Waterbird Monitoring in the Antsalova Region, Western Madagascar

G. RAZAFIMANJATO[1], T. S. SAM[1] AND R. THORSTROM[2]

[1]The Peregrine Fund's Madagascar Project, B.P. 4113 Antananarivo (101), Madagascar

[2]The Peregrine Fund, 5668 West Flying Hawk Lane, Boise, ID, USA
Corresponding author; Internet: rthorstrom@peregrinefund.org

Abstract.—Waterbird surveys following the annual African Waterbird Census were conducted in the Antsalova region of western Madagascar from 2002 to 2004. Seven wetland sites were monitored: five freshwater lakes, one alkaline lake and one marsh. Three of the five fresh water lakes were in the Manambolomaty Lakes Complex, a RAMSAR site. A total of 37,836 individual birds were recorded belonging to 55 species representing 15 families. The marsh had the highest waterbird abundance of all sites with an average of 3,616.3 ± 461 individuals (N=3 years). Species diversity index was highest in the freshwater lakes with an average of 2.53 ± 0.07, and the lowest was recorded at Antsohale Lake with an average of 2.22 ± 0.08. The waterbird abundance varied significantly between freshwater lakes and the marsh from 2002 to 2004, between freshwater lakes and the alkaline lake in 2003 and 2004, and between the alkaline lake and marsh. The net difference in species abundance between the Manambolomaty Lakes Complex and the other lakes varied significantly. In contrast, species richness between the Manambolomaty Lakes Complex and the other lakes did not vary. Several threatened species were at population levels observed ten years earlier. *Received 10 February 2007, accepted 1 April 2007.*

Key words.—waterbird surveys, threaten species, lakes, marsh, western Madagascar.

Waterbirds 30(3): 441-447, 2007

The wetlands of Madagascar are critically endangered habitat and they are inhabited by a high diversity of wetland-dependent birds including several endangered and highly-threatened species (Morris and Hawkins 1998; Rabarisoa 2001). The western Malagasy wetlands Endemic Bird Area (EBA) is a 26,000 km^2 complex of lakes, rivers, marshes, deltas, rocky shorelines and mangroves. The wetlands in this region are sometimes ephemeral, and are characterized as shallow lakes composed of reeds (*Phragmites*) and native waterlilies (*Nymphaea*) with open and muddy shores (ZICOMA 1999). The varying habitat types in this region contain a larger number of threatened avian species of the western biome like the critically endangered Madagascar Fish Eagle (*Haliaeetus vociferoides*) and Sakalava Rail (*Amaurornis olivieri*), the endangered Madagascar Teal (*Anas bernieri*), and the vulnerable Humblot's (Madagascar) Heron (*Ardea humbloti*) and Madagascar Plover (*Charadrius thoracicus*) (BirdLife International 2006).

The western Malagasy wetlands and their natural resources are extremely important to the local human populations for nutritional and economic values. However, due to the limited number and size of the wetlands, and the increasing human population in western Madagascar the biodiversity is being compromised and is rapidly disappearing (BirdLife International 2006). The main biodiversity threats in this region are conversion of wetland habitat to intensive rice paddies, hunting of birds, and over harvesting of fish stocks and forest resources. Due to their remoteness, the limited conservation efforts in the area and the lack of local human education and development the western wetlands have not been adequately protected (BirdLife International 2006).

The wetlands of the Antsalova region of western central Madagascar are composed of extensive coastal mangroves, marshes, lakes, rocky and sandy beaches, and contain the highest number of threatened bird species in the western region (ZICOMA 1999). In 1998, Manambolomaty Lakes Complex made up of Ankerika, Befotaka, and Soamalipo Lakes along with the alkaline Antsamaka Lake and nearby forests, were delineated into two local resource management zones. Also in 1998, the Manambolomaty Lakes Complex and several satellite lakes were classified as one of only two RAMSAR sites created in Madagascar (Gazetim-panjakan'i 1998). This complex of lakes has important ecological and

economical value in the Antsalova region (Rabarisoa 2001). There are twenty endemic bird species, and the highest density of the threatened Madagascar Big-headed Turtle (*Erymnochelys madagascariensis*) are found here (Dodman *et al.* 1999).

