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# Information Sheet on Ramsar Wetlands (RIS)

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**2. Date this sheet was completed/updated:** 3 August 2003

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**3. Country:** Madagascar

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**4. Name of the Ramsar site:** Lake Alaotra Wetlands and Catchment Basin

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**5. Map of site included:**

**a) hard copy** (required for inclusion of site in the Ramsar List): yes  -or- no

b) digital (electronic) format (optional): yes  -or- no

**6. Geographical coordinates:** All the wetlands and catchment basins of Lake Alaotra (722,500 hectares), included in the Maningory basin (1,264,500 hectares) on the eastern watershed (Chaperon et al., 1993), are located within the following geographical coordinates:

17° 02' 000" - 18° 10' 000" South latitude  
48° 00' 000" - 48° 40' 000' East longitude

**7. General location:** Located in the eastern part of the Central Region of the large island, Alaotra is about 110 kilometres directly northwest of Toamasina (a provincial centre) (see map 2). Three sub-prefectures are represented in this area: Ambatondrazaka, Amparafaravola and Andilamena. The last two are in the prefecture of Ambatondrazaka.

**8. Elevation:** The altitude of the lakes and rice fields is about 750 metres with a minimum of 751 and a maximum of 1260 metres on the catchment basins.

**9. Area:** A total of 722,500 hectares

Table 1: Area of the wetlands

Type of area	Area (ha)	Sources
Lake Alaotra	19,971	Digitalisation of a Landsat image 2000
Other lakes in the marshes	5,445	Digitalisation FTM map
Marshes	23,500	Digitalisation of a Landsat image 2000
Rice fields	117,000	Digitalisation FTM map
Small rice fields	54,088	Digitalisation FTM map
Alaotra catchment basin (plus valleys and streams)	502,496	Digitalisation FTM map
TOTAL	722,500	

Moreau (1987) estimates that the flooding of the marshes, irrigated rice fields and Lake Alaotra could cover more than 800 square kilometres.

**10. Overview:** The Alaotra wetlands are characterized by the large continental lake of Alaotra around which there are about 23,500 hectares of marshes. They provide habitat for local endemic species such as the lemur, *Haplemur griseus alaotrensis*, seriously endangered according to IUCN/CSBG (2001); a very rare waterbird *Aythya*

*innotata*, seriously endangered according to IUCN (2000); and a very rare waterbird *Tachybaptus rufolavatus*, also seriously endangered according to Young and Smith (1989), Pidgeon (1996) and Hawkins et al. (1999). Furthermore, there are other species endemic to Madagascar including five species of fish. Rice fields cover more than 117,000 hectares in the Alaotra basin, making this area the most important source of rice in Madagascar.

## 11. Ramsar Criteria:

1, 2, 3, 4 and 8

**The criterion that best describes the site:** Five Ramsar criteria out of eight are fulfilled for the Alaotra wetland. Among them, it is criterion 2 concerning the presence of endangered endemic fauna at the international level that best characterizes the site.

**12. Justification for the application of each Criterion listed in 11. above:** Five criteria confirm the international importance of the Lake Alaotra wetlands and catchment basin.

Criterion 1: The Lake Alaotra wetlands and catchment basin fulfil criterion 1 because they contain 45 per cent of the types of natural inland wetlands identified according to the RAMSAR system of classification. This area is also a unique representative example of the natural wetlands of the biogeographic region of Eastern Madagascar.

