IMPORTANT BIRD AREAS OF BOTSWANA

MONITORING REPORT 2007

BIRDLIFE BOTSWANA

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PREFACE

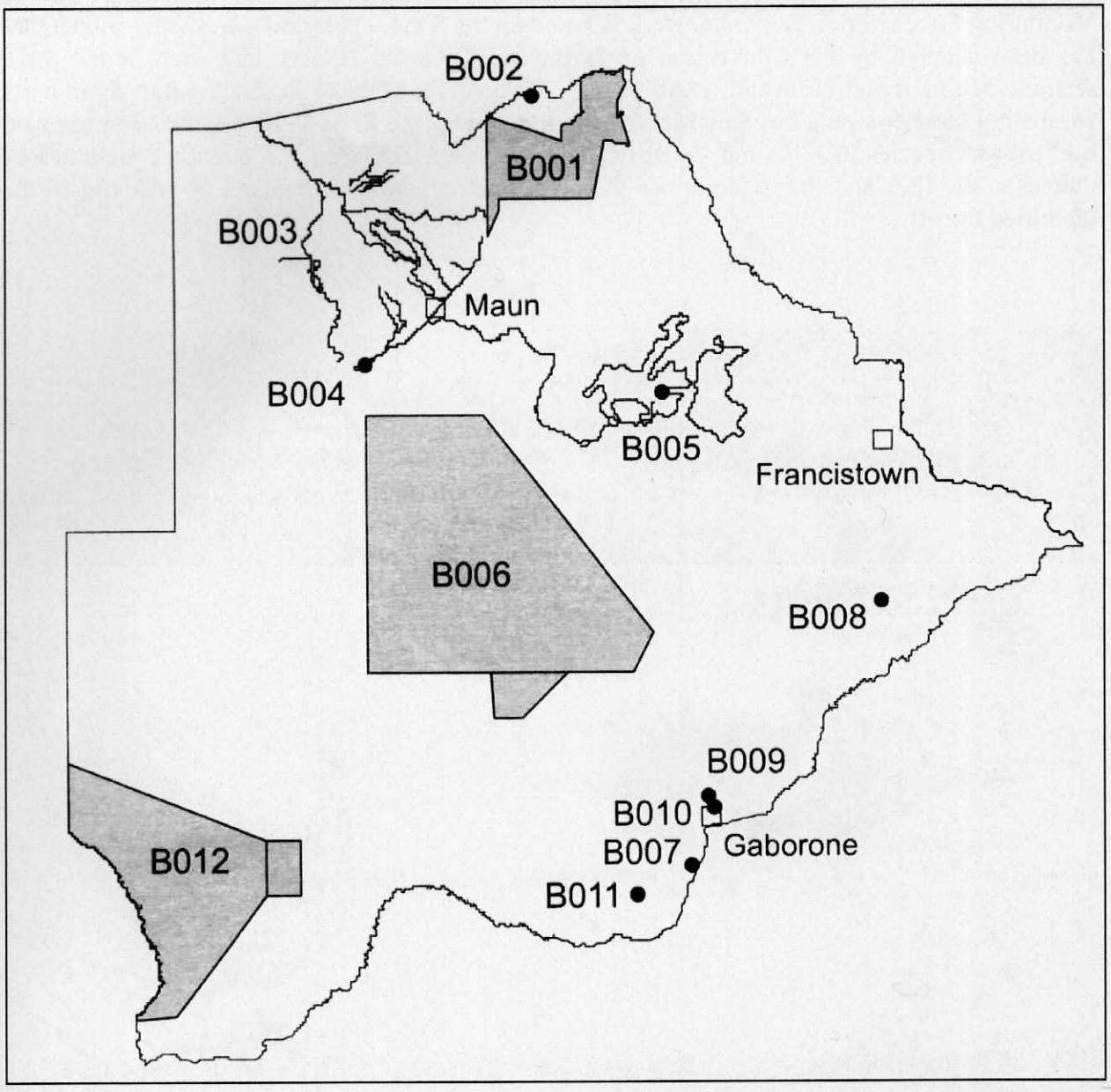
Botswana has 12 Important Bird Areas (IBAs), ranging from the diminutive Phakalane Sewage Lagoons (100ha) to the Central Kalahari Game Reserve - which is over 50,000km^2 in extent. These sites were selected based on international criteria, and form part of a network that is critical for birds and biodiversity both nationally and internationally. BirdLife Botswana is committed to monitoring these sites regularly, an enormous undertaking that challenges our limited personnel and resources. A start has however been made, with much appreciated assistance from various partners, and this report details some of the results achieved so far. Three IBAs – Linyanti Swamps, Lake Ngami and Makgadikgadi Pans – have been monitored intensively during 2007, and the findings form the basis for this report. Future issues of Babbler will include information from other IBAs as their monitoring protocols are developed and implemented.

Although scientifically rigorous, the report is written in a readable fashion and is well illustrated with colour photographs. It is intended to be read by amateur birdwatchers, government officials and scientists alike, and will add to the considerable body of literature on Botswana's birds that BirdLife Botswana has published since its inception.

The publication of the report has been made possible by the generosity of two of BirdLife Botswana's staunchest supporters, Mark Muller and Brian Bridges, who, through their companies Ngami Toyota and Mulbridge Transport, have sponsored all printing costs. They have also financed and undertaken a considerable amount of the fieldwork involved in monitoring these IBAs. This 'extraordinary' contribution from 'ordinary' BirdLife Botswana members is greatly appreciated.

H Hester
Chairman
Gaborone, December 2007

IMPORTANT BIRD AREAS OF BOTSWANA



LEGEND

B001	Chobe National Park	B007	Mannyelanong Hill
B002	Linyanti Swamps	B008	Tswapong Hills
B003	Okavango Delta	B009	Bokaa Dam
B004	Lake Ngami	B010	Phakalane Sewage Lagoons
B005	Makgadikgadi Pans	B011	South-east Botswana
B006	Central Kalahari	B012	Gemsbok National Park

INTRODUCTION TO THE REPORT

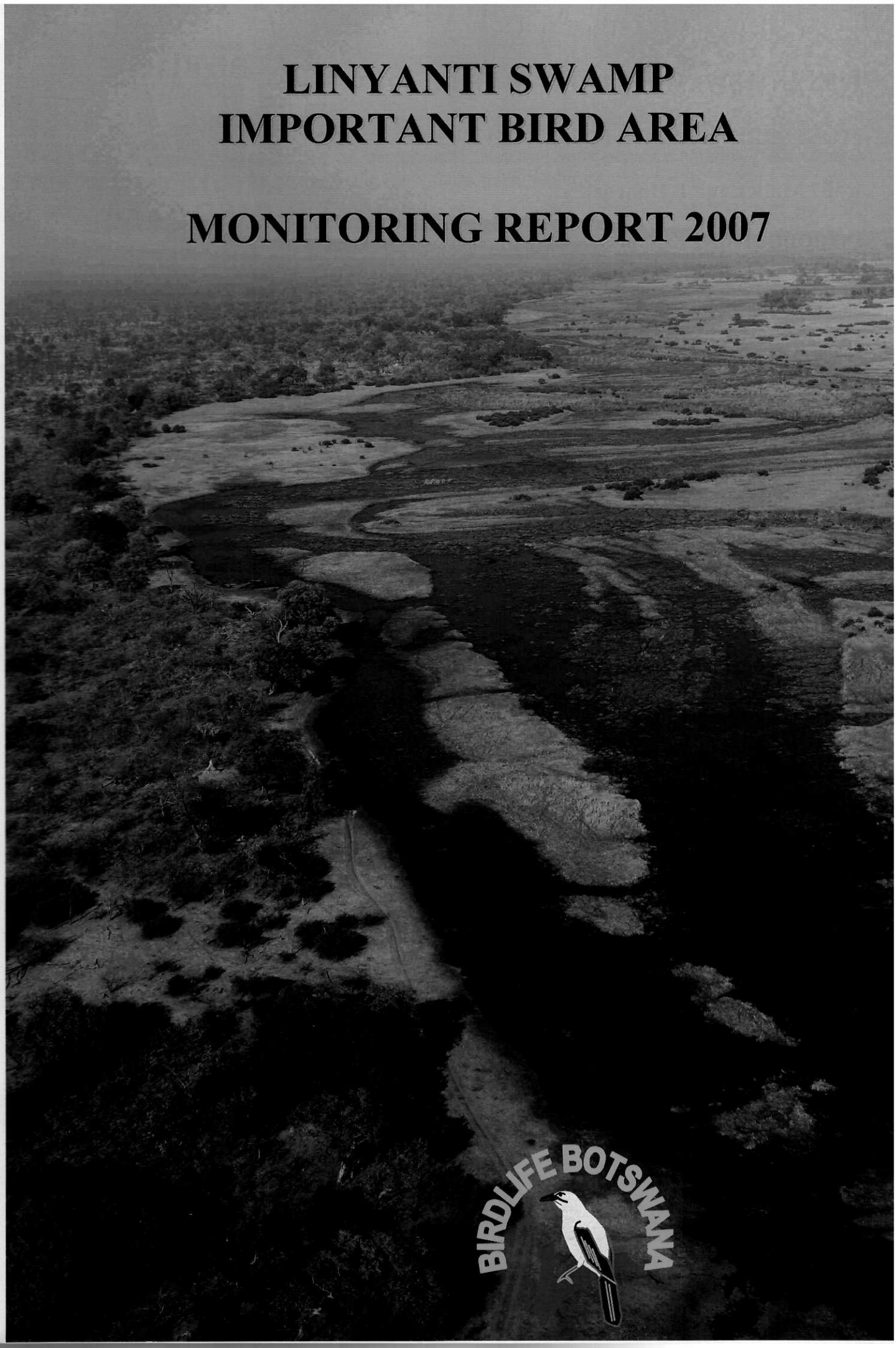
Important Bird Area (IBA) monitoring in Botswana is done following BirdLife's 'Global Monitoring Framework'. This framework is based on the State – Pressure – Response model that has been adopted by the Convention on Biological Diversity (CBD), and each of the three sections of this report (Linyanti, Lake Ngami, Makgadikgadi Pans) is divided into three parts paralleling these components. Part 1 deals with the state of the IBA, with particular emphasis on the 'trigger' species of birds that 'qualify' the area as an IBA. Part 2 focuses on pressures or threats to the IBA and Part 3 describes the conservation action undertaken in response to the identified threats.

DEDICATION

This report is dedicated to the memory of Tsogo Maipetho, colleague and friend who passed away unexpectedly at the end of 2007. He will always be remembered for his quiet, steady contribution to the BirdLife Botswana office in Maun, and to bird conservation in the country generally.

LINYANTI SWAMP IMPORTANT BIRD AREA

MONITORING REPORT 2007



BIRDLIFE BOTSWANA

LINYANTI SWAMPS IMPORTANT BIRD AREA

MONITORING REPORT 2007

by M Muller and P Hancock

INTRODUCTION

As part of BirdLife Botswana's commitment to maintaining a network of sites that are critical for birds both nationally and internationally, the Linyanti Swamps Important Bird Area (IBA) is monitored annually following BirdLife's global monitoring framework. This framework is based on the State – Pressure – Response model that has been adopted by the Convention on Biological Diversity (CBD), and this report is divided into three parts paralleling these components. Part 1 deals with the state of the Linyanti IBA, with particular emphasis on the 'trigger' species of birds that 'qualify' the area as an IBA. Part 2 focuses on pressures or threats to the IBA and Part 3 describes the conservation action undertaken in response to the identified threats.

During 2006, the whole of the Linyanti IBA was aerially sprayed with Deltamethrin to eradicate the Tsetse Fly, and a team from the Maun Branch of Birdlife Botswana, formed part of the monitoring team that was commissioned by the Botswana Government to assess if this operation had any negative impacts on birds. This provided Birdlife Botswana with the perfect opportunity to establish baseline data for long-term monitoring of this IBA. This report builds on the foundation established during 2006, and presents data gathered during fieldwork undertaken during June and September, 2007.

During the course of this year the monitoring team expanded the scope of the monitoring project and aligned it with the global monitoring framework as mentioned above. A solid core of knowledge and an excellent understanding of the IBA have been established.

ACKNOWLEDGEMENTS

The Linyanti Swamps IBA encompasses the photographic concessions operated by Wilderness Safaris, Linyanti Explorations and Kwando Safaris, and we are grateful to these organizations and their staff for their co-operation and assistance with the monitoring. In particular, Map Ives' support and enthusiasm for the project, coupled with the logistical support that he organized for the BirdLife team, greatly facilitated our work and is sincerely appreciated.

Sincere thanks to all BirdLife team members for conducting the fieldwork; B Bridges, D Bridges, A Flatt and G Mogorosi – without your assistance, this report would not have been possible.

OBJECTIVE

The principal objective of the project was to gather quantitative data for the ongoing monitoring of the Linyanti Swamps IBA, to determine if there were any negative anthropogenic changes impacting on the area generally, and its avifauna in particular.