In this paper we present information on waterbird presence, abundance, diversity, annual fluctuations, and how the local community association resource management *Gestion Local Securisèe* (GELOSE) process has affected the waterbird populations.

METHODS

We use the term "waterbirds" to denote wetland-dependent species such as waterfowl, wading, shore, and marine birds. Bird surveys were conducted in the Antsalova region of western central Madagascar from 18°75'-19°25'S and 44°25'-44°50'E (Fig. 1). The dry season is from April to October and the wet season from November to March. The annual rainfall varies between 950-1,600 mm. The minimum and maximum temperatures range from 15°C and 37°C respectively, with an annual average of 25°C.

Seven wetland sites were surveyed: six freshwater lakes and one marsh. The lakes consisted of three lakes in the Manambolomaty Lakes Complex (Soamalipo, Befotaka, Ankerika) and lakes Antsamaka, Antsohale and Masama. Bemamba was the sole marsh and it is surrounded by the lakes on all sides. This marsh has been classified as a hunting reserve since 1972. These seven wetlands were monitored for three consecutive years from 2002 to 2004.

These wetland sites were classified into three distinct categories: 1) freshwater lakes, represented by Masama, Antsohale, Ankerika, Soamalipo and Befotaka which are shallow lakes with a low density of emergent and surface plants and with some aquatic bamboo growing along the lake's edges (the conversion of the lake shores into rice paddies is most notable at these lakes; 2) Antsamaka Lake which is a shallow alkaline lake with a high density of emergent waterlilies and some reeds; and 3) a marsh which was once an open lake, but has changed drastically in the last few decades with waterlilies, hyacinth, and reeds eliminating the open water.

Waterbird monitoring occurred from 2002 to 2004, and surveys were conducted biannually in January and July following the protocol of the annual African Waterbird Census (Perennou 1991). Two teams of three persons each conducted the surveys using binoculars, spotting scopes, field guides and data sheets. Survey teams walked or paddled in dugout and inflatable canoes along the lakes and marsh shorelines. Surveys started from 05.30 h and ended around 08.30 h in the morning, and again from 17.00 h to a few minutes after sunset around 18.30 h to identify species and numbers at roost sites. These techniques were standardized during all surveys. Waterbird surveys were completed during a two-week period at the seven wetland sites. Two days were spent at each site and surveys were carried out three hours in the morning and slightly more than one hour in the afternoon. Birds encountered were identified, counted, and recorded. Small flocks of around 100 birds, and depending on the species, were counted individually while large flocks' greater than 100 birds were estimated by visually establishing an imaginary block of birds and then determining the number of birds in each block and then multiplied by the number of blocks to get a total count of birds (Perennou 1991).

The Shannon-Wiener index, H' was used as a measure of bird diversity at each site (Kent and Coker 1992). Waterbird abundance was determined by t-test (paired t-test) to test the significant difference of waterbird abundance between lakes and among the habitat types. Except where stated, measures are given are means ± SD. Species richness and population abundance at the three lakes complex compared to the other sites were analyzed by using Chi-squared test (Johnson 1992).

RESULTS

From 2002 to 2004 we recorded 37,836 waterbirds composed of 55 species belonging to 15 families. The number of waterbirds recorded increased from year to year: 9,146 in 2002, 13,085 in 2003 and 15,605 in 2004 and the number of species varied from 47 in 2002 to 53 in 2003 (Table 1).