Criterion 2: The Lake Alaotra wetlands and catchment basin meet criterion 2 because they provide habitat for three taxa locally endemic to Lake Alaotra, which are all endangered: *bandro* (*Hapalemur griseus alaotrensis*) (the only taxon of lemur living exclusively on the edge of the lake in the marsh), *vivin'Alaotra* (*Tachybaptus rufolavatus*) and *onjy* (*Aythya innotata*). This area also provides habitat for other endangered endemic species, such as *vano* (*Ardea humblotii*), *danamona* (*Thalassornis leuconotos insularis*), *vivy* (*Tachybaptus pelzelinii*), *angaka* (*Anas melleri*) (Young, 1995; Ramanampamonjy and Randrianasolo, 1997; Ramanampamonjy and Razafindrahanta, 1998). It also provides habitat for five species of very rare indigenous fish: *fony gasy* (or *marakely*) (*Paratilapia polleni*), *katrana* (*Rheocles alaotrensis*), *zono* (or *pirina*) (*Rheocles sikorae*), *menazipo* (*Aurecleus alaotrensis*) and *toho* (or *sondry*) (*Gobuis aenofuseus*), almost all extinct at Lake Alaotra.

Criterion 3: The Lake Alaotra wetlands and catchment basin fulfil criterion 3 because they currently provide habitat for 30 species of waterfowl of which five are endemic; two species of lemurs (*Hapalemur griseus alaotrensis* and *Microcebus rufus*); one species of carnivore *Galidia elegans*; two species of endemic rodents *Brachyuromys* sp. and *Eliurus* sp.; and two species of insectivores (*Microgale cowani* and *Suncus murins*). The Alaotra wetland is also rich in fish fauna because it contains about fifteen species of fish of which the five mentioned above are endemic. This wetland provides habitat for six classes of invertebrates (Arachnida, Crustacea, Gastropoda, Insecta, Oligochaeta and Turbellaria), including five orders of insects. As for the flora, the Alaotra wetland has 75 species of plants, including 16 in the Cyperaceae

and 11 in the Poaceae families (Pidgeon, 1996).

Criterion 4: The Lake Alaotra wetlands and catchment basin fulfil criterion 4 because several species of waterfowl, *Anas melleri*, *Ardea cinerea*, *A. humblotii*, *A. purpurea* and *Bubulcus ibis*, breed there. The marsh is also a place of refuge for Anatidae (*Anas erythroryncha*, *A. hottentota*, *A. melleri*, *Dendrocygna bicolor*, *D. viduata* and *Sarkidiornis melanotos*) during moulting. This is also a site where endemic fish lay eggs: *Aurecleus alaotrensis*, *Paratilapia polleni*, *Rheocles alaotrensis* and *R. sikorae*.

Criterion 8: The Lake Alaotra wetlands and catchment basins meets criterion 8 because the marshes provide an important source of food for fish. The four species of tilapia recorded at Alaotra represent 84.02 per cent in weight of all the fish found there. *Tilapia zilli* is a herbivore and feeds on *Cyperus* sp., *Nymphaea* sp. and *Phragmites* sp., which are abundant in the marsh and lake. *Oreochromis macrochir*, *O. mossambicus* and *O. niloticus* are, nonetheless, omnivores. The marsh is also a place for spawning and breeding for fish because most of the fish use the substratum of the marsh or borrows on the edges of the lake to lay eggs.

### 13. Biogeography

a) biogeographic region:

b) biogeographic regionalisation scheme (include reference citation):

**14. Physical features of the site:** Lake Alaotra is a lake of tectonic origin characterised by natural open water that is 1 to 2.5 metres deep (maximum 4 metres) at the end of the rainy season. The soil is hydromorphic to clay in the lower parts but easily eroded laterite on the slopes and hills. The bedrock is predominantly sandy, covered by detrital sediments. The main bogs are found in quiet areas of the main stream (Bourgeon, 1984; Chaperon et al., 1993). Located in the central-eastern part of Madagascar, the climate is moderately tropical. According to the ombrothermic diagram of Walter and Lieth (1967) (see annex 5, figure 3), prepared from meteorological data (1991–2000) from the station at Ambohitsilaozana, the region of Alaotra has two very distinct seasons: five months of wet season (from November to March) and seven months of dry season (from April to October). Furthermore, pluviometric data from the past ten years show a notable drop of precipitation since 1999 with the height of humidity more in December and January (see annex 5, figures 4 and 5).