THE GLOBAL MONITORING FRAMEWORK

The global monitoring framework requires that data are collected on environmental parameters that could influence bird numbers, to provide a context for the monitoring of the 'trigger' species, and then the trigger species are monitored in an objective way to determine their trends. The trigger species for Linyanti are shown in Table 1 below:

Table 1. Trigger species for the Linyanti IBA (Tyler and Bishop, 1998, updated)

1. <u>Globally Threatened Species</u> • Cape Vulture. • Lappet-faced Vulture. • White-headed Vulture. • White-backed Vulture. • Lesser Kestrel • Wattled Crane. • Slaty Egret. • Corn Crake. • Black-winged Pratincole. • African Skimmer. • European Roller.
2. <u>Range- and Biome-restricted species</u> • Arnot's Chat. • Burchell's Starling. • Dickinson's Kestrel. • Burchell's Sandgrouse. • Coppery-tailed Coucal. • Racket-tailed Roller. • Bradfield's Hornbill. • Hartlaub's Babbler. • Kurrichane Thrush. • Miombo Rock Thrush. • Kalahari Scrub-Robin. • Barred Wren-Warbler. • Stierling's Wren-Warbler. • Chirping Cisticola. • Meves's Starling. • White-bellied Sunbird. • Brown Firefinch. • Broad-tailed Paradise-Whydah.

3. **Congregatory Waterbirds**
   - Rufous-bellied Heron
   - African Darter
   - Great Egret
   - African Openbill
   - Marabou Stork
   - Hottentot Teal
   - African Pygmy-Goose
   - Collared Pratincole

The pressures on the Linyanti IBA were originally identified by Tyler and Bishop (1998), but some of these have been superceded and a current set of issues has been identified through fieldwork, and documented in Part 2. These threats need to be ranked so that they can be incorporated into the global monitoring framework.

The conservation action taken, or response to the threats, is required as the final part of the global monitoring framework to assess and measure any progress that has been made towards addressing or mitigating these threats. Again the actions need to be objectively ranked for incorporation in the framework. The relevant details are documented in Part 3.

PART 1 – STATE OF THE LINYANTI IBA

Environmental setting

Regional and local rainfall is an important environmental variable affecting birds in the Linyanti Swamps. Unfortunately there are no long-term meteorological stations in the Kwando-Linyanti area - the nearest stations on the Botswana side are Shakawe, Maun and Kasane. Rainfall will however manifest itself on the flooding regime, another vital component of the Linyanti ecosystem. All that can be said about the rainfall during 2007 is that it was less than that experienced during the preceding season, with the result that by winter, all deciduous trees, even *Diospyros mespiliformis*, had lost their leaves, making visibility for locating birds and their nests very good.

Water flow data exist for the Kwando River at Kongola in Namibia since 1981 and at Bates Camp in Botswana since 1989 and are depicted in Figure 1 overleaf.

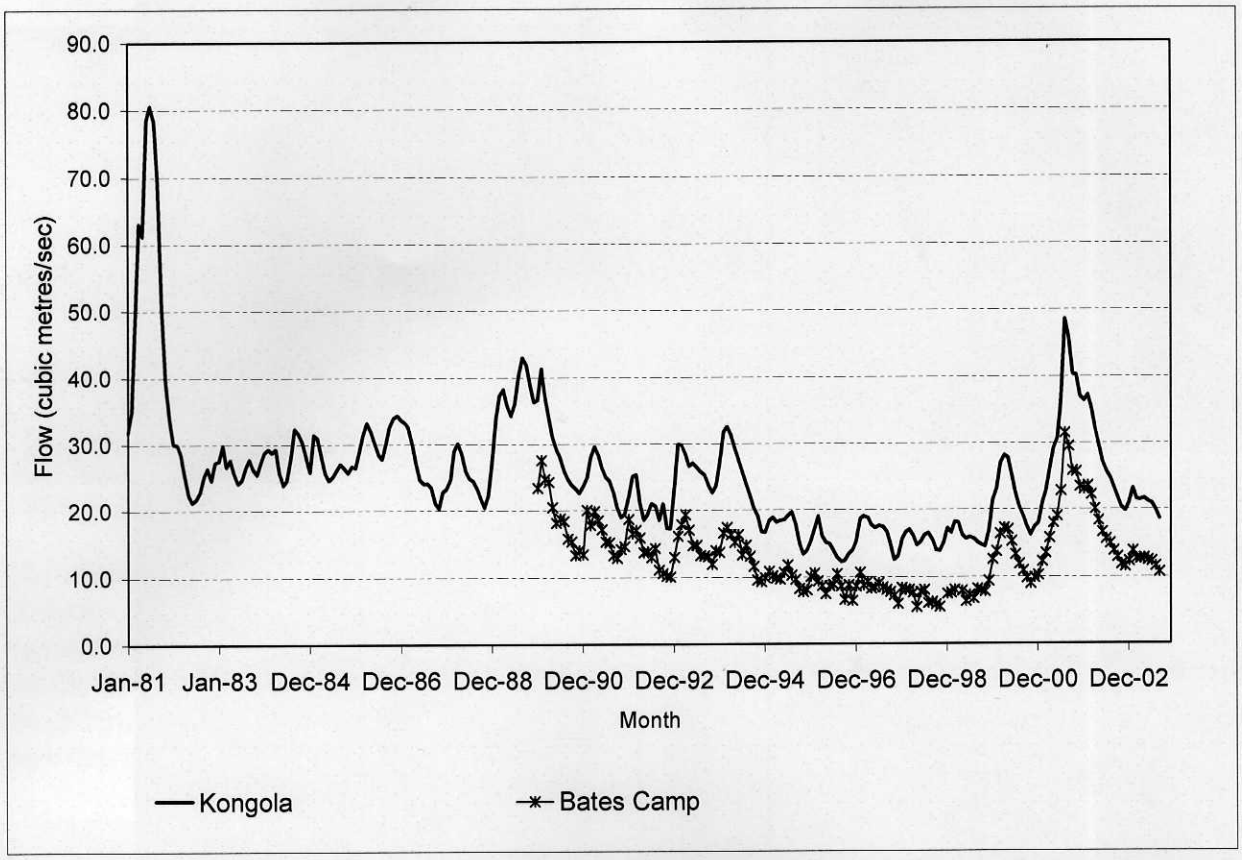


Figure 1. Water discharge on the Kwando River at Kongola (Namibia) and Bates Camp (Botswana) after Wolski (2007).

The graph indicates that water flows have increased in recent years following a decade of low and declining flows from 1989 to 1999, but are still considerably lower than the maximum recorded in 1981. During the 1990s, Zibadianja Lagoon, an important waterbird habitat, diminished in size as did the extent of the flooded area, with associated drying out of floodplains and reedbeds – also important bird habitats. The fluctuation in the area flooded is shown in Figure 2 below.

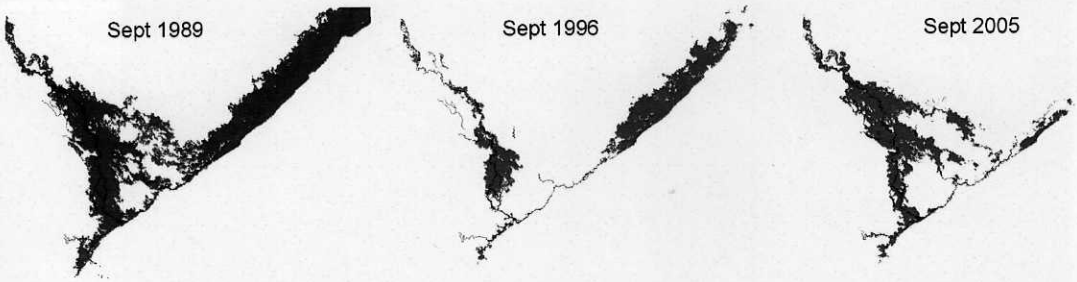


Figure 2. Comparison of flood extents in the Kwando/Linyanti system for high flood (1989), low flood (1996) and average flood year (2005) after Wolski (2007).

Large portions of the Linyanti floodplain are now dry grasslands with tree-covered islands interspersed with open water, sparse aquatic vegetation, *Papyrus* and *Phragmites* reedbeds. A few aerial views (Figure 3 overleaf) show this clearly.

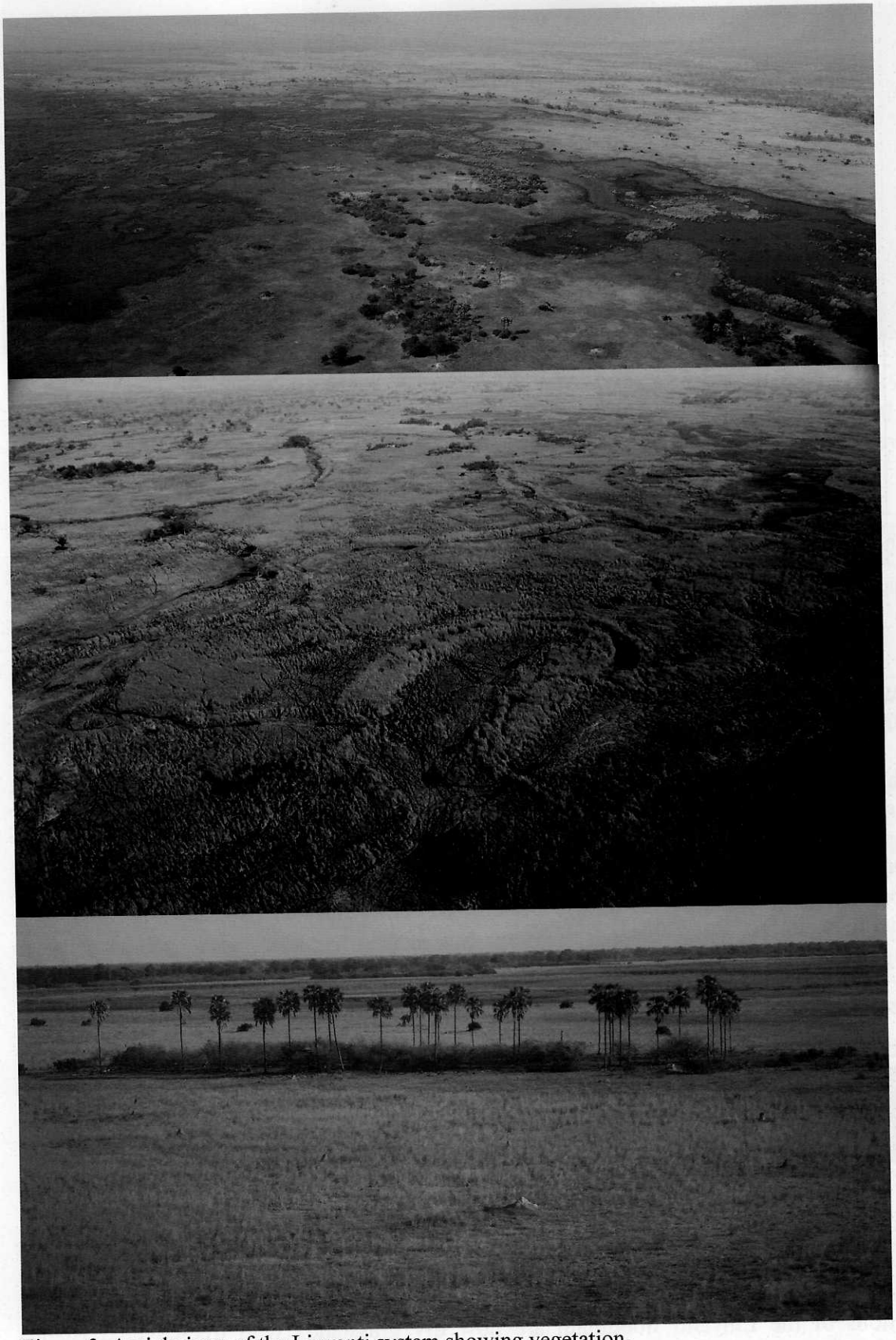


Figure 3. Aerial views of the Linyanti system showing vegetation.

Parts of the open waterbodies have become infested with the alien waterweed, *Salvinia* – according to Hancock *et al.* (2005) this negatively affects the feeding success of the Slaty Egret which hunts by sight (and possibly other waterbirds too). The extent of the *Salvinia* could not be quantified, but the seriousness is shown in Figure 4 overleaf:

Figure 4. Total coverage of the water surface by a mat of *Salvinia molesta*.

The relative dryness of the system may be responsible for an increase in the number and extent of fires – an important ecological factor which has both positive and negative impacts for birds. For example, Slaty Egrets have a preference for feeding on recently burnt, shallow floodplains, but the *Phragmites* reedbeds used by this species for breeding are destroyed by fire (Hancock *et al.*, 2005). Figure 5 shows an uncontrolled fire burning during September 2007, and the resultant haze that reduced visibility during aerial survey work.

Figure 5. Uncontrolled fire and the resultant haze extending over the Linyanti system.

Figure 6 shows the extent of fires in the Linyanti system during 2007 – from the Web Fire Mapper for Botswana (http://maps.geog.umd.edu/activefire_html/checkboxes/botswana_checkbox.html) The Linyanti IBA is in the lower left hand quarter of the image, but a wider area is depicted since fires in the surrounding area will influence bird distribution. The corresponding maps for 2005 and 2006 are shown in Figure 7.