The annual number of waterbirds varied among the seven sites from 266 to 3,555 in 2002, from 613 to 3,438 in 2003, and from 493 to 4,105 in 2004. The most abundant species observed were White-faced Whistling Ducks (*Dendrocygna viduata*) (1,907.3 ± 602.4, n = 3 years), Cattle Egrets (*Bubulcus ibis*) (1,616.6 ± 911.4, N = 3 y), Glossy Ibises (*Plegadis falcinellus*) (1,265.3 ± 79.9, N = 3 y) and Fulvous Whistling Ducks (*D. bicolor*) (1,231.3 ± 700, N = 3 y). Most of the other species remained fairly constant during the three years.

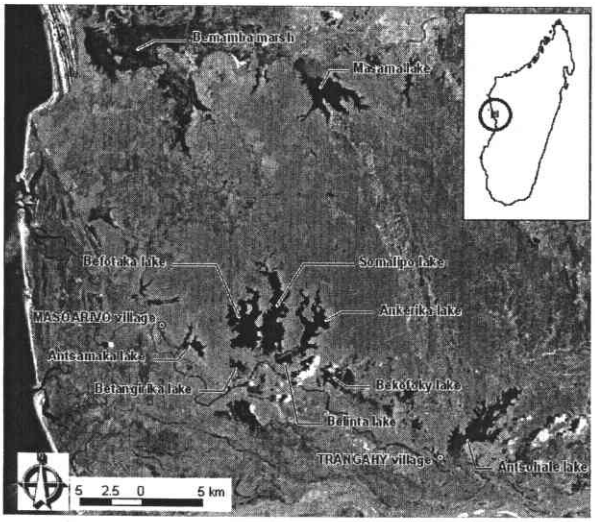

Figure 1. Map of the wetland study sites in the Antsalova region of western Madagascar.

Table 1. Waterbird numbers at the wetland study sites from 2002-2004 in the Antsalova region, western Madagascar.

Sites	2002	2003	2004	TOTAL
Antsohale	687	1,795	2,388	4,870
Ankerika	501	916	717	2,134
Soamalipo	1,408	1,308	2,585	5,301
Befotaka	996	1,826	1,729	4,551
Antsamaka	1,733	3,438	3,588	8,759
Bemamba	3,555	3,189	4,105	10,849
Masama	266	613	493	1,372
Total	9,146	13,085	15,605	37,836

At the seven wetland sites, and during the three consecutive years, Bemamba had the highest average number of species, 36.3 ± 1.5, and number of individuals 3,616.3 ± 461 observed. In contrast, Masama Lake had the lowest species average (24.6 ± 3) and lowest number of individuals (457.3 ± 176.2) observed. Antsohale Lake had the fewest average number of species (23 ± 3), but had a high number of individuals (1,623.3 ± 863.3). In the Manambolomaty Lakes Complex, Soamalipo Lake had the highest species richness at 30.6 ± 6.6 among the three lakes while Antsamaka Lake had a high number of individuals at 2,919.6 ± 1,030.4. Bemamba Marsh had the highest number of threatened species (N = 4 species) in 2002 and 2004 and Antsamaka Lake had the highest in 2003 (N = 4 species).

Eight threatened species of the 17 threatened waterbirds in Madagascar were recorded at the seven sites (BirdLife International 2004) (Table 2). The Madagascar Teal, Madagascar Plover, Madagascar (Humblot's) Heron, Madagascar Fish Eagle, Madagascar Little Grebe (*Tachybaptus pelzelnii*) are residents in the area; and Lesser Flamingo (*Phoeniconaias minor*), Madagascar Sacred Ibis (*Threskiornis bernieri*), and Madagascar Pond Heron (*Ardeola idea*) are seasonal migrants to the area.

Six migrant and one vagrant species were observed during surveys such as: Common Sandpiper (*Actitis hypoleucos*), Madagascar Pond Heron, Lesser Flamingo, Greater Flamingo (*P. ruber*), Common Greenshank (*Tringa nebularia*), Lesser Crested Tern (*Sterna bengalensis*) and White-winged Tern (*Chlidonias leucopterus*) (Hawkins and Goodman 2003). Both species of flamingos visited only Antsamaka Lake, the alkaline lake. Greater Flamingos were present year round, but their numbers decreased during the three survey years, and Lesser Flamingos were observed at Antsamaka Lake numbering 117 and 55 birds in 2002 and 2003, respectively.

