

Alaotra wetlands

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The Alaotra wetlands in central eastern Madagascar are the largest wetlands in the country. Lac Alaotra is 20,000 ha, has an average depth of 2-4 m and is situated at 750 m asl. Surrounding the lake are 23,000 ha of marshes dominated by papyrus *Cyperus madagascariensis* and rushes *Phragmites communis* and then 120,000 ha of rice-fields within a watershed encompassing 722,500 ha and reaching 1,300 m at the highest point.

At least three species are endemic to the Alaotra wetlands, all of which are Critically Endangered: Alaotran gentle lemur *Hapalemur griseus alaotrensis*, Alaotra little grebe *Tachybaptus rufolavatus* and Madagascar pochard *Aythya innotata*. A small carnivore was also recently discovered in the marshes, which is likely to be a new species *Salanoia* sp. The two endemic bird species may already be extinct, probably because of exotic fish introduction and excessive drowning in fishing nets. Local people claim that the carnivorous introduced fish *Channa striata* has been a significant predator of young of diving species such as the endemic grebe, which had limited flight capacity. Of the 50 water bird species recorded at the lake, 8 are Madagascar endemics. Six fish species are Madagascar endemics.

Alaotra is an example of a shallow wetland that is a highly productive ecosystem, very valuable for people and biodiversity, but also vulnerable to degradation, particularly linked to sedimentation. This process is easily affected by human activities, such as agriculture causing increased erosion and siltation, and introduction of aquatic plants and fish causing dramatic changes in the trophic structure of the ecosystem.

The endemic fauna at Alaotra is threatened due to major environmental changes including:

- habitat degradation,
- over-hunting,
- over-fishing,
- competition and predation by introduced fish species,
- siltation from erosion,
- pollution by human waste, fertilizers and pesticides and
- invasion of introduced aquatic plants.

The human population living in the Alaotra watershed has increased five-fold from 109,000 in 1960 to approximately 550,000 people today, the majority of whom depend on rice cultivation and fishing for their livelihood. The original Sihanaka people have been joined by migrants from all over Madagascar. The Alaotra is the most important rice production area in the country and has one of the most important inland fisheries.

Once forested, most hills around the lake are now denuded, causing development of accentuated erosion gullies which deposit infertile laterite and sands on lower land resulting in loss of rice fields, silting of irrigation canals and acidification of the lake.

Only 81,500 ha are now under cultivation giving an annual rice production of around 250,000 tonnes. Since the 1950s, the water lilies (*Nymphaea* spp.) that covered large parts of the lake have almost disappeared. Over 70% of the waterways and lakes within the marshes have been invaded by *Azolla* sp., *Salvinia molesta* and *Eichhornia crassipes* which have reduced access to fishing grounds and significantly altered habitats. Most of the original marshes, home to the lemurs have been transformed into rice fields, while remaining marshes have been burned

frequently either in an attempt to create further rice fields, to create pasture for cattle, or to create open areas for fishing as a result of choking of traditional fishing areas by invasive plants.

Durrell Wildlife Conservation Trust began research in 1986 on local endemics at Alaotra and began a public awareness campaign from 1997 involving festivals in over 70 villages and environmental education in over 100 schools. This catalysed grass-roots interest in marsh conservation, as villagers recognized that they provide a refuge and breeding ground for fish and birds, are the source of materials for houses, woven baskets and mats and of dried rhizomes for cooking fuel, and they form a barrier protecting the lake from siltation and pollution. Building on this local interest in marsh conservation, a series of meetings and workshops at village, commune (group of villages) and regional levels stimulated local conservation and management initiatives from 2001.