### 15. Physical features of the catchment area:

**16. Hydrological values:** Lake Alaotra forms a basin that receives water from infiltration, flooding and runoff. It currently receives large amounts of eroded sediments from the surrounding mountains. This creates a problem of siltation of the rice fields and of even the lake at certain places. The main tributaries of Lake Alaotra are the Sasomangana and the Sahabe in the south and the Sahamaloto and Anony in the north. The exit from Lake Alaotra is the Maningory. Table 1 (annex 3) gives a list of 30 important rivers and streams of Alaotra. Fifteen dams built on the

main tributaries in the areas to control flooding are listed. Table 2 (annex 3) gives a list of existing dams and their location. As for the capturing of sediments, the Imamba/Ivavaka Project is planting trees in order to stabilize stream banks (Elson et al., 1992).

## 17. Wetland types:

### a) presence:

Inland: M, N, O, P, Tp, Ts

Human-made: 1, 2, 3, 4, 6, 7, 9

**b) dominance: Decreasing order of importance:** 4, 3, Tp, O, M, N, Ts, 9, 6, U, P, Y, W, 1

**18. General ecological features:** Four general types of habitat exist in the Lake Alaotra wetland:

- Lakes, ponds, canals and tributary streams;
- Marshes providing habitat for the lemur *Haplemur griseus alaotrensis*;
- Marsh grasslands dominated by herbaceous plants and dwarf plants that provide habitat for wild birdlife;
- Hills, catchment basins, grazing areas and forests, covered primarily with *Aristida rufescens* and *Heteropogon* sp.

**19. Noteworthy flora:** Vegetation is present in two strata. The upper stratum is dominated by zozoro (*Cyperus madagascariensis*), bararata (*Phragmites communis*) and vahankelana (*Aegyrea vahibora*). While the lower stratum has populations of vendrana (*Cyperus latifolius*), tamboloana (*Polygonum glabrum*) and vilona (*Echinochloa crusgalli*). The catchment basins are dominated by *Aristida rufescens* and *Heteropogon* sp. The low lands are covered by the grass rapanitra (*Cynodon dactylon*), and the ponds are filled with many species of flora, such as via (*Typhonodorum lindleyanum*), tamboloana (*Polygonum glabrum*) and karangy (*Leersia hexandra*).

**20. Noteworthy fauna:** The Lake Alaotra marsh provides habitat for the lemur *Haplemur griseus alaotrensis*, which is currently seriously endangered (IUCN/SSG, 2001). This is a subspecies endemic to Madagascar, but also endemic to the Alaotra (Mutschler, 1999). The population of this animal is currently declining because while there were more than 10,000 specimens around 1990 (DWCT, 2000), there were only about 7500 specimens in 1994 (Mutschler and Feistner, 1995), 5000 to 7000 specimens in 1999 (Mutschler et al., 1999), and currently the total population is estimated to be 3000 specimens (DWCT, 2001). The main causes of this decline are the burning of the vegetation in the marsh areas and hunting (DWCT, 2001). Apart from this lemur, the Alaotra wetlands provide habitat for two very rare endemic bird species: *Aythya innotata* and *Tachybaptus rufolavatus*. Despite a reward of

1,000,000 Malgache francs proposed by the Durrell Wildlife Conservation Fund since 1999 for whoever finds a specimen of *Aythya innotata*, but no one in the region has yet been able to find one up to now. The last two specimens of this species were observed in 1985 and in 1991 (Wilmé, 1993). Likewise, *Tachybaptus rufolavatus* has almost disappeared in the region of Alaotra (Hawkins et al., 1999). Alaotra also provides habitat for many wild ducks, such as *angaka* (*Anas melleri*), *damanona* (*Thalassornis leuconotos insularis*), *menamolotra* (*Anas erythroryncha*), *kazazaka* (*Anas hottentota*), *tahia* (*Dendrocygna bicolor*), *ara* (*Sarkidiornis melanotos*) and *vorontsara* (*Nettapus auritus*).