The rare Madagascar Pond Heron had a maximum count of ten individuals in 2004 at Antsohale Lake. For the Madagascar Plover, the number recorded varied from two to 15 individuals at Bemamba Marsh and Antsamaka Lake in 2003. This shorebird has been

Table 2. Threatened bird species recorded at the wetland study sites from 2002-2004 in the Antsalova region, western Madagascar (+ is presence, - is absence, CR is critically endangered, EN is endangered, VU is vulnerable, and NT is near threatened).

Species	2002	2003	2004	Status
Madagascar Fish Eagle *Haliaeetus vociferoides*	+	+	+	CR
Madagascar Teal *Anas bernieri*	+	+	+	EN
Malagasy Pond Heron *Ardeola idea*	+	+	+	EN
Madagascar (Humblot's) Heron *Ardea humbloti*	+	+	+	EN
Madagascar Sacred Ibis *Threskiornis bernieri*	+	+	-	EN
Madagascar Little Grebe *Tachybaptus pelzelnii*	+	+	+	VU
Madagascar Plover *Charadrius thoracicus*	-	+	-	VU
Lesser Flamingo *Phoeniconaias minor*	+	+	-	NT

gradually disappearing, and during the most recent survey in 2005 we did not recorded this species (pers. obs.). For the Madagascar Sacred Ibis, its numbers have been constant from three to five individuals at Soamalipo Lake and Bemamba Marsh except for 2004 when they weren't recorded.

In general, the number of endemic species present in the Antsalova region was relatively low with only 9.1% (N = 5 species) of all Malagasy endemics recorded: Madagascar Teal, Madagascar Little Grebe, Madagascar Fish Eagle, Madagascar Plover, and Madagascar Jacana (*Actophilornis albinucha*).

Waterbird species diversity differed between sites and years due to the difference in habitat type and water levels. Masama Lake had the highest average species diversity compared to the other sites, and Antsohale Lake had the lowest average species diversity (see Table 3).

Waterbird Abundance

Waterbird abundance was statistically significant (t-test paired, $P < 0.05$) between Soamalipo and Masama Lakes from 2002 to 2004 ($t_{4,54} = 2.38$, $t_{4,54} = 2.77$ and $t_{4,54} = 2.43$). Also a significant difference was observed between Ankerika and Soamalipo and between Befotaka and Masama, in 2002 and 2004 ($t_{4,54} = -2.110$, $t_{4,54} = -2.35$ and $t_{4,54} = 2.14$, $t_{4,54} = 2.55$), between Antsohale and Masama, in 2003 and 2004 ($t_{4,54} = 2.13$ and $t_{4,54} = 2.34$), and finally between Antsohale and Ankerika ($t_{4,54} = 2.21$), and Ankerika and Befotaka ($t_{4,54} = -2.21$) in 2004.

The freshwater Soamalipo Lake was selected as a comparison between the alkaline Antsamaka Lake and Bemamba Marsh for bird abundance. There was only a significant difference between the fresh water lake and alkaline lake ($t_{4,54} = -2.306$, $P < 0.05$) and between the marsh in 2003 ($t_{4,54} = -2.238$, $P < 0.05$). There was no difference among Soamalipo Lake, Antsamaka Lake and Bemamba Marsh during 2002 and 2004.

Waterbird abundance at the Manambolomaty Lakes Complex (three lakes) was 44.4% (N = 11,986 individuals) of the total effective (N = 26,987) against 55.6% (N = 15,001 individuals) for the other lakes (Antsamaka, Antsohale and Masama) but species richness decreased. The three lakes had the highest average diversity of 29.3 ± 6.4 (N = 3 y) than the other lakes 26 ± 5 (N = 3 y). The net difference in waterbird abundance between the three lakes and the other lakes was significant ($\chi^2 = 9.3$; $P < 0.01$). In contrast, the species richness between the three lakes and the other lakes was not significant ($\chi^2 = 0.9$; $P = 0.6$).