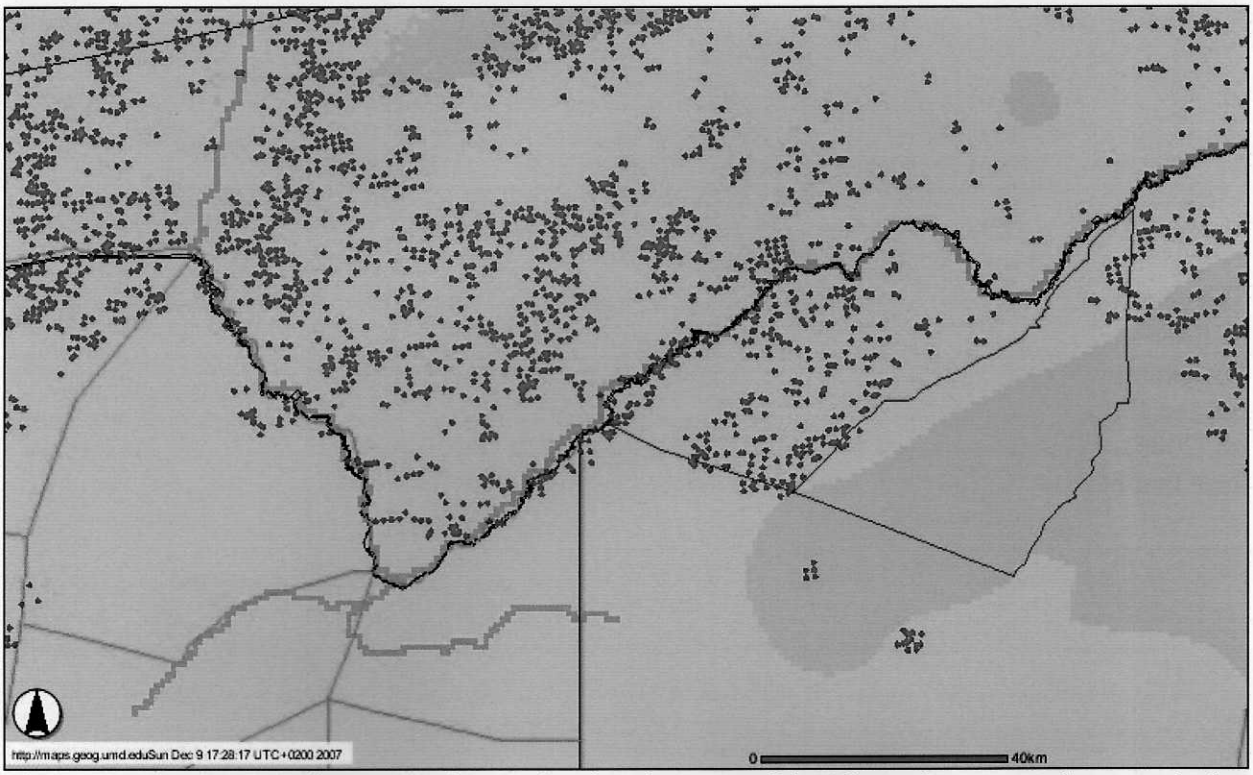


Figure 6. Botswana web fire mapper image showing the areas of the Linyanti system and surrounds that were burnt during 2007 (red dots).

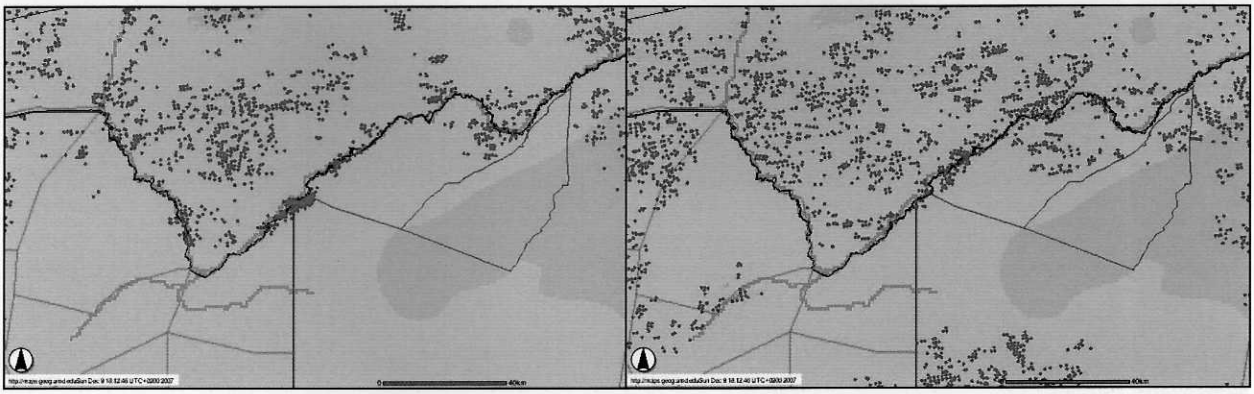


Figure 7. Extent of fires in the Linyanti system during 2005 (left) and 2006 (right)

A final parameter of importance for birds in the Linyanti IBA is the large elephant population which impacts heavily on bird habitats, both dryland and wetland. The elephant population in northern Botswana currently stands at 152,000, with 38,614 of these occurring in the Linyanti area, giving it the highest density in Botswana, of 4.2 elephants/km^2. Figure 8 shows the high number of trees felled by elephants in the *Colophospermum mopane* woodland to the south of the Linyanti floodplain – elephants also selectively debark large *Acacia nigrescens* trees used preferentially by vultures and other raptors for nesting.

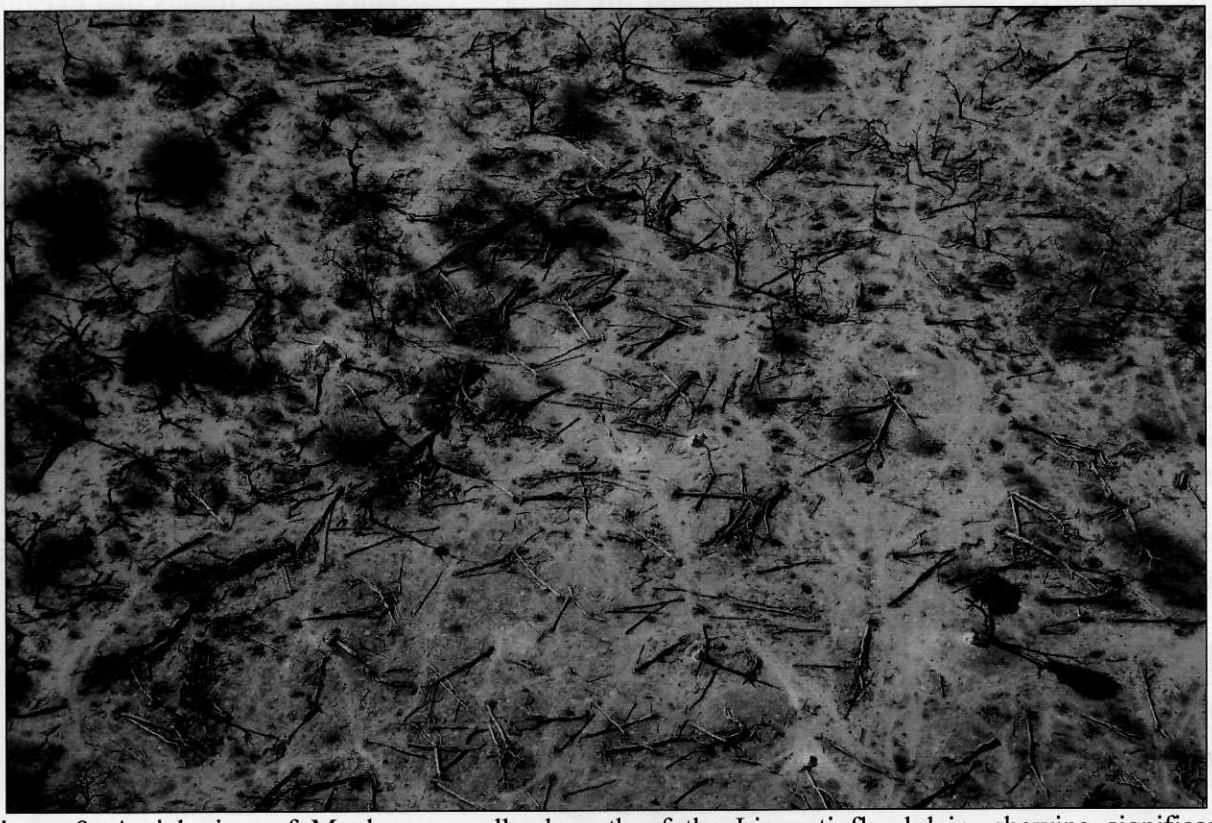


Figure 8. Aerial view of Mophane woodland south of the Linyanti floodplain, showing significant numbers of trees felled by elephants.

Elephants also exert a heavy impact on the *Phragmites* reedbeds that are favoured by herons and egrets for nesting – bulls in particular spend a considerable amount of time in these reedbeds and can trample large areas as shown in Figure 9 below:

Figure 9. Five bull elephants feeding in *Phragmites* reedbed, showing the extent of the area trampled.

The cumulative effect of both elephants and fire on these vegetation types means that existing habitats are undergoing large-scale change, with implications for the avifauna of the Linyanti area.

Finally, elephants contribute to the increased turbidity of the water in the Linyanti, thereby impacting on waterbirds such as the Slaty Egret and African Fish-Eagle that hunt by sight.

Status of the Avifauna

1. Globally threatened species

Not all globally threatened species found in Linyanti are suitable for monitoring, and unsuitable species are discussed at the end of this section. The emphasis for monitoring is on species that are sufficiently abundant and conspicuous to provide useful data.

The primary species monitored are White-backed Vulture, Wattled Crane and Slaty Egret. Different methods are used to monitor these species, as described below.

White-backed Vultures

Photo: J Macdonald

A large sample of White-backed Vulture nests were located from the air during the 2006 monitoring, and these were revisited during the 2007 breeding season – the first nest check was done in the last week of June when it was predicted that most birds would be incubating or have very small chicks, and the second visit was during the middle of September in order to see how many of the chicks had reached fledging stage. The aerial survey work was done using two specialized light aircraft capable of slow, safe low-level flight – a gyrocopter piloted by B Bridges, with D Bridges as observer, and a twin-engined AirCam, piloted by M Muller, with A Flatt as the observer.

The aircraft were flown at approximately 70km per hour, 50m above ground level for an average of two hours in the early mornings and late afternoons when atmospheric conditions were optimal; the Gyrocopter proved to be less influenced by wind conditions. The observer recorded the nest contents, and for new nests, the geographical co-ordinates using a hand-held Global Positioning System (Garmin 296, set for WGS 84, and decimal degrees).

The results of the survey show that there is a large and healthy breeding population of this species in the IBA, far in excess of original estimates. A total of 83 nest sites have been identified, but not all were active during 2007 – some had collapsed or disappeared by the time of the 2007 survey. Accordingly at the end of September, 2007, there were 77 nest sites that were used in the calculation of breeding success for this species. The details are tabled ovrleaf.

Table 2. Nest site data for White-backed Vultures

Nest site no.	June findings	Details	September findings	Breeding success
WBV0191	Inactive	Empty	1 x chick	1
WBV0301	Inactive	Empty	1 x adult, 1 x chick	1
WBV0303	Inactive	broken	1 x chick	1
WBV0304	Active	Adult brooding	Empty	0
WBV0307	Active	Adult brooding	1 x chick	1
WBV0309	Active	Adult brooding	1 x chick	1
WBV0310	Active	Adult brooding	Not found	
WBV0312	Active	Adult brooding	Empty	0
WBV0313	Active	Adult brooding	1 x adult, 1 x chick	1
WBV0315	Active	Adult brooding	1 x adult	1
WBV0316	Active	Adult brooding	Nest broken	
WBV0317	Inactive	broken	Nest broken	
WBV0320	Active	Adult brooding	1 x chick	1
WBV0321	Active	Adult brooding	1 x chick	1
WBV0322	Inactive	Empty	1 x egg	0
WBV0323	Active	Adult brooding	1 x chick	1
WBV0324	Inactive	Empty	Empty	
WBV0325	Active	Adult brooding	Bird sitting tight	1
WBV0326	Not Found		1 x egg	0
WBV0336	Active	Adult brooding	Empty	0
WBV0337	Inactive	Empty	1 x chick	1
WBV0339	Active	Adult brooding	1 x egg	0
WBV0342	Active	Adult brooding	1 x chick	1
WBV0343	Active	Adult brooding	1 x chick	1
WBV0344	Active	Adult brooding	1 x chick	1
WBV0346	Active	Adult brooding	1 x chick	1
WBV0347	Active	Adult brooding	1 x chick	1
WBV0348	Active	Adult brooding	1 x chick	1
WBV0349	Active	Adult brooding	Not found	
WBV0350	Active	Adult brooding	1 x chick	1
WBV0351	Active	Adult brooding	1 x egg	0
WBV0353	Active	Adult brooding	Empty	0
WBV0354	Active	Adult brooding	Empty	0
WBV0355	Inactive	Empty	Empty	
WBV0356	Active	Adult brooding	Nest broken	0
WBV0357	Active	Adult brooding	1 x chick	1
WBV0358	Inactive	Broken	No trace of nest	
WBV0373	Active	2 eggs	2 eggs	0
WBV0374	Active	Adult brooding	1 x chick	1
WBV0376	Inactive	Empty	Empty & disused	
WBV0381	Active	Adult brooding	1 x chick	1
WBV0382	Active	Adult brooding	Empty	0
WBV0385	Active	1 x chick	1 x chick	1
WBV0389	Active	1 x egg	1 x chick	1
WBV0570	Active	Adult brooding	Empty	0
WBV0571	Active	Adult brooding	Empty	0
WBV0572	Active	Adult brooding	1 x chick	1
WBV0573	Active	Adult brooding	1 x chick	1
WBV0574	Active	Adult brooding	1 x chick	1