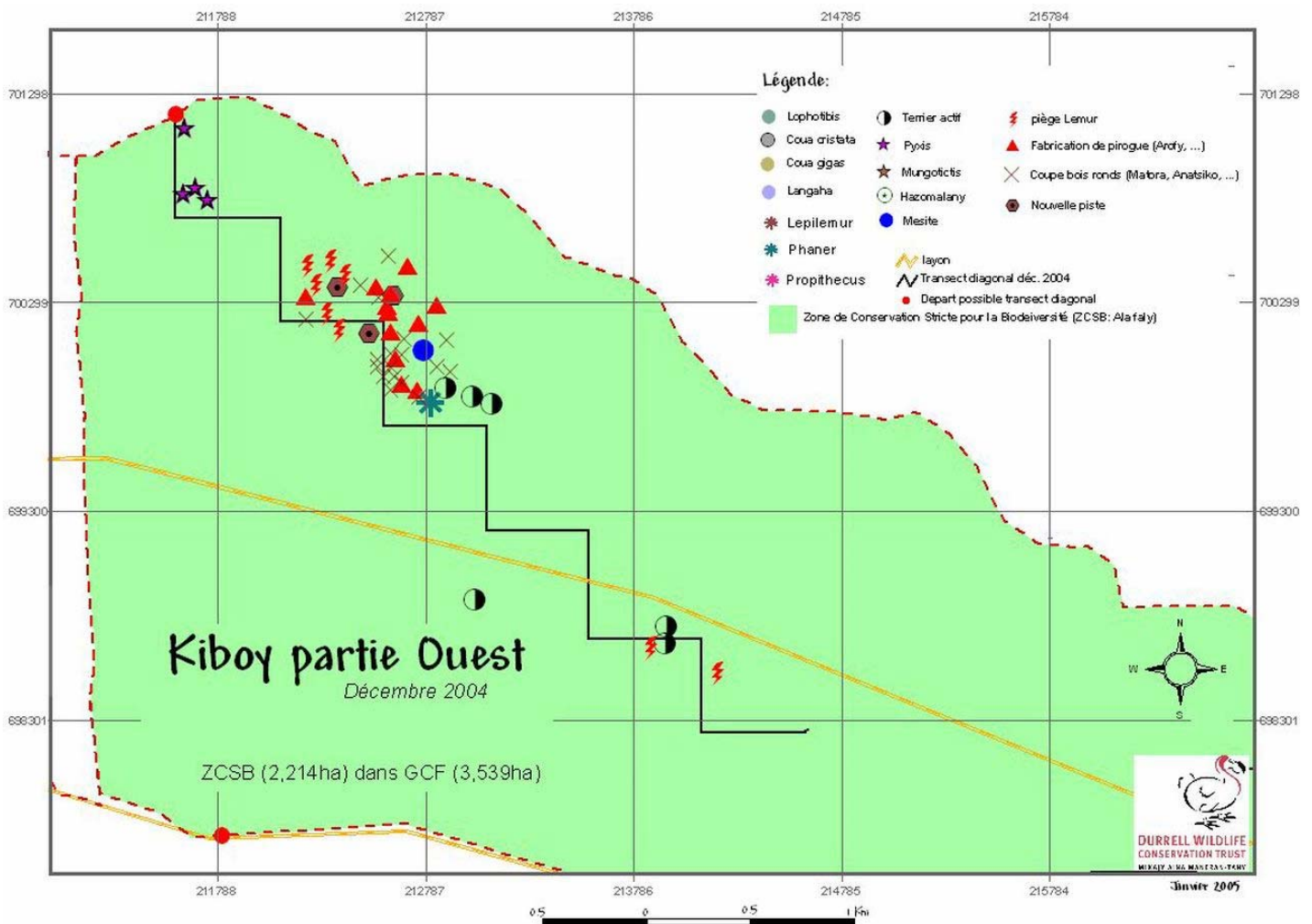


Fig. 4 Monitoring results map. (© Durrell Wildlife Conservation Trust)

Nine communities have so far received three-year renewable resource-management transfers from the State (the legal owner of the lake and marshes) giving them management control over 35% of all the marshes and the entire marsh area will soon be legally managed by surrounding communities. Sustainable use and marsh protection have been developed through the creation of by-laws ("dina") and federations of community associations. Regional fishing laws have been adopted since 1998 that control fishing practices with the aim of maintaining fish stocks and

Box 8. The Alaotran gentle lemur (*Hapalemur griseus alaotrensis*)

Jonah Ratsimbazafy

The Alaotran gentle lemur *Hapalemur griseus alaotrensis* is found only in the marshes of Lac Alaotra, the largest lake in Madagascar located in the centraleastern highlands. The species is 'Critically Endangered' according to IUCN Red List criteria due to its extremely reduced geographical range (only occurring in the remaining 23,000 ha of Alaotra marshes) and the rapid decline in population. The main causes of its decline have been transformation of its marsh habitat to rice fields, widespread and repeated burning of remaining areas of marsh and hunting for local consumption.

Hapalemur g. alaotrensis is the only primate taxon in the world that lives exclusively in a wetland habitat. It is a small folivorous primate that lives in family groups of 2 to 12 individuals occupying territories of 1 to 5 ha.