DISCUSSION

During the last decade, the maximum number of individual waterbirds recorded in Madagascar occurred in 1994 (Langrand 1994; Rabarisoa 1999, 2003), and then decreased until 2002 after which numbers increased again in 2004 (see Fig. 2). The decrease from 1994 to 2002, may have been due to increased disturbance by human activities and possibly also due the climatic vari-

Table 3. The Shannon-Wiener Index of species diversity at the wetland study sites from 2002-2004 in the Antsalova region, western Madagascar.

Sites	2002	2003	2004	Average ± SD
Antsohale	2.28	2.26	2.13	2.22 ± 0.08
Ankerika	2.02	2.77	2.57	2.45 ± 0.39
Soamalipo	2.27	2.85	2.39	2.50 ± 0.30
Befotaka	2.26	2.35	2.51	2.37 ± 0.12
Antsamaka	1.99	2.61	2.55	2.38 ± 0.34
Bemamba	2.38	2.43	2.09	2.30 ± 0.18
Masama	2.47	2.62	2.50	2.53 ± 0.07
Average ± SD	2.23 ± 0.17	2.55 ± 0.21	2.39 ± 0.20	

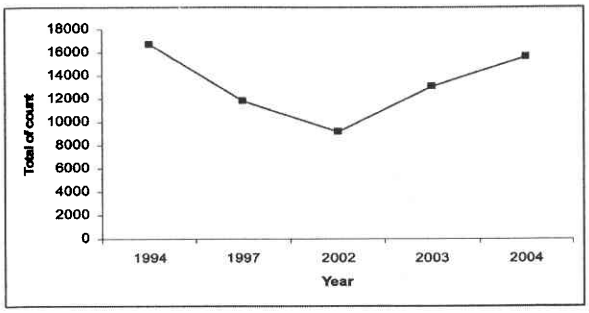

Figure 2. Waterbird surveys from 1994, 1997 and this study (2002-2004) in the wetlands of the Antsalova region, western Madagascar (Langrand 1994; Rabarisoa 1999, 2003).

ations. After 2002, in the Manambolomaty Lakes Complex, the establishment of a local communities resource management and conservation program began, and coincided with a net increase in species richness and abundance. This suggests the study sites had become more favorable habitat again for supporting wetland-dependent bird species.

Although endangered species like the Sakalava Rail was recorded at Bemamba Marsh in 1995 (Ramanampamonjy 1995), we did not record it during our surveys at Bemamba Marsh or the other sites. This could be the result of us not being able to survey the whole marsh network due to inaccessibility. Alternatively, this rare bird may have moved from the site because of habitat disturbance and human pressure.

Species richness and abundance recorded at each lake was correlated with the quality and size of the habitat available. Soamalipo Lake, having the largest surface area of 4.86 km^2, was inhabited by more individuals and species than the other two lakes in the Manambolomaty Lakes Complex: Befotaka at 3.86 km^2 and Ankerika at 3.09 km^2. This was also documented in Soamalipo Lake in earlier waterbird surveys by Rabarisoa (2003).

Antsamaka Lake has a large quantity and variety of introduced plants, several bird species appeared to prefer this heterogeneous habitat type: the African Pygmy Goose (*Nettapus auritus*), Common Moorhen (*Gallinula chloropus*), White-backed Duck (*Thalassornis leuconotus*), Hottentot Teal (*A. hottentota*), Purple Swamphen (*Porphyrio porphyrio*) and Allen's Gallinule (*Porphyrula alleni*). Red-knobbed Coots (*Fulica cristata*) and Greater Flamingos were common during January, the wet season, but were not present during the July censuses because this ephemeral lake was dried up. In Bemamba Marsh, the reeds and aquatic bamboo on the edge, and the rice growing activities at Soamalipo and Befotaka Lakes provided suitable habit for the secretive Greater Painted Snipe (*Rostratula benghalensis*).