Nest site no.	June findings	Details	September findings	Breeding success
WBV0576	Active	Adult brooding	1 x chick	1
WBV0577	Active	Adult brooding	1 x chick	1
WBV0578	Active	Adult brooding	1 x egg	0
WBV0579	Active	Adult brooding	1 x chick	1
WBV0581	Active	Adult brooding	Empty	0
WBV0582	Active	Adult brooding	1 x chick	1
WBV0583	Active	Adult brooding	1 x chick	1
WBV0584	Active	Adult brooding	Empty	0
WBV0585	Active	Adult brooding	1 x chick	1
WBV0587	Active	Adult brooding	Empty	0
WBV0588	Active	Adult brooding	1 x chick	1
WBV0589	Active	Adult brooding	Not found	
WBV0590	Active	Adult brooding	1 x chick	1
WBV0592	Active	Adult brooding	1 x chick	1
WBV0593	Active	Adult brooding	1 x chick	1
WBV0594	Active	Adult brooding	1 x egg	0
WBV0596	Active	Adult brooding	Nest broken	0
WBV0598	Active	Adult brooding	2 eggs	0
WBV0599	Active	1 x egg	Empty	0
WBV0600	Active	Adult brooding	Empty	0
WBV0601	Active	1 x egg	1 x chick	1
WBV0613	Active	Adult brooding	Not checked	
WBV0665	Not checked	Not checked	1 x chick	1
WBV0666	Not checked	Not checked	1 x chick	1
WBV0667	Not checked	Not checked	2 eggs	0
WBV0668	Not checked	Not checked	1 x chick	1
WBV0669	Not checked	Not checked	1 x chick	1
WBV0670	Not checked	Not checked	1 x chick	1

Excluding the nests that could not be relocated, there is a breeding success of 64% for this species during 2007. This falls within the range recorded by Mundy *et al.* (1992) who report breeding success rates of 43 to 87% for this species. It appears as though there is a potential total breeding population of 100 pairs of White-backed Vultures in the IBA, exceeding the estimate of 20 pairs given by Tyler and Bishop (1998).

The nesting activity of White-backed Vultures in the IBA is almost entirely restricted to the large riparian trees along the Linyanti faultline, both sides of the first 17 kilometres of the Savuti channel and the *Hyphaene petersiana* palm belt areas in the Selinda Concession.

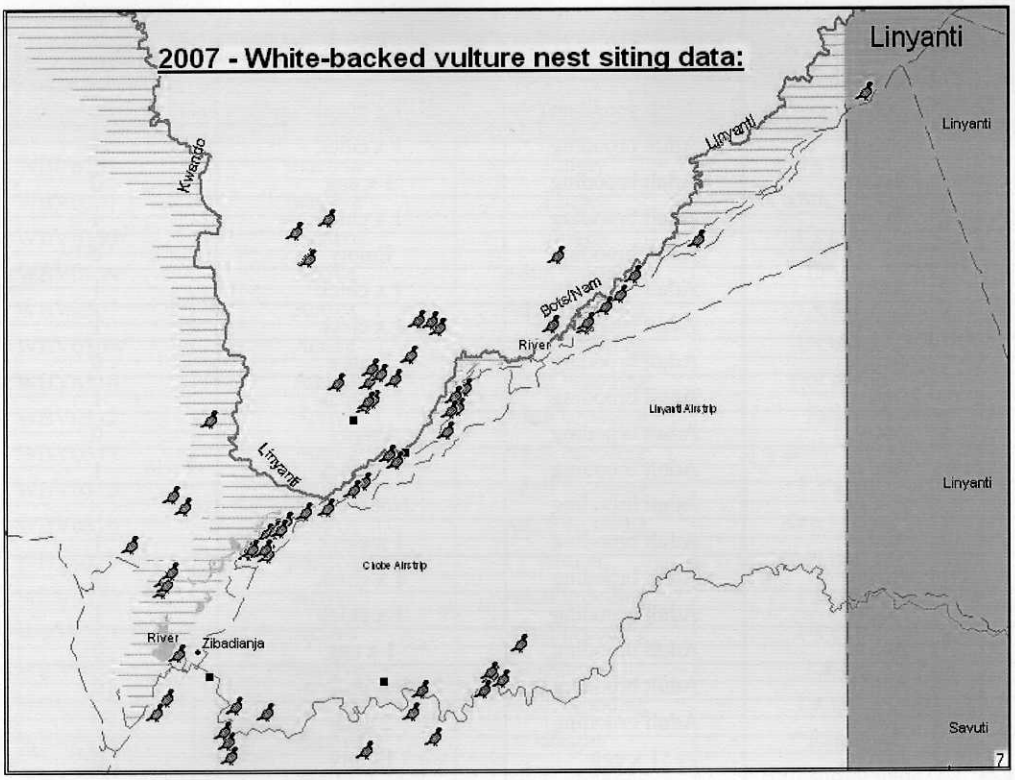


Figure 10. Distribution of known White-backed Vulture nests (symbols) in the Linyanti IBA.

Nest sites for White-backed Vultures are restricted almost entirely to three species of trees:

1. *Acacia nigrescens* (31 sites, 47% of all sites).
2. *Diospyros mespiliformis* (17 sites, 26% of all sites).

Nests are always placed on the tops of these two species of trees.

3. *Hyphaene petersiana* palm trees (17 sites, 26% of all sites).

Nests are placed in the top fronds, generally on the western side of these trees.

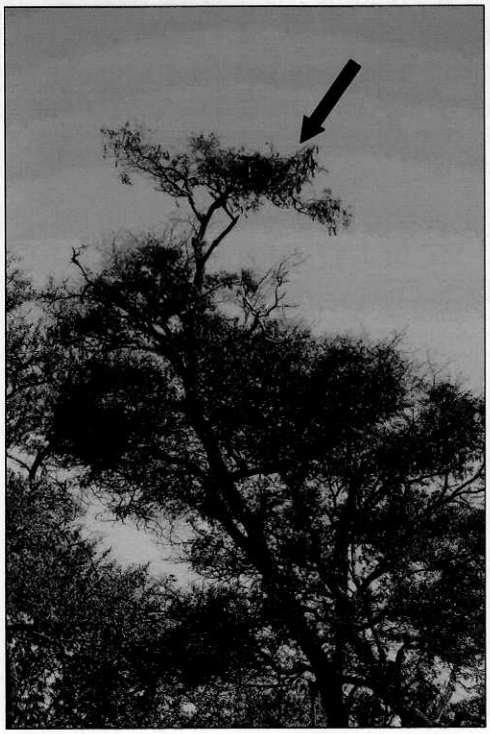


Figure 11. White-backed Vulture nest on canopy of *Acacia nigrescens* (left, arrowed) and on fronds of *Hyphaene petersiana* (right).

The preference of Elephants for *Acacia nigrescens* and *Hyphaene petersiana*, coupled with the high density of this species means that there is heavy pressure on White-backed Vulture nesting sites. The palm trees are often weakened by fire, and then inadvertently pushed over by the elephants during the palm fruiting season when trying to dislodge the fruits. This aspect will be discussed further in Part 2 – pressures on the IBA.

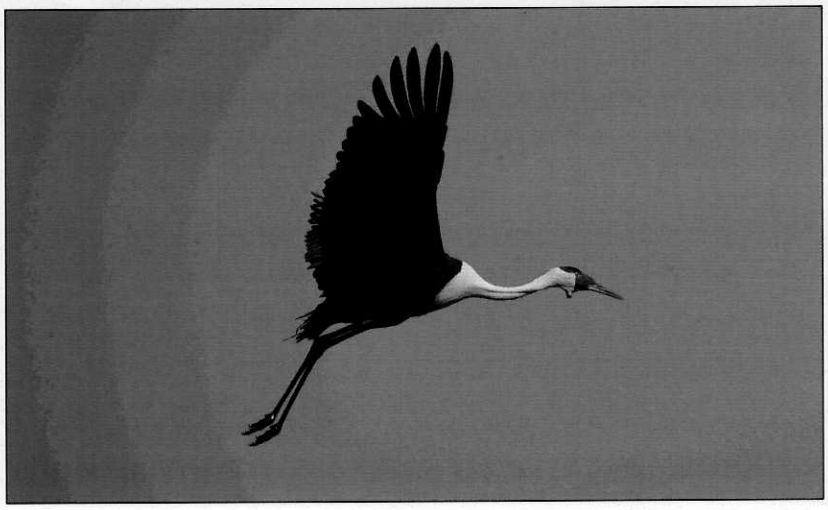
During the September survey, several nests were found to have one egg and appeared deserted - this is contrary to what was noted during the 2006 monitoring. However, the reason for these apparent desertions is unknown. Also, a dead vulture was spotted from the air and when checked on the ground, was found to have the upper mandible completely smashed. This appears to have been a natural mortality.

Figure 11. Dead White-backed Vulture with damaged upper mandible

It is also interesting to note that nest site no. AFE0025, occupied by an African Fish-Eagle during 2006, was taken over by a White-backed Vulture during 2007, while WBV0376 was occupied by a Tawny Eagle. These observations indicate that there is competition for suitable nest sites in the IBA.

Wattled Crane

The Gyrocopter and AirCam were used to search the Linyanti floodplains for Wattled Cranes, in order to ascertain the population size in this IBA.



During fieldwork in June, five breeding pairs were located on the floodplain, of which four were on definite breeding territories. Three of the pairs had small chicks. The centre of each breeding territory is shown in Figure 13 overleaf.

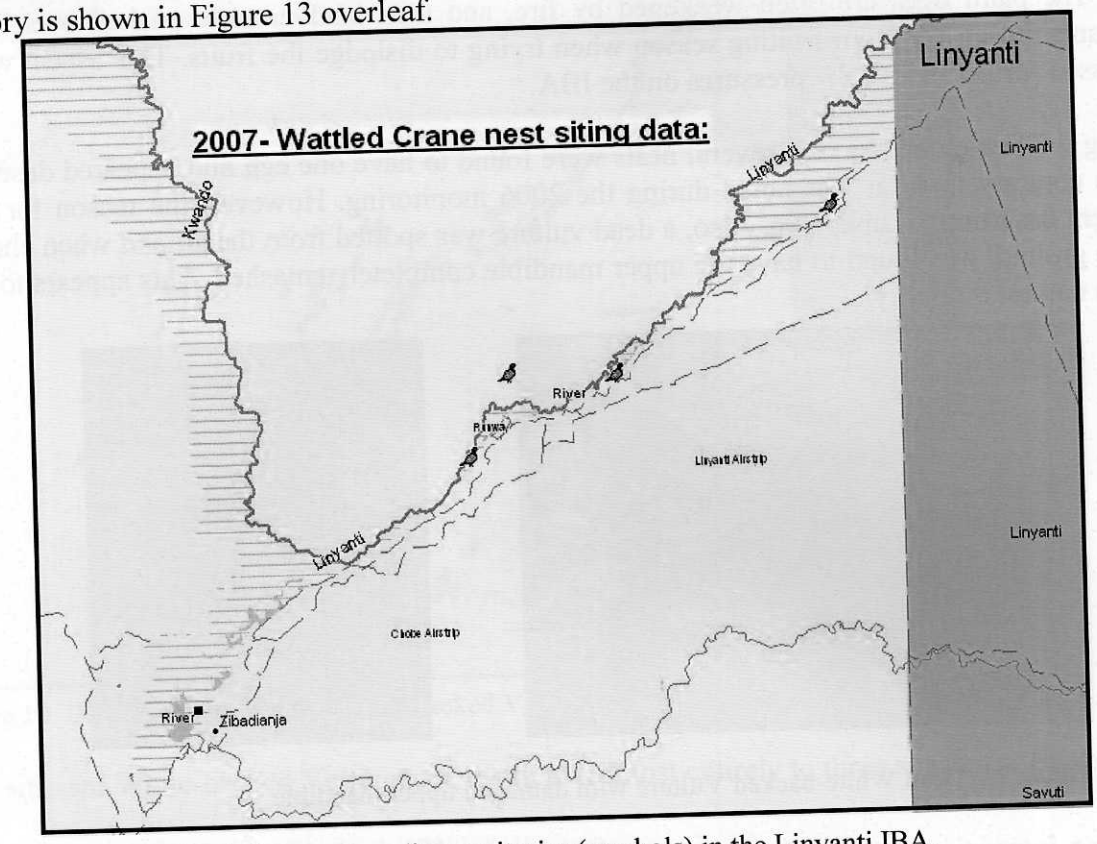


Figure 13. Wattled Crane breeding territories (symbols) in the Linyanti IBA.

In addition, a 'floater' flock of 14 cranes was located around Zibadianja Lagoon, in June – these are fully-grown but not yet sexually mature birds that are known to flock together before pairing off at about seven years of age. Although this group could not be relocated during September, two smaller flocks of seven and five cranes respectively were seen. The Wattled Crane population is therefore estimated at 24 to 30 birds. This seems to be a 'relict' population that is under threat from frequent fires coupled with the drying up of the area, which impact on the feeding and breeding habitat. It would be interesting to establish whether the groups of "floaters" seen derive from birds bred in Linyanti, or others that have moved into the area from Zambia or the Okavango Delta.

The breeding success of the Wattled Cranes is shown in Table 3.

Table 3. Breeding data for Wattled Cranes in the Linyanti IBA.