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**21. Social and cultural values:** The Lake Alaotra marsh is traditionally used by the surrounding population as a source of raw material for construction, handicrafts, construction of furniture and as an area for hunting and fishing. Fluctuation in fisheries production in the region is presented in annex 2. The seasonal wetlands and the edges of the permanent wetlands have been used for grazing, farming and as a source of domestic water. We have not estimated the forest area in the region, but visible forestry resources are scattered on the southern slopes of the basin around Lake Alaotra and on the small islands, such as Nosivola. Several bits of forest have been surveyed in the region east of Andreba Gare, Ouest Amparafaravola, Est Imerimandroso and around the Anony River. As for forestry, several areas of forestation of species of eucalyptus have been exploited on the slopes of Lake Alaotra. The Alaotra wetlands have a religious importance based on taboos and sacred places that are always respected. The studies of Andriantsiorimanana (2000) show that respect for the taboo “*fady*” is still widely spread throughout the region. For example, ceremonies asking for blessing take place on the sacred Nosivola, Vohitrandriana and Nosibe mountains, which are all located in the heart of the wetland. Finally, the Alaotra region has, through the Centre Agronomique du Lac Alaotra (CALA) research centre located at Ambohitsilaozana, a museum of fauna and flora and a documentation centre.

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## **22. Land tenure/ownership:**

**(a) within the Ramsar site:** The rice fields and other cultivated areas are private property, but the marshes and most of the hills belong to the government. However, since 1998, exploitation of the marshes located in the area south of the lake has increased considerably. Local persons and new arrivals stake their claims to marshes areas, which they then transform into rice fields. This is the specific case of Ambodivoara, Ampilahoana, Antsapananefatra and Antanifotsy Sahamamy.

**(b) in the surrounding area:**

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## **23. Current land (including water) use:**

**(a) within the Ramsar site:**

**(b) in the surroundings/catchment:** In the Alaotra catchment area, the lowest land is dominated by rice fields (see the map). The lower slopes are occupied by food crops and several forest strata, while the upper slopes are grasslands dominated by

*Aristida rufescens* and *Heteropogon* sp. In the surrounding regions, large plantations of *Pinus patula* (about 70,000 hectares) of Société Fanalamanga cover the ground of the south-western part of the Lake Alaotra catchment basin. There is also a wet forest complex, "Réserve Naturelle Intégrale de Zahamena", which occupies the Eastern region of the Alaotra catchment basin.

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**24. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:**

**(a) within the Ramsar site:** According to Pidgeon (1996), the main adverse factor affecting the ecologic characteristics of Alaotra are introduction of fish exotic, mainly *Carassius*, *Cyprinus* sp., *Gambusia* sp., *Micropterus* sp., *Ophicephalus* sp., *Oreochromis* sp., *Tilapia* sp., (see table 1, annex 4), which leads to the progressive disappearance of locally endemic fish and a unfavourable modification of the plant composition of the lake. Sedimentation and eutrophication of the lake through erosion and organic or inorganic pollution (chemistry) pose serious threats to the survival of the aquatic species of Alaotra. Another adverse effect is organic pollution of the lake, which is linked to the demographic explosion in the region (see annex 1). It is a result of several modes of biological fertilisation associated with sedimentation. Furthermore, acidification of Lake Alaotra, which according to Pidgeon (1996) is probably promoted by the drop in water level, a continuous supply of iron (lateritic soil carried by run-off) and a lack of photosynthesis by plants in the marsh, owing to decomposition of plants after burning. The drop in pH below 5.4 is a limiting factor in the reproduction of most of the fish. Inorganic pollution (from the use of pesticides) is due to the proximity of the rice fields to the lake. Water polluted by chemical fertilisation of the rice fields is easily supplied by the irrigation canals linking the rice fields and the lake. Furthermore, deforestation of the watersheds, use of seine nets and frequent fires in the marsh constitute harmful factors affecting the ecology of this site. In addition, there are factors such as the progressive invasion of the ponds by exotic species: mainly *tsikafona* (*Eichornia crassipes*), *fanotopelika* (*Azola* sp.) and *ramilamina* (*Salvinia* sp.). Invasion of the ponds blocks communication between various parts (Ramanampamonjy et al., 1998). Currently, 74 per cent of the lakes at Anororo and 77 per cent of those at Andilana Sud are suffering from the invasion of exotic species (DWCT, 2001).