To evaluate the conservation status of this species, Durrell Wildlife Conservation Trust team has conducted annual censuses of the lemur population in four sites since 2001 during the rainy season. Durrell also assesses the habitat where the species occurs and threats that affect the survival of the species. Study methods involved direct lemur observations from canoes along transects, characterisation and mapping of different marsh habitats and interviews with local people to determine the history of burning and other threats to the species.

Earlier studies indicated that the population plunged by 60% from around 7,500 individuals in 1994 to around 3,000 individuals in 2001. By comparing the results of the census of *H. g. alaotrensis* within the five-year period from 2001, our findings indicate that encounter rates of *H. g. alaotrensis* have increased overall. Both the number of the observed individuals and groups increased during the surveys. We conclude that the *H. g. alaotrensis* population was at least stable during the last few years.

Results also indicate that the lemurs are only present in marshes that have not been burned for more than three years, which have the same structure, floristic diversity and size of stems as undisturbed habitat. The suitable habitat for the species was about 54% of the total area of the marshes or 10,100 ha in 2003, 13,750 ha in 2004. The results of participative ecological monitoring held in 2004 and 2005 indicated that big fires were recorded in Andilana sud and Anororo in 2003, then in Andilana and in Ambodivoara in 2004. Those fires had a big impact on the size of the suitable habitat in 2005 when only 5,089.8 ha was good habitat (suitable) for the *Hapalemur g. alaotrensis* in total in the four key sites (about the third of the total size of the marshes).

have become progressively more effective with enforcement of a two-month closed fishing period from 2001. All fishermen are members of associations since 2003. Communities took the initiative to start replanting marshes during the first marsh festivals in 1997. In subsequent years, 26 villages have replanted 22.5 ha with the aim of recreating a green belt of marshes around the lake.

The entire Alaotra watershed was designated as a Ramsar site in 2003, formalising the new regional and national commitment to conserving its biodiversity and maintaining the ecosystem functions through sustainable use. A regional organisation representing all stakeholders 'Alaotra Rano Soa' has been created to coordinate wetland management. Following the declaration by the President of the Republic of Madagascar that protected areas would be tripled to cover 6

million hectares or 10% of the country at the World Parks Congress in Durban in September 2003, Alaotra has been identified as a priority for creation of a new protected area in which sustainable use for fishing and harvest of marsh products will be promoted while also protecting habitats and endangered species. Over the past two years we have facilitated a participatory process to gain support for creation of the protected area and to agree on the limits and type of management. This process has led to strong support for the creation of the protected area and good integration of conservation priorities into regional development planning.

The campaign to conserve the biodiversity and productivity of the Alaotra wetlands has consistently gained momentum and increasingly widespread support from grass-roots beginnings when fishing people living around the lake vigorously expressed their wish to turn the tide of ecological degradation during the first marsh festivals in 1997. Popular support has been strengthened by the capacity of the wetland ecosystem to respond relatively quickly to management, such as reduction in marsh burning, introduction of a closed fishing season and enforcement of minimum mesh sizes for fishing nets. Ecological monitoring data show that the fish have increased in size. The average catch rate varied between 0.2 and 0.4 kg/person/hour with a significant increase from 2002 to 2003 (paired t-test $p \leq 0.05$), although longer-term data will be important to show if this is a real trend. Encounter rates for Alaotran gentle lemurs have increased consistently from 2001 suggesting that the population has stabilised. We hope that the foundations have been laid to maintain Alaotra's unique biodiversity while also sustaining human populations, although many challenges remain, such as controlling the impact of invasive species.

Box 9. Participatory ecological monitoring at Lac Alaotra

Herizo Andrianandrasana

Since 2001, Durrell Wildlife Conservation Trust has organised annual participatory ecological monitoring, both to evaluate the effectiveness of these management initiatives and to reinforce local commitment to management by demonstrating the impacts. Participatory methods were used to facilitate data collection and also to develop broader local knowledge of the wetland biodiversity and resources and the level of threats. It was hoped that this would foster greater local ownership of wetland monitoring and management to help ensure future sustainability. The goal is to detect natural and/or human-induced changes in the state of the biodiversity and natural resources as an aid to evaluating and improving management. Data were collected in 16 villages covering 90% of marshes around the lake by teams including Durrell staff, local communities and Government technicians on key species, such as the locally endemic lemur and water birds, on useful natural resources and on the major threats to the Alaotra wetland.