Nest site no.	June status	Details	September findings	Breeding success
WC0162	Not checked	Not checked	2 x Adults with 1 x 3/4 grown juvenile	1
WC0166	Active	1 x chick 2% of adult size	2 x Adults with 1 x 3/4 grown juvenile	1
WC0167	Active	1 x chick 20% of adult size	2 x Adults with 1 x fledged chick	1
WC0168	Active	No findings	No findings - adults not found	0
WC0169	Inactive	No findings	No findings - adults not found	0

Wattled Cranes in Linyanti bred earlier than those in the Okavango Delta during 2007 - G Atkinson (pers. comm.) reported a pair with a small chick in May. This may be a response to the

that the eggs are hatched and the chicks are mobile before there is an influx of elephant into the IBA.

Figure 14. Wattled Crane pair with newly-hatched chick (arrowed). June, 2007.

Figure 15. Wattled Crane pair with chick (behind, right hand side). September, 2007.

Slaty Egret

Slaty Egrets were counted along a fixed transect established by Hancock *et al.* (2006). The precise location of the transect is shown in Hancock *et al.* (*op. cit.*) – it follows the edge of the Linyanti floodplain between King's Pool Camp and Zibadianja Hide.

During June, no Slaty Egrets were encountered along the transect, while in September, eight separate individuals were counted. Figure 15 shows Slaty Egret numbers along this transect since 2005 when monitoring started.

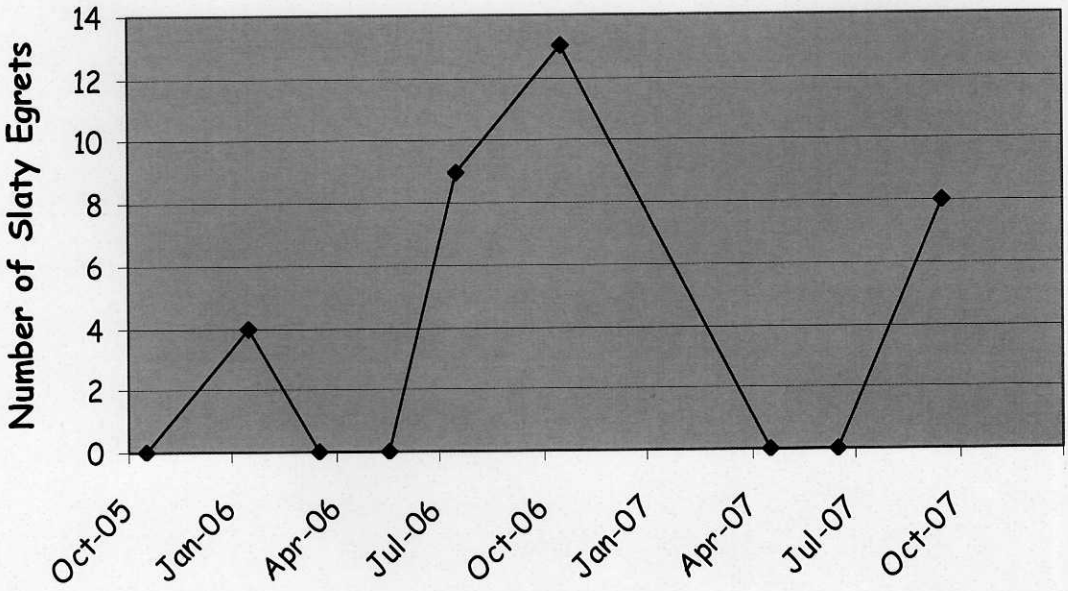


Figure 15. Slaty Egret numbers along the Linyanti transect, October, 2005 to October, 2007.

During 2006, at least two very young, recently fledged immature Slaty Egrets were seen, indicating that the birds probably breed in the IBA, although the nesting site has not been found. By contrast, all Slaty Egrets seen along the transect, and elsewhere, during 2007 were adults; it would appear that no successful breeding took place this year.

The Linyanti IBA has plenty of suitable, shallowly-flooded grassland that is the preferred habitat for this species, and still has extensive pristine *Phragmites* reedbeds that would be ideal nesting sites, as shown in Figure 16. It is difficult to understand why this bird does not occur in greater numbers within the IBA.

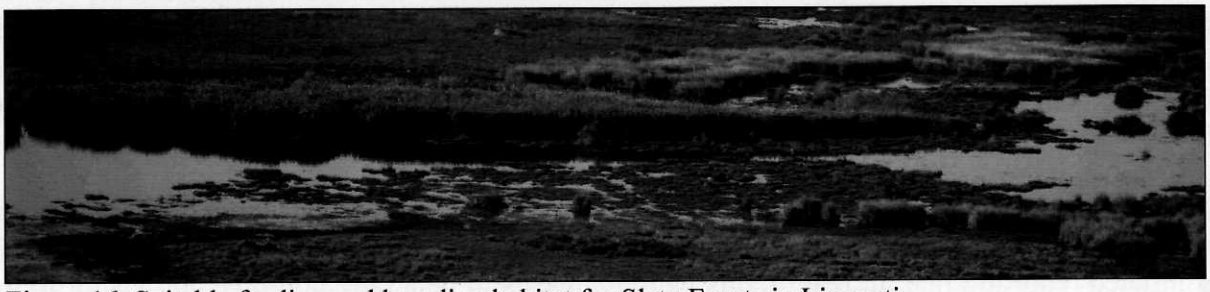


Figure 16. Suitable feeding and breeding habitat for Slaty Egrets in Linyanti.

There are two possible reasons:

i. The first is that the IBA has dried out enormously over the last decade and there can be no doubt that a lot of what would have been ideal habitat 10 years ago is now dry plains country.
ii. The second possible reason is that there is very poor visibility for this sight-hunting species due to the dense *Salvinia* mat on the water, and the water turbidity caused by the constant disturbance of large numbers of elephants. This factor would also affect other important birds that need clear water, such as the Great Egret; indeed there is a notable lack of white egret and heron species in the IBA (see monitoring of congregatory waterbirds for numbers of these species).

Cape Vulture

There have been no sightings of this species during two years of survey work in the IBA. Accordingly, at the very best, the Cape Vulture is a very rare vagrant to the IBA. This is borne out by current information in the Bird Atlas of Botswana (Penry, 1994). It is not suitable for systematic monitoring.

Lappet-faced Vulture

In the course of four monitoring trips over the last two years, totaling approximately 40 days of fieldwork by two observing teams (supported by over 100 hours of flying), only one Lappet-faced Vulture has been seen, and no nests have been found within the IBA.

This is surprising since the distribution data presented by Penry (1994) show a high rate of reporting for this species in the Linyanti IBA. However, hunters who operated in this area during the 1970s indicate that this species has never been plentiful (P Carr-Hartley, pers. comm.; J Dugmore, pers. comm.). A relatively recent record of a nest site alongside the old Tsetse Fly Control track in the southern part of the IBAa, from Grant Nel of Linyanti Explorations, was not found during a careful aerial search of the area. Indeed no suitable nesting habitat for this species was noted during the course of this flight. Furthermore, experienced observers such as Brian Rode, who has been resident in the IBA for several years, and Grant Atkinson who guides in the IBA for Wilderness Safaris, have also returned very low reporting rates for this vulture.

The current published distribution data for this species are therefore misleading - this has probably arisen from the fact that the area has been popular with birders in the past, resulting in an inflated reporting rate. In reality, this vulture appears to be a rare, non-breeding visitor to the IBA. Consequently it is unsuitable for monitoring.

White-headed Vulture

There have been very few sightings of this bird during our monitoring work. It appears unlikely that the breeding population of this species in the IBA is in excess of three pairs of birds. Once again, this is contrary to published distribution data which show relatively high reporting rates within the IBA.

Only one active nest has been found in the IBA. During 2006, the breeding attempt failed due to the collapse of the nest for unknown reasons. This year the birds were found on a new nest not far from the original one, and again the nesting attempt failed.

Figure 17. Adult White-headed Vulture on nest.

This species is a very rare breeding resident in the IBA with an estimated maximum population of ten birds; it is not suitable for monitoring.

Lesser Kestrel, European Roller

The migratory kestrels transit through the IBA at the beginning and end of summer, and are not present during the winter months when monitoring has been carried out. Similarly with the European Rollers. The potential of these two species for monitoring will need to be investigated during a summer field trip.

Corn Crake, African Skimmer, Black-winged Pratincole

These species also occur in very low numbers in the IBA and are unsuitable for monitoring. The skimmer and pratincole are included in the congregatory waterbird monitoring,

2. Range- and biome-restricted species

As with globally threatened species, only some range- and biome-restricted species are found in suitable numbers for monitoring in the IBAa. They are:

Arnot's Chat	Bradfield's Hornbill	Burchell's Starling
Hartlaub's Babbler	Kurrichane Thrush	Meves's Starling
White-bellied Sunbird		

These species are recorded in 26 fixed point counts, the positions of which are shown by symbols in Figure 18.

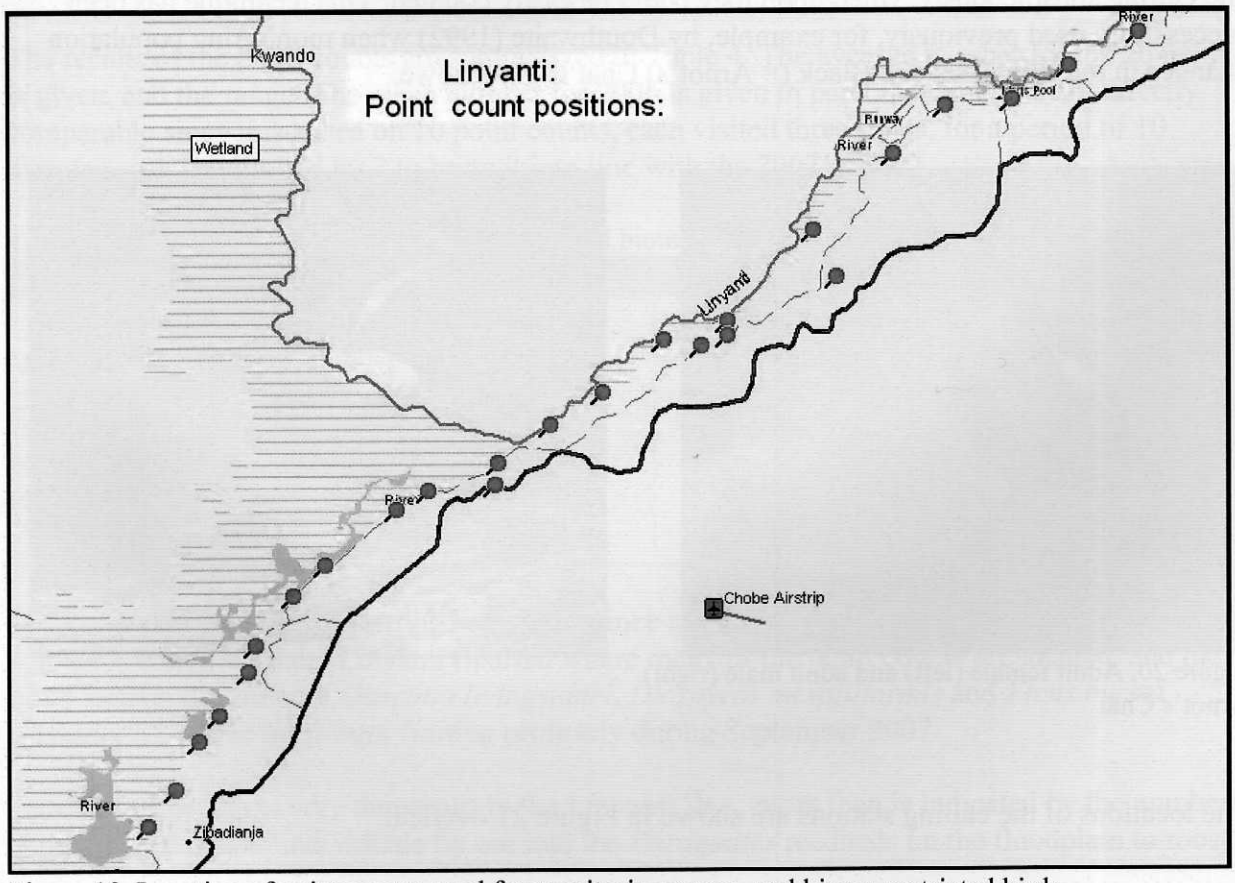


Figure 18. Location of point counts used for monitoring range- and biome-restricted birds.

Each site is visited once a year, at the same time of the year - during late September. For each designated point, a 20-minute full bird count is conducted - the numbers of each species seen within a 100m radius of the point are recorded. Experience gained during the 2006 monitoring showed that a 10-minute recording period, as used by Pendleton and Hart (2005) in the Okavango, was insufficient to give a sample that could be subject to statistical analysis.