(b) in the surrounding area:

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**25. Conservation measures taken:** The Lake Alaotra wetland does not yet benefit from a status of a protected area. The conservation measures in force are the application of laws by the Services des Eaux et Forêts, Pêches and the Gendarmerie; and the "DINA DE PECHE"<sup>1</sup> of 11 December 1998 setting the annual closing of fishing during one to two months, which will be applied for the third time. This "DINA" will be amended in July 2002. Finally, the "DINA" of the village associations, Communauté de Base (COBA) and Fédérations d'Associations serve as a structure for applied management. As for the rice fields, from 1962 to 1985

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1. DINA DE PECHE: Regional Convention for Fisheries Management in Lake Alaotra

Société SOMALAC cleared government land at Alaotra and converting them into rice fields after construction of dams, canals and paddies. After the agrarian reform, SOMALAC distributed lots of rice fields that have become private land. Towards 1987, the creation of the rice growers' association "TAMBA-JOTRA" taught the technique for managing the rice fields that had not been disseminated until then. This gave the rice growers and water users access to the management of water resources for their individual exploitation.

Attempts at community conservation have already taken place and have been applied in several villages through village associations with which the Durrell Wildlife Conservation Trust has worked, including at Andilana Sud (Association VORONTSARA), at Andreba Gare (Associations ZETRA MAITSO, AINA NY ZETRA), at Vohimarina (Association TAVAZA), at Ampasika (Association TAHIA), at Vohimenabe (Association TARATRA) and at Vohitsara (Association VOAHIRANA). New village associations have been created this year at Ambodivoara (AHARA), at Anororo (ZEVONA), at Ambohidavakely (ANGAKA), at Angoja (KITSEA) and at Amboavorikely (ONJY).

The Landscape Development Intervention (LDI) agency has been promoting community conservation through COBA<sup>2</sup> and the KOLO HARENA associations. Currently, KOLO HARENA exists at Belempona, Andreba Gare, Madiorano, Ambohimiarina, Ambatomanga, Andranomena, Vohidrazana, Ambatomafana and Ankasina. Examples of conservation measures that have been adopted are: on 19 October 2001, transfer of the management of the Ambohimiarina and Belempona marsh (type GCF<sup>3</sup>) took place officially through a tripartite contract between COBA, the Commune and CIREF.

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**26. Conservation measures proposed but not yet implemented:** The mayors of all the communes around the lake met three times in 1997 to discuss problems stemming from degradation of the lake. They agreed to enforce regulations in order to limit the size of the openings in fishnets and to protect the marshes against fire through a regional convention called «Dina de pêche». Enforcement of the regulations is still insufficient because most of the management committees at the communal level (representatives of the fishermen, the commune and the fisheries service) are still being created. New communal legislation that was adopted in March 2000 to regulate the status of fishermen (distribution of a blue card for fishermen, etc.) has not yet been applied effectively.

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## **27. Current scientific research and facilities:**

The Durrell Wildlife Conservation Trust sponsors the following research.

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2. COBA: Communauté de Base (A representative agency of the local community under law 2000-027 of 13 January 2002).

3. GCF: Gestion contractualisée des forêts (A contract for transfer of forest management, including the marshes between the government and the COBA, under law 2001-123 of 14 February 2001).



