and sustainable resource use through improved community land stewardship linked to improved living standards. To this end, the government launched its “Madagascar Naturally” vision in 2005, recognizing the central role that a healthy environment plays in the social, economic, and spiritual well-being of the Malagasy people, and the Madagascar Action Plan in 2007, comprising a set of strategies for sustainable development with a commitment to “cherish the environment.”

Creating incentives to ensure community investment in a system that has, until fairly recently, excluded them is critical to the success of conservation in Madagascar. In the absence of fair reimbursement, there is risk that disenfranchised members of the communities will persist in, or even exacerbate, destructive resource use. To accommodate the seemingly competing interests of conservation and sustainable resource use, Madagascar adopted several best practices including (1) protected area limits, internal zoning and resource use rules, defined in public consultation at local levels; (2) detailed forest inventories to inform strict management rules for

forest resource extraction; and (3) community-based ecological monitoring of biodiversity indicators as well as human disturbance. Underlying these practices is the identification of sustainable financing mechanisms for protected areas, and clear and direct returns to local communities engaged in contracted forest resource management in border forests of protected areas. The government began to promote equitable sustainable financing mechanisms at the project level through programs such as that in the Makira Forest Protected Area, which assures that 50% of revenue from the sale of sequestered forest carbon credits returns to local communities to support a variety of activities including community-based ecological monitoring (Holmes et al. 2008).

### **The 2009 Political Crisis, a Serious Setback for Conservation**

The political crisis in Madagascar initiated in 2009 has had a substantial, negative impact on Madagascar's conservation efforts. During this period, opposition to the administration of President Ravalomanana manifested in regime change backed by the armed forces. Opposition leader Andry Rajoelina assumed the role of head of state in the transitional government, Haute Autorité de la Transition (HAT). As the HAT was established through military intervention and without democratic elections, it was not recognized by many international governments and organizations. International agencies have largely suspended financial support to environmental programs, and illegal logging and export of tropical hardwood species has dramatically increased along with the deterioration of government regulation of these activities (Innes 2010). Strong local and regional economic interests have been displaced by even stronger transnational economic forces. The resulting rapid and extreme ecosystem degradation, coupled with a substantial increase in bushmeat hunting (Golden 2009), is precipitating a survival crisis for many lemur species. Increasing numbers of immigrants have flooded villages in eastern Madagascar in search of gold, with gold mining now occurring in Ranomafana National Park (Wright, personal observation). Studies conducted by the NGO *Madagasikara Voakajy* show that traditions that once protected lemurs have broken down (Jenkins et al. 2011). The increase in human-wildlife contact in degraded forests could enhance the risk of disease emergence and spread, potentially with global consequences (Barrett and Ratsimbazafy 2009).

At first glance, the future looks dire for lemurs, and the state of Madagascar's natural areas is precarious. Yet despite these daunting challenges, we find cause for optimism in the many conservation NGOs that persist in their efforts. Perhaps more importantly, local communities with whom we have worked for several years still hold out hope, if benefits of conservation can be realized locally; the empowerment of local communities may be Madagascar's only chance of preserving its endangered species, especially in remote areas where government control is weak.

There is also increasing cooperation among conservation practitioners: 2009 saw the creation of the *Alliance Voahary Gasy*, a civil society composed of Malagasy

Conservation associations/NGOs aimed at defending good governance and protecting Madagascar's resources against corruption and illegal trade. Such groups advance the following goals (1) implementation of a criminal justice court in Madagascar to prosecute traffickers/environmental delinquents; (2) implementation of community policing at a local level in places with weaker governmental control; (3) sustained efforts to combat corruption; and (4) expansion of ecotourism organized by and with benefits for local communities.

## Conclusions

With lemurs facing so many threats, many populations may be lost before they are studied. Mittermeier et al. (2010) underscored the lack of information for many Malagasy primates, noting that ~40% of lemur species are classified by the IUCN as data deficient. What is the outlook for extant lemurs? Can we avoid a continuation of the Holocene extinctions?

Over the past century, conservation philosophy has moved from complete exclusion of local people, to compensation of local people, to their inclusion within protected landscapes and formalization of their rights to use natural resources. This shift was necessary both ethically and practically, and there is evidence of its success before the recent political crisis: national deforestation rates declined from 0.83% to 0.53% annually from 2000 to 2005, with considerably lower rates (0.12%) inside protected areas (CI/IRG/USAID data).

However, the balance between people and nature in new protected areas is still unstable and exacerbated by the ongoing political crisis. The long-term success of new conservation approaches will depend on how genuinely local communities are engaged, how effectively management plans protect biodiversity, and whether activities on the ground match those prescribed in the plans. In the future, conservationists in Madagascar are likely to be less concerned with destruction outside protected areas and more concerned with resource extraction (both legal and illegal) within them. This is the trade-off of the massive expansion of protected areas: even if virtually all forests in Madagascar are included in some protection regime (as is intended), at least some of these areas must generate tangible economic development for local communities and the nation as a whole.

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