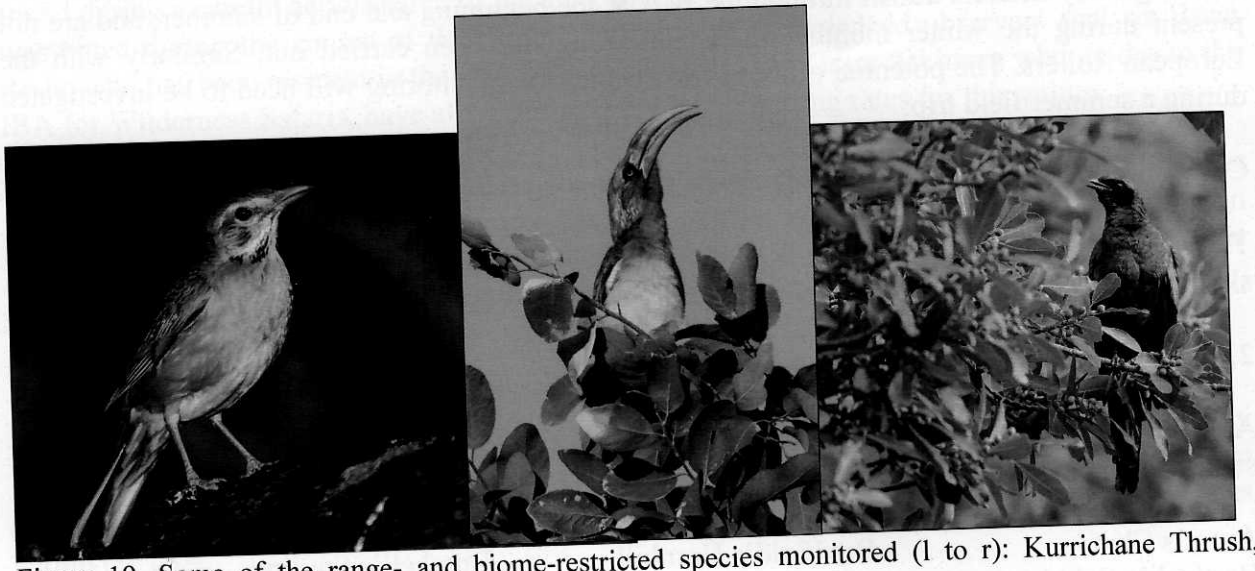


Figure 19. Some of the range- and biome-restricted species monitored (l to r): Kurrichane Thrush, Bradfield's Hornbill and Burchell's Starling.

In addition to the above, Arnot's Chat numbers were monitored at 20 calling stations. This species responds to its pre-recorded song when played on a tape recorder, since the groups are territorial. At each of the stations, the tape was played until the birds responded by flying closer and calling conspicuously, whereupon they could be easily counted. This technique has been successfully used previously, for example, by Douthwaite (1992) when monitoring population changes in the White-headed Black (= Arnot's) Chat in Zimbabwe.

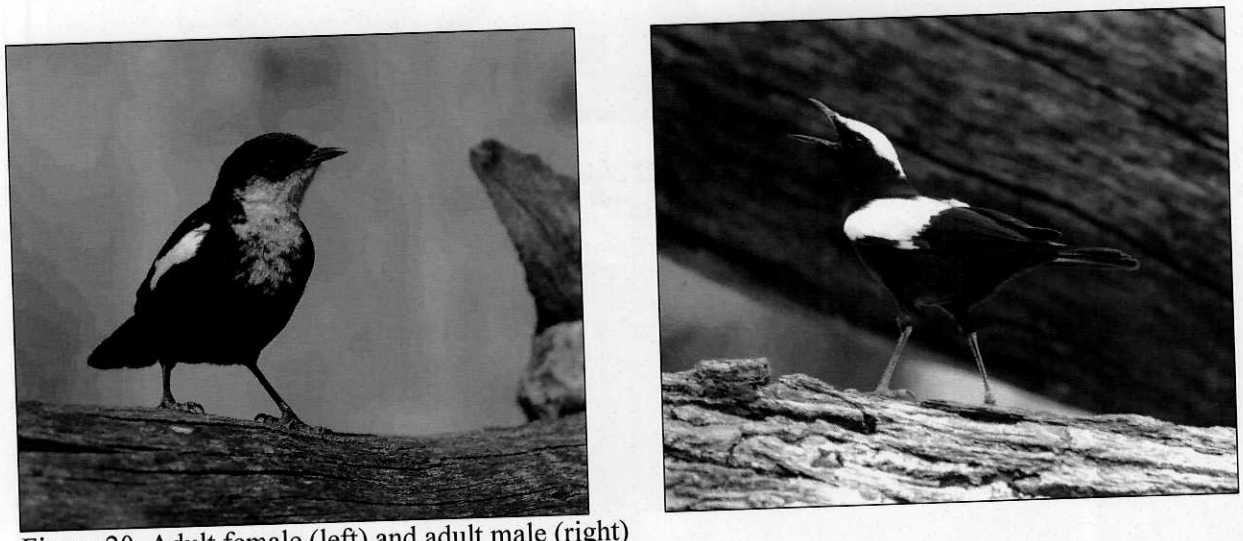


Figure 20. Adult female (left) and adult male (right) Arnot's Chat

The locations of the calling stations are shown in Figure 21 overleaf:

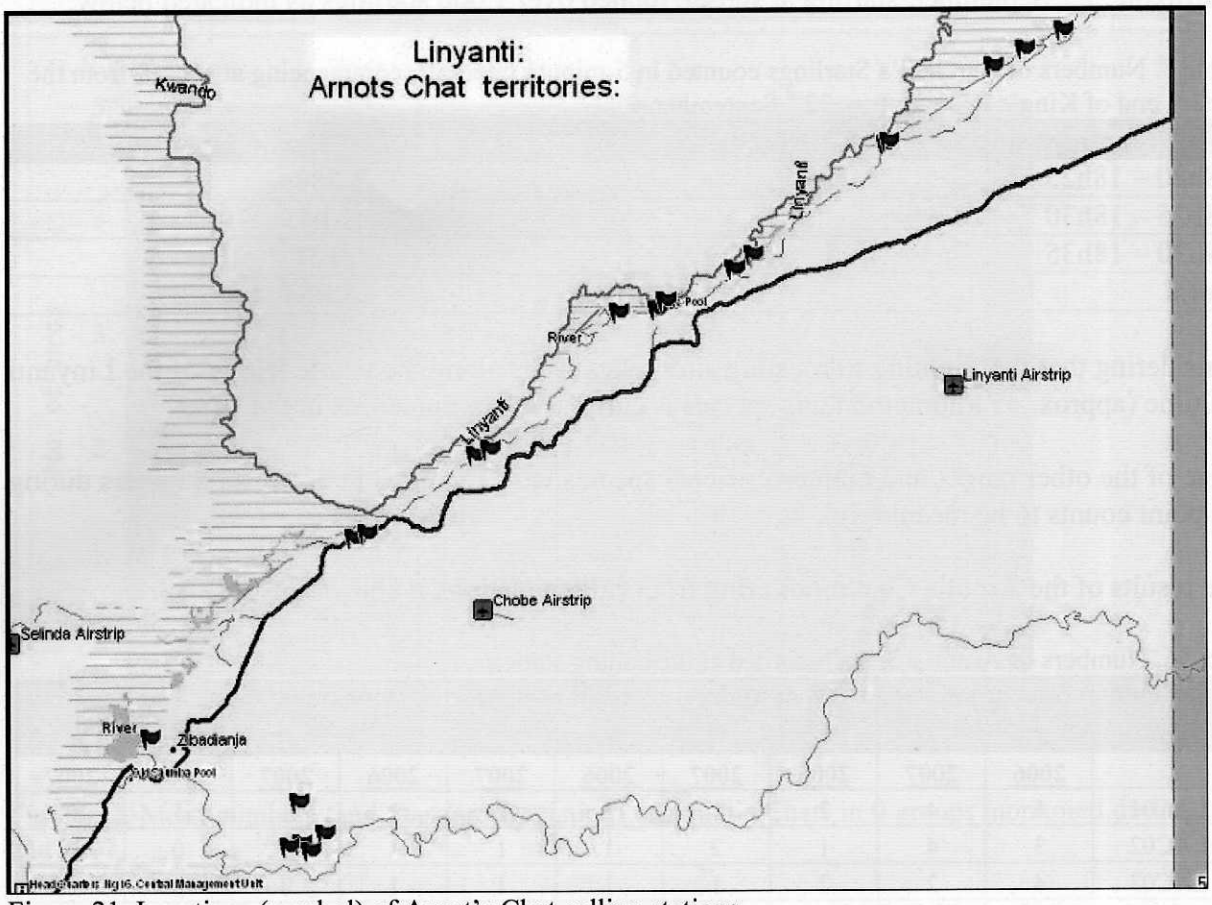


Figure 21. Locations (symbol) of Arnot's Chat calling stations

The results of the point counts are summarized in Table 4. The average number for the 26 points is given, and the range. The mean number for 2006 is given in parentheses, but is not directly comparable since it is based on 10 point counts, each visited three times, for a period of 10 minutes each (multiplied by 2 to bring it into line with the 2007 counts).

Table 4. Mean and range for numbers of range- and biome-restricted species recorded at the point counts.

Species	Mean number	Min. no. per point	Max. no. per point
Arnot's Chat	0.58	0	4
Bradfield's Hornbill	0.04 (0)	0	1
Burchell's Starling	11.15 (2.66)	1	34
Hartlaub's Babbler	1.31 (0.86)	0	6
Kurrichane Thrush	0.08 (0)	0	1
Meves's Starling	0 (0.14)	0	0
White-bellied Sunbird	0.77 (0)	0	6

The results for Burchell's Starling are useful, since an adequate sample was obtained. This species is common in the Linyanti riparian where many of the point counts are located, and the birds feed on the fruits of *Garcinia livingstonei*, *Diospyros mespiliformis* and *Ficus burkei* (*thonningii*). These trees were fruiting profusely during September 2007.

Burchell's Starling is very numerous in the Linyanti IBA, more than is indicated by the numbers above. Thousands of individuals fly out into the *Phragmites* reedbeds on the floodplain to roost

communally every evening, and a count from a point at the eastern end of the King's Pool airstrip on 22nd September, starting at sunset, totaled over 1,000 starlings as indicated below:

Table 5. Numbers of Burchell's Starlings counted in 5-minute intervals, commencing at sunset, from the eastern end of King's Pool airstrip. 22nd September, 2007.

Time (commencing at sunset = 18h20)	No. of starlings
18h20 – 18h25	288
18h25 – 18h30	1,045
18h30 – 18h35	121
Total	**1,454**

Considering that the flighting to roosting sites takes place along the whole length of the Linyanti faultline (approx. 45 kilometres) this species is currently very numerous in the IBA.

None of the other range- and biome-restricted species were recorded in adequate numbers during the point counts to be meaningful.

The results of the Arnot's Chat monitoring from calling stations is shown in Table 6.

Table 6. Numbers of Arnot's Chats recorded at the calling stations.

Site no.	Total group size		Adult Males		Adult Females		Immature Males		Immature females	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
LAC01	6	4	2	1	2	2	1	1	1	0
LAC02	3	4	1	2	1	1	1	1	0	0
LAC03	4	2	2	1	1	1	1	0	0	0
LAC03a	new	2	new	1	new	1	new	0	new	0
LAC04	2	1	1	1	1	0	0	0	0	0
LAC05	5	4	1	3	2	1	2	0	0	0
LAC06	2	2	1	1	1	1	0	0	0	0
LAC07	4	0	2	0	2	0	0	0	0	0
LAC08	2	3	1	1	1	2	0	0	0	0
LAC09	4	2	1	1	3	1	0	0	0	0
LAC11	new	3	new	1	new	1	new	1	new	0
LAC12	new	2	new	1	new	1	new	0	new	0
LAC13	new	5	new	3	new	1	new	1	new	0
LAC14	new	2	new	1	new	1	new	0	new	0
LAC15	new	1	new	0	new	1	new	0	new	0
LAC16	new	3	new	1	new	2	new	0	new	0
LAC17	new	2	new	1	new	1	new	0	new	0
LAC18	new	4	new	0	new	4	new	0	new	0
LAC19	new	1	new	1	new	0	new	0	new	0
LAC19a	new	5	new	3	new	2	new	0	new	0
Totals		52		24		24		4		0

There is a healthy population of this species in the IBA, despite heavy elephant pressure in the *Colophospermum mopane* woodland that it favours. As a result of its fidelity to a surprisingly small territory and ready response to taped playback of its calls, it is an ideal species to monitor intensively. The nine groups counted during 2006 had a total of 32 members; the same groups when counted during 2007 had only 22 members – this is a significant drop, as shown in Figure 22.

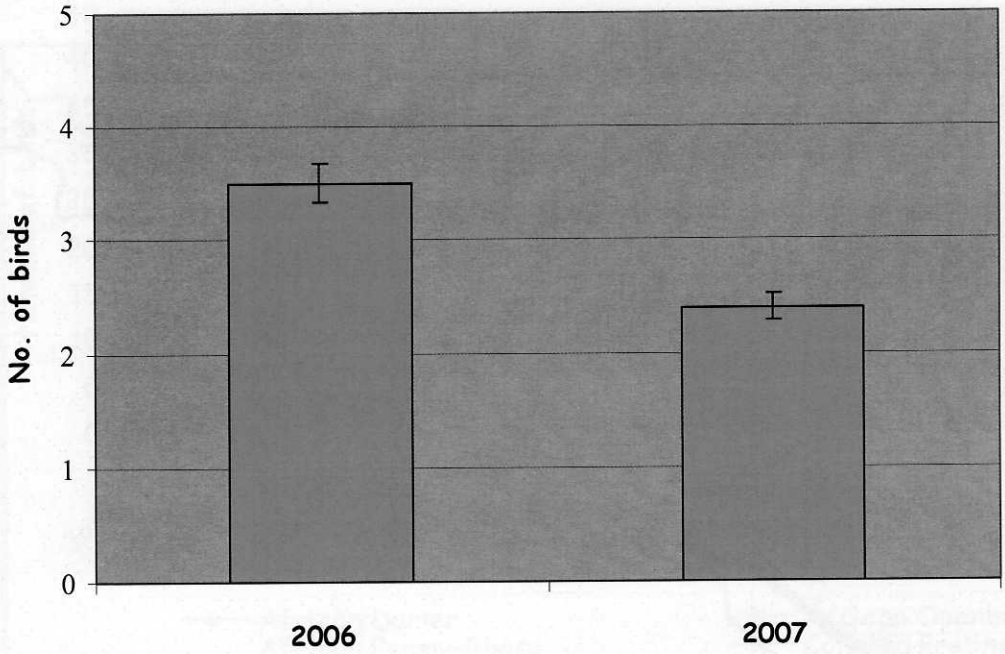


Figure 22. Mean numbers (and Standard Deviation) of Arnot's Chats in 9 groups monitored during 2006 and 2007.