The presence of Lesser Flamingos at Befotoka Lake, an adjacent lake to the alkaline Antsamaka Lake, appears to be uncommon because this species has a greater affinity for alkaline and saltwater habitats. The absence of this species in 2004 at Antsamaka Lake suggests they are irregular visitors or have local movements within Madagascar. Further support of seasonal movements of Lesser Flamingos was the surprising appearance of them at the freshwater Mburo Lake in Uganda (Arinaitwe 1996).

Species Diversity and Abundance

Species richness was highest at Bemamba Marsh than the freshwater lakes and the alkaline lake, but this marsh ranked the lowest in species diversity. The lower species diversity in Antsohale Lake could be the result of human disturbances from hunting and the conversion of the lake shore into rice cultivation. A detailed ecological study is needed to determine the causes of this trend.

Bemamba Marsh supported the greatest number of individual birds than the freshwater lakes likely due to its heterogeneity of habitat. This wetland has become severely degraded and is currently under threat by local communities who harvest grass from it to feed their livestock. The water hyacinth (*Eichhornia crassipes*) seems to have spread rapidly on the open surface, and local human communities are removing reeds for craft products such as woven baskets. This may lead to waterbird habitat degradation in the near future. At Antsamaka Lake, this shallow and sometimes temporal lake has numerous waterlilies which appear to shelter numerous birds and species. The principal threats to the freshwater lakes were: the con-

version of lake shores into rice paddies by humans, and some areas of the lakes have been silting in during the rainy seasons.

Waterbirds in western Madagascar are being hunted by traditional and modern hunting methods. Adult ducks are being trapped and killed by nets during their molting period (Zola and Kasidy, pers. comm.) or are shot (pers. obs.). In heronries on Befotoka Lake, the most serious threat to these birds is from local people who rob their nests and cut their nesting trees down so they can take nestlings for a protein rich food source. Rabarisoa (1999) reported that the heronry at Befotaka Lake is under serious threat from human activities such as deforestation, hunting, and the stealing of eggs and young from nests. These activities have significantly decreased since the establishment of the GELOSE resource management zones operated by the two local associations, Fikambanan'ny Zanak'Andranobe Miray (FIZAMI) and Fikambanana Fampandrosoana Ankerika Mamokatra (FIFAMA). Langrand (1987) reported the principal threats to Madagascar Fish Eagles are hunting, trapping, and taking young from nests. In the last decade, breeding success increased from three in 1994 to eight in 2004 because human-caused threats have gradually been reduced mainly due to The Peregrine Fund establishing a research camp in 1991 on Soamalipo Lake with a focus on Madagascar Fish Eagle research, and later assisting in a local community conservation program to protect this species (Watson *et al.* 1993).

Soamalipo and Befotaka Lakes are controlled by the FIZAMI association, and Ankerika Lake is managed by the FIFAMA association. These two associations are working to conserve wetland and forest natural resources and biodiversity. Other freshwater lakes and marshes have no resource protection. Several conservation laws and policies within these two local associations include no shooting, a fishing season that follows the traditional calendar which is shorter than the governmental fishing season calendar; a limited number of fishing permits and the requirement that fisherman are assigned to established fishing camps on the lakes. Our results indicate that local resource management strategies are necessary at some of the non-protected freshwater lakes and marshes in order to preserve waterbirds and their habitats. According to Andrianarimisa (1998), the management of such worldwide important sites requires ecological monitoring in order to develop suitable conservation strategies.

ACKNOWLEDGMENTS

We thank especially Lily-Arison Rene de Roland, National Director of The Peregrine Fund's Madagascar Project and the staff in Antananarivo for their valuable comments and help on the manuscript. Additional thanks are due to the field technicians of the The Peregrine Fund's Madagascar Project for their assistance in the field. We thank the Liz Claiborne and Art Ortenberg Foundation, MacArthur Foundation, and Environment Now for their financial support.