Biological research:

Study of the dynamism of the population of *Hapalemur griseus alaotrensis*. RALAINASOLO, F. (2001)

Study of movements of *Hapalemur griseus alaotrensis*. RAZAFINDRAMAHATRA, L. (2001)

Study of the *catheméralité* of *Hapalemur griseus alaotrensis*. OLIVIERI, G. (2001)

Study of the social behaviour of *Hapalemur griseus alaotrensis*. WEBER, P. (2001)

Monitoring:

Monitoring of the ecology of the Alaotra wetland (fires, siltation and exploitation of the marshes, fishing, hunting). DWCT in collaboration with LDI, Services Techniques and Associations villageoises (2002) (planned for every year).

Survey of waterfowl. Wetlands International-Durrell Wildlife Conservation Trust. Site Lac Alaotra-Madagascar. (Every January and June since 1997)

Study of the regeneration of the Alaotra marsh. ANDRIANANDRASANA, Tiana Herizo (2001).

Chemical analysis of the water at Alaotra. ANDRIANANDRASANA, Tiana Herizo (2002)

Research on the biology and conservation status of *Hapalemur griseus alaotrensis*, *Anas melleri* and *Aythya innotata* (ongoing research).

In addition, additional research projects could be underway sponsored by LDI, CALA and others.

**28. Current conservation education:** The Durrell Wildlife Conservation Trust and the Office of the Environmental Education Programme of the Ministry of National Education, financed by the U.K. Government, continue to sponsor a programme to promote awareness and education in the villages and schools surrounding the lake. This programme began in 1996, and its objective is to promote appreciation of the value and functions of the lake's ecosystem, especially the important ecological role of the marshes. In this programme, we seek to promote awareness in order to achieve conservation of the marshes by the local inhabitants. The project for tourism for the park at Bandro d'Andreba Gare currently has several reception centres, trained guides, canoes and canals for movement of visitors, as well as a visitors' centre, observation hides, nature trails, information booklets and facilities for school visits.

**29. Current recreation and tourism:** Currently, there are very few tourists, except several specialists looking for birds or lemurs. However, it is estimated that about 20 tourists a year visit the Park at Bandro d'Andreba Gare. These are tourists who are visiting the Zahamena Reserve, scientists (Malgache and foreigners) and curious people passing through the region.

The following reception centres exist:

Recreational sites	Tourist sites	Historical sites
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<b>(Family picnic site, Easter and Pentecostal Mondays)</b>		
Andilana Sud Ampasika (Amboavory) Amparihibe (Mahatsinjo) Anosiboribory Bevava Station CALA Ambohitsilaozana Manakambahiny Ouest Marololo (Andranomena)	Bezafo Andilana Lakes Amparihilehibe Andilana Lakes Ambatofotsy lookout Imerimandroso lookout	Museum CALA Ambohitsilaozana Island of Ambato (Vohitsoa) Grotte de l'île de Nosivola Grotte de l'île d'Anosy Vohitrandraiana sacred mountain

**30. Jurisdiction:** The lake and the marshes are under the jurisdiction of the Ministry of Agriculture through the Office des Eaux et Forêts and of the Ministère des Ressources Halieutiques, through the Direction régionale des Eaux et Forêts de Toamasina and from the local government at Ambatondrazaka. The “Alaotra Ranosoa” Association brings together the COBA federations, the technical services, local officials and NGOs working in the region. Currently, community management of the natural resources of Alaotra takes place under the GCF.

31. Management authority:

The head of CIREF Ambatondrazaka<sup>4</sup>, Tel.: 54 811 95, BP 101 Ambatondrazaka 503, Madagascar

The head of CIRPRH Ambatondrazaka<sup>5</sup>, Tel.: 54 812 46, E-mail: csp-azk@dts.mg, BP 36 Ambatondrazaka 503, Madagascar

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4. CIREF: Circonscription des Eaux et Forêts

5. CIRPRH: Circonscription de la Pêche et Ressources Halieutiques

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