It is not clear why less Arnot's Chats were counted during 2007, without being certain that exactly the same groups were monitored both years. Accordingly we have decided to capture and colour ring as many individuals in each territory as is possible, in order to improve the monitoring of Arnot's Chat as one of the few biome-restricted species with good monitoring potential.

3. Congregatory waterbirds

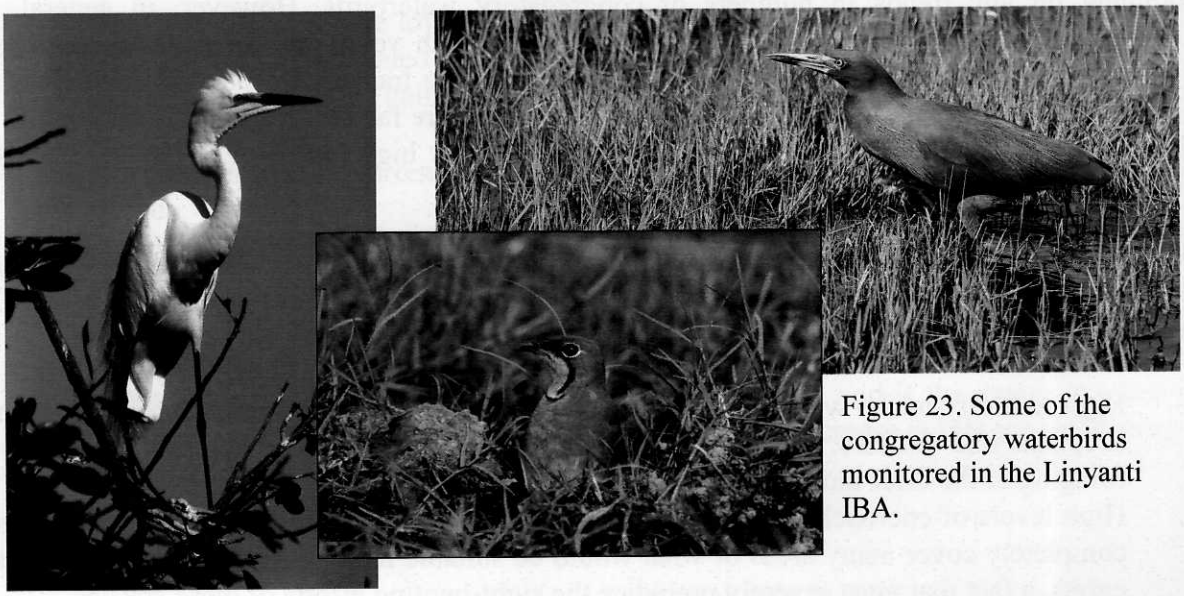


Figure 23. Some of the congregatory waterbirds monitored in the Linyanti IBA.

Congregatory waterbirds are counted along the same fixed transect (Figure 24) as used for counting Slaty Egrets – indeed, the Slaty Egrets are counted as part of the waterbird count, as are non-trigger waterbird species (see later). The numbers of the trigger species for the IBA are shown in Figure 25 (overleaf).

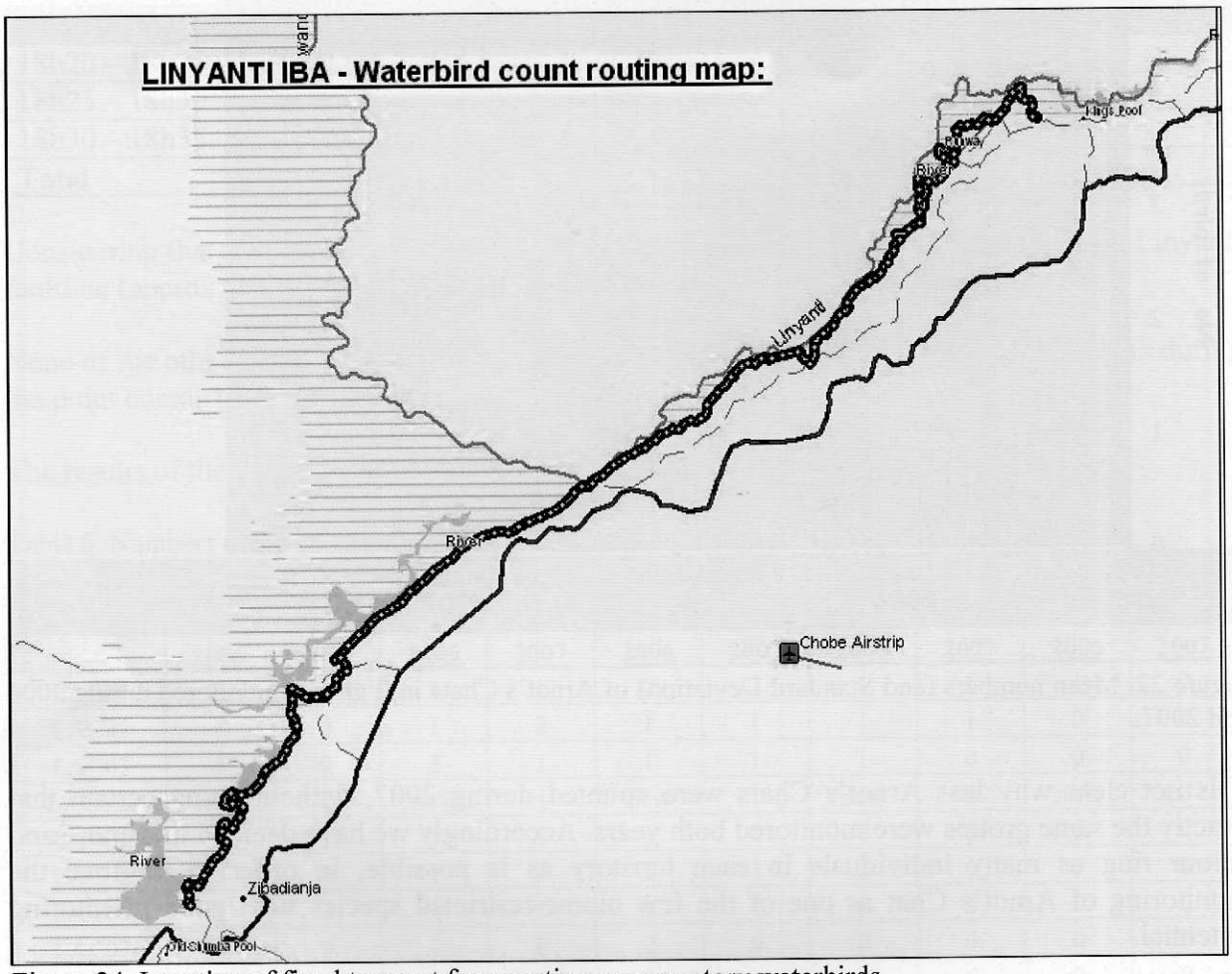


Figure 24. Location of fixed transect for counting congregatory waterbirds.

Since data collection has only been carried out for two consecutive years, it is not possible to comment on any trends in numbers of congregatory waterbirds. However, in general, the numbers of congregatory waterbirds were low during both years, none approaching its 0,5% threshold (notwithstanding that the numbers counted in the transect are a small fraction of the birds actually present). This is difficult to explain as there are factors that would indicate that the IBA is in fact a very productive system *e.g.* the extremely high incidence of breeding African Fish-Eagles.

Why then should there be such low reporting rates for other piscivorous birds such as egrets and herons is difficult to explain (the Goliath Heron, for example, has not been recorded in the IBA during our monitoring). Possible causes could be:

1. High turbidity of the water as a result of the extremely high population of Hippopotamus, Elephant and Buffalo. All these species make extensive use of the wetland areas for foraging in the drier months of the year, and churn up the water.
2. High levels of encroachment by the alien water weed – *Salvinia molesta* - which tends to completely cover many areas of what would be suitable feeding habitat for the herons and egrets, a fact that must severely prejudice the sight-hunting efforts of these species.

3. Burning - the extensive fires that the whole wetland area is subjected to each year could possibly have serious negative effects on waterbirds by modifying the floodplain areas.

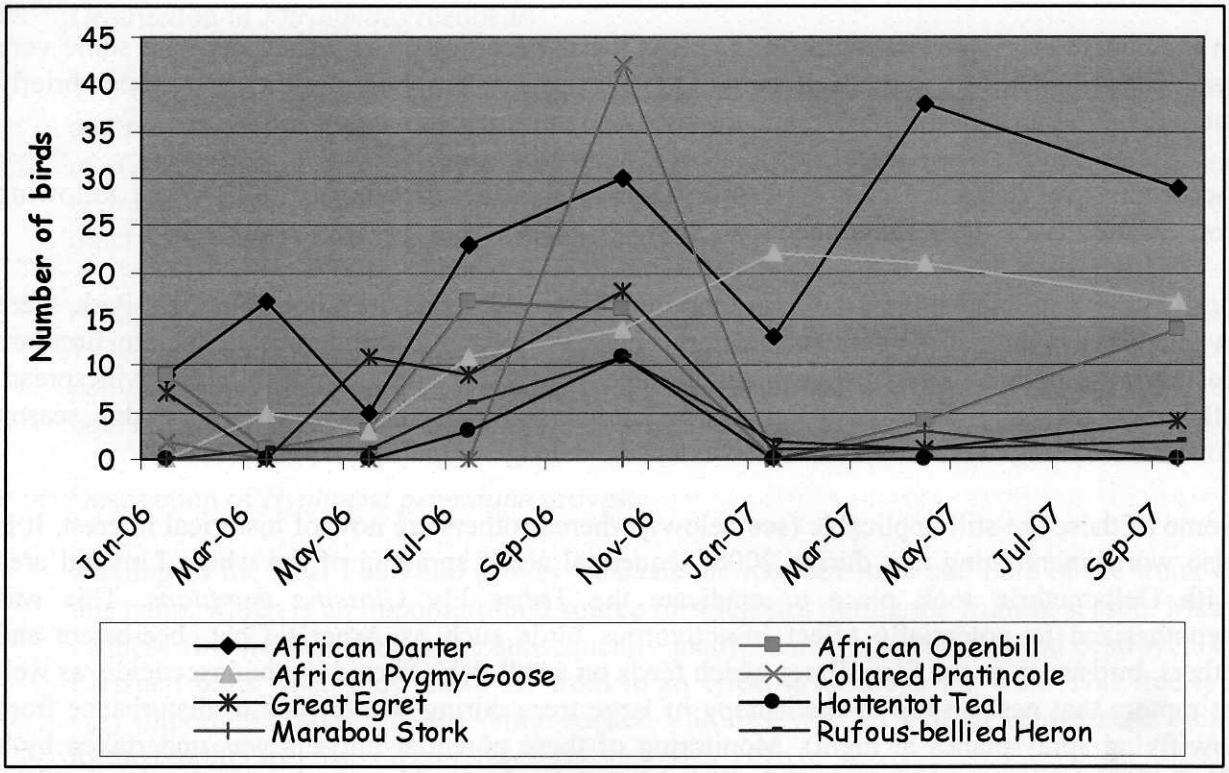


Figure 25. Numbers of congregatory waterbirds (trigger species) recorded in the Linyanti IBA from the beginning of 2006 to September, 2007

Conclusion to Part 1

Due to the short-term nature of the monitoring, it being only in the second year, it is not possible to draw any concrete scientific conclusions as to whether or not the trigger species monitored have increased or decreased. However, a few generalizations may guide future monitoring:

- The White-backed Vulture population is large and healthy. White-headed and Lappet-faced Vultures are however cause for concern
- Wattled Crane numbers are low and this is probably due to the very low flood levels over the past decade, and associated factors such as frequency of fires *etc*. Further monitoring of this species is necessary to gain a better understanding of factors influencing its population dynamics in Linyanti.
- Slaty Egret numbers are currently low, and this is also due to the low flood levels over the past decade.
- Of the range- and biome-restricted species, Burchell's Starling and Arnot's Chat have good potential for monitoring as indicator species.
- Congregatory waterbird numbers are low, due once again to the low water levels and extent of flooding. The flood levels probably have an over-riding effect on the numbers of most waterbirds, including Wattled Cranes and Slaty Egrets, and if the recent increase in water levels and flooding extent persist, there should be an increase in this group of birds.