LITERATURE CITED

Andrianarimisa, A. 1998. Conservation de la biodiversité, vers une gestion communautaire du complexe lacustre de la forêt de Tsimembo. Rapport d'avancement V, 1997/1998. Antananarivo, Madagascar.

Arinaitwe, J. 1996. African Waterbird Census 1996. Les dénombrements d'oiseaux d'eau en Afrique (T. Dodman and V. Taylor, Eds.). Wetlands International, Wageningen, The Netherlands.

BirdLife International. 2004. Threatened Birds of the World, CD-ROM. BirdLife International, Cambridge.

BirdLife International. 2006. Wetland conservation in Madagascar. http://www.birdlife.org.

Dodman, T., H. Y. Béibro, E. Hubert and E. Williams. 1999. African Waterbird Census 1998. Les dénombrements d'oiseaux d'eau en Afrique, 1998. Wetlands International, Dakar, Senegal.

Gazetim-panjakan'i Repoblikan'i Madagascar. 1998. Loi no. 98-003: autorisant la ratification de la Convention de RAMSAR, relative aux zones humides d'importance internationale particulièrement comme habitats des oiseaux d'eau. Gazetim-panjakana, Antananarivo.

Hawkins, A. F. A. and S. M. Goodman. 2003. Introduction to the birds. *In* The Natural History of Madagascar. The University of Chicago Press, IL.

Johnson, R. R. 1992. Elementary Statistics. Sixth Edition. PWS-KENT Publishing Company, Boston.

Kent, M. and P. Coker. 1992. Vegetation Description and Analysis: A practical Approach. Belhaven Press, London.

Langrand, O. 1987. Distribution, status and conservation of the Madagascar Fish-eagle *Haliaeetus vociferoides* Desmurs 1845. Biological Conservation 42: 73-77.

Langrand, O. 1994. Madagascar. *In* African Waterbird Census 1994. Les Dénombrements D'oiseaux D'eau en Afrique, 1994 (V. Taylor and P. M. Rose, Eds.). The International Waterfowl and Wetlands Research Burea, Slimbridge.

Morris, P. and A. F. A. Hawkins. 1998. Birds of Madagascar: A Photographic Guide. Pica Press, Robertsbridge.

Perennou, C. 1991. African waterfowl census: counting waterbirds. The International Waterfowl and Wetlands Research Bureau, Slimbridge.

Rabarisoa, R. 1999. Madagascar. *In* African Waterbird Census 1998. Les Dénombrements D'oiseaux D'eau en Afrique, 1998 (T. H. Y. Dodman, E. Hubert and E. Williams, Eds.). Wetlands International, Dakar, Senegal.

Rabarisoa, R. 2001. Variation de la population des oiseaux d'eau dans le complexe des lacs de Manambolomaty, un site ramsar de Madagascar. Ostrich Supplement No. 15: 83-87.

Rabarisoa, R. 2003. Madagascar. *In* African Waterbird Census. Les Dénombrement D'oiseaux D'eau en Afrique 1999, 2000 and 2001 (T. Dodman and C. H. Diagana, Eds.). Wetlands International, Wageningen.

Ramanampamonjy, J. R. 1995. Rencontre inattendue avec le Râle d'Olivier (*Amaurornis olivieri*) au lac Bemamba. Working Group on Birds in the Madagascar Region Newsletter 5(2): 5-7.

Watson, R. T., J. Berkelman, R. Lewis and S. Razafindramanana. 1993. Conservation studies on the Madagascar Fish-eagle *Haliaeetus vociferoides*. Proceedings 8th Pan-African Ornithological Congress. Bujumbura, Burundi.

ZICOMA. 1999. Les zones d'importance pour la conservation des oiseaux à Madagascar. Project ZICOMA. Antananarivo, Madagascar.