PART 2 – PRESSURES ON THE ENVIRONMENT

In the course of monitoring work in the IBA, it has become apparent that there are some very real and serious threats to the wellbeing of the Linyanti system. Some of these have been briefly mentioned in Part 1 of this report, but are discussed in more detail below.

According to Tyler and Bishop (1998) in their original description of the IBA, the following conservation issues were mentioned:

"… On the Namibian side of the river, and in Botswana, outside the Chobe National Park, there is fairly heavy human settlement and large numbers of cattle; numerous deliberate fires are destroying floodplain vegetation including reedbeds; snaring and poaching is widespread, affecting birds and mammals. Very large numbers of Elephant, which in the dry season concentrate along the river, have caused extensive damage to the riparian woodlands".

Some of these are still applicable (see below), whereas others are now of historical interest. It is also worth mentioning that during 2006, sequential aerial spraying of the whole Linyanti area with Deltamethrin took place to eradicate the Tsetse Fly *Glossina morsitans*. This was hypothesized to potentially affect insectivorous birds such as Arnot's Chat, bee-eaters and others, birds such as the Slaty Egret which feeds on small fish affected by the insecticide, as well as raptors that nest on top of the canopy of large trees during winter (due to disturbance from low-flying spray-planes at night). Monitoring of these potential impacts was undertaken by a BirdLife team; however, the spraying did not have any discernible negative effects on any of the bird species monitored (see Hancock, P. 2007).

Low flood cycle

The current, below-average flood levels and extent is a natural phenomenon that is beyond the control of BirdLife Botswana and natural resource managers in the area. Nevertheless it is a factor of major importance in influencing bird habitats and numbers, and exacerbates many of the human-induced environmental issues in this IBA. For example, low water levels make human access to the Linyanti Swamps easier and increases the number of anthropogenic fires, which in turn have a greater impact on the drying reedbeds, some of which will not recover under the current flooding regime. There are likely to be substantial fluctuations in bird numbers in this IBA due to hydrological changes alone, and these should not be interpreted as positive or negative changes due to conservation action (or lack thereof).

Fire

The frequency and extent of fires started by humans in the Linyanti IBA is the highest ranking threat to birds and biodiversity generally. During 2007, the area burnt within the IBA was less than that burnt during 2005 and similar in extent to that burnt in 2006 (see Figures 6 and 7, page 7). From observations made during the IBA monitoring, it is clear that most of these fires were started by people, particularly on the Namibian side where rural communities have been able to penetrate large areas of the floodplain now that water levels are low. Small groups of fishermen and subsistence agriculturalists were observed from the air, some in close proximity to the sites where the fires originated.

The uncontrolled fires have far-reaching effects - some of these, applicable to the Linyanti IBA are detailed here:

- Destruction of *Phragmites* reedbeds

  The burning of *Phragmites* reedbeds has disastrous consequences for all the reed nesting and roosting birds such as egrets, Burchell's Starlings and Chirping Cisticolas. Hancock *et al.* (2005) have expressed concern about the impact of fires on the breeding habitat (*Phragmites* reedbeds) of Slaty Egrets in the Okavango Delta, and the same applies to other egrets and herons that prefer this habitat type for nesting in Linyanti.

  Additionally, fire has impacted heavily on the Sitatunga population of the IBA. During the 1970s, this area was considered the best Sitatunga hunting area in Botswana, but now populations of this Near Threatened antelope have declined drastically – in well over 100 hours of flying in the IBA, only three sightings of this animal have been made.

- Destruction of *Hyphaene petersiana* groves:

  Burning of the Real Fan Palm groves weakens the root structure and bole of the trunk of this palm, which is an important food source for Elephant during the fruiting season. Many of these fire-weakened trees are subsequently inadvertently pushed over and destroyed by Elephant bulls when they shake the trees in an effort to dislodge the fruit. This tree is a very important nesting tree for White-backed Vultures, with 26% of all known nests being located in this species.

There are some protected areas on the Namibian side adjacent to the IBA (Mamili and Mudumu National Parks) and these areas are unpopulated and don't seem to be the source of the fires; it is the communal land where the fires originate. The Linyanti wetlands on the Namibian side of the border are part of the Namibian IBA (N003 – Eastern Caprivi Wetlands IBA) and so scope exists for addressing this cross-border fire issue with Namibian colleagues. This could take the form of an education and awareness campaign targeting rural communities on the Namibian side in the short-term.

Elephant

The large Elephant population in northern Botswana, which reaches its greatest densities in the Linyanti area, has a heavy impact on both dry and wetland habitats in the IBA. The changes to the vegetation have serious consequences for many species of birds, as illustrated below:

- Birds of the understory (which is non-existent in the Linyanti riparian) such as White-browed Robin-Chats are scarce in the IBA. During two years of monitoring, only one individual of this species was seen, and this was in the garden of the concession manager of King's Pool, which is an area that is protected by an electric fence which keeps Elephant out.
- Favoured raptor nesting tree species (*Acacia nigrescens and Hyphaene petersiana*) are heavily impacted by Elephants.
- Elephant feeding on *Phragmites* reedbeds, coupled with the influence of fire, impacts negatively on the Slaty Egret and other birds that use reedbeds for nesting.
- Large numbers of Elephants on the Linyanti floodplains results in the water being continually turbid, negatively affecting those bird species that hunt by sight *e.g.* Slaty Egret and other *Ardeidae*.

Botswana's elephant management plan has not yet been finalized, making it difficult to address this issue.

PART 3 – RESPONSE – CONSERVATION ACTIONS TAKEN FOR THE ENVIRONMENT

BirdLife Botswana's involvement with the Linyanti IBA is in its early stages, and none of the issues described above has been addressed to date.

In order to effectively bring about change it will be necessary to partner with a range of stakeholders, most importantly the concessionaires in Controlled Hunting Areas NG 14, NG 15 and NG 16. Okavango Wilderness Safaris and Linyanti Explorations have already demonstrated their commitment to supporting BirdLife Botswana's bird monitoring and conservation programme.

Other relevant bodies include the Department of Wildlife and National Parks, Botswana Wildlife Management Association, Department of Water Affairs (*Salvinia* control) and Agriculture Resources Board (fires). In Namibia, the Ministry of Environment and Tourism, Namibia Nature Foundation, Namibia Crane Working Group and Raptors Namibia will be essential partners. Simmons *et al.* (1998) recognize that maintaining the biotic diversity of the Eastern Caprivi Wetlands will only be possible if "legislation and enforcement are improved, and wildlife education and communication programmes for the surrounding rural communities are continued".

A good foundation exists for implementing conservation action during 2008 and beyond.

REFERENCES

Carr-Hartley, P. Personal communication.

Douthwaite, RJ. 1992. Effects of DDT treatments applied for tsetse fly control on White-headed Black Chat (*Thamnolaea arnoti*) populations in Zimbabwe. Part 1: population changes. Ecotoxicology 1: 17 – 30.

Dugmore, J. Personal communication. E-mail: kalkanvas@botsnet.bw

Hancock, P. 2007. Birds. In: Environmental monitoring of May to August 2006 aerial spraying of Deltamethrin for Tsetse Fly eradication in the Kwando-Linyanti and Caprivi Regions. Bonyongo, MC and Mazvimavi, D. (Eds) pp 198 – 223. Report to the Department of Animal Health and Production, Harry Oppenheimer Okavango Research Centre, University of Botswana.

Hancock, P, Mpofu, Z, Tyler, SJ and Meyer, T. 2005. A baseline survey of the Slaty Egret in the Okavango Delta Ramsar Site, Botswana. Report to the Okavango Delta Management Plan, Maun, Botswana.

Mundy, P, Ledger, J, Butchart, D and Piper, S. 1992. Vultures of Africa. Acorn Books, Russel Friedman Books and the Vulture Study Group. Johannesburg, South Africa.

Pendleton, F and Hart, T. 2005. Changes in insectivorous bird populations in response to spraying Deltamethrin for Tsetse Fly Control in the Okavango Delta. Babbler 45: 7 – 19.

Penry, H. 1994. Bird Atlas of Botswana. University of Natal Press, Pietermaritzburg. 316pp.

Roche, C and Nel, G. 2006. Collared Palm-Thrush at Selinda – a case for a revised understanding of the distribution of the species in northern Botswana. Ecological Journal 7: 102 to 103.

Simmons, RE, Boix-Hinzen, C, Barnes, KN, Jarvis, AM and Robertson, A. 1998. Important Bird Areas of southern Africa. Barnes, KN. (ed.) pp. 295-332. BirdLife South Africa, Johannesburg.

Tyler, SJ and Bishop, DR. 1998. Important Bird Areas of Botswana. In: The Important Bird Areas of southern Africa. Barnes, KN. (ed.) pp. 333-354. BirdLife South Africa, Johannesburg.

Wolski, P. 2007. Climate and hydrology. In: Environmental monitoring of May to August 2006 aerial spraying of Deltamethrin for Tsetse Fly eradication in the Kwando-Linyanti and Caprivi Regions. Bonyongo, MC and Mazvimavi, D. (Eds). Report to the Department of Animal Health and Production, Harry Oppenheimer Okavango Research Centre, University of Botswana.

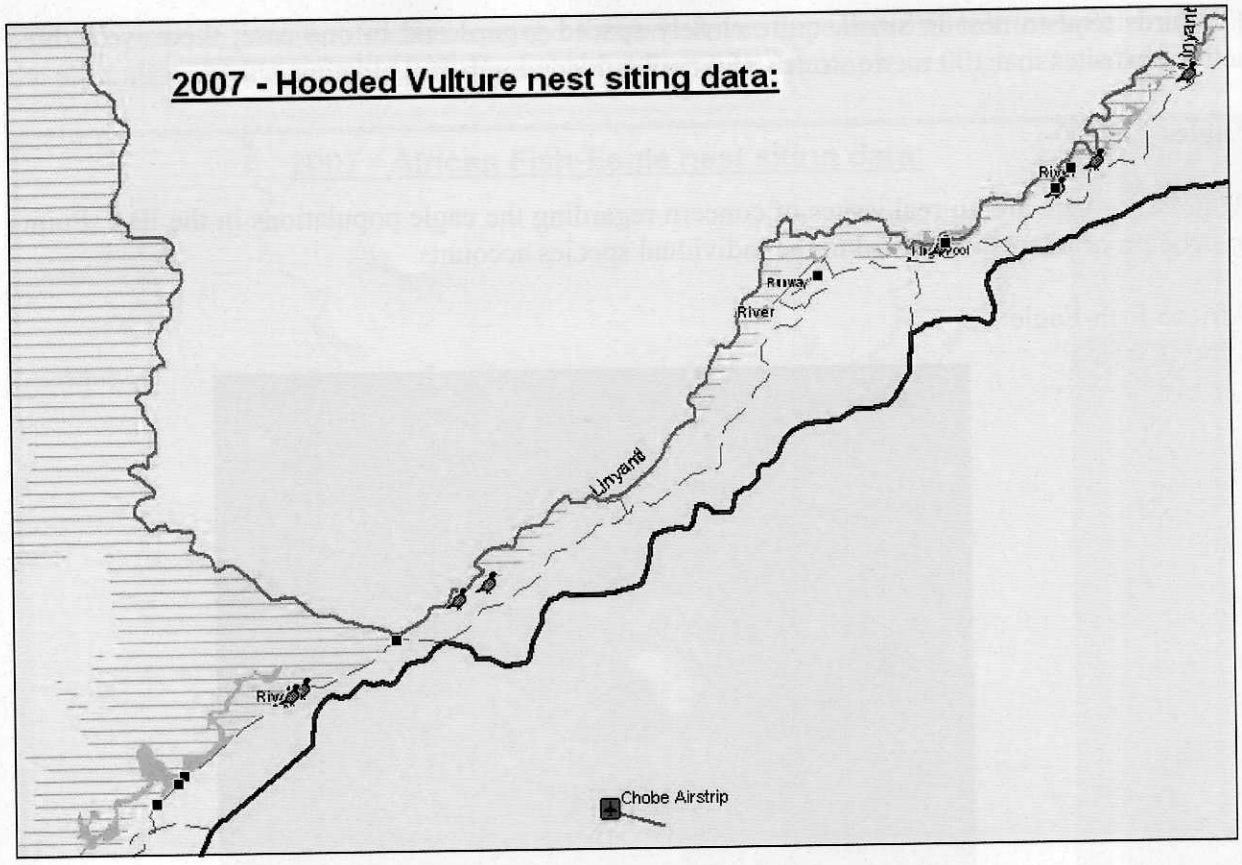
APPENDIX 1 – NOTES ON OTHER BIRD SPECIES OF THE LINYANTI IBA

During the course of monitoring trigger species in the IBA, a great deal of information on other bird species has been gathered incidentally. It is felt that this information is sufficiently valuable to warrant it being included here. This is useful baseline information that could be valuable in the future, particularly since it concentrates on 'indicator' species such as raptors that are at the top of food chains and webs, and likely to reflect changes in the ecosystem. Additional data on these species will only be collected incidentally in the future *i.e.* they will not be the subject of a specific monitoring project.

Hooded Vulture

There is a small breeding population of this species within the IBA. Nest sites are nearly impossible to find from the air as the birds have a small and in many cases extremely well-concealed nest that is always placed well-below the canopy of densely foliaged trees almost exclusively along the riparian frontage of the Linyanti fault-line.

During the first fieldtrip in June, only two of the seven known breeding sites of this species were found to be active. However, the riparian trees were still in full foliage during the June trip; in September when the foliage of the nesting trees for this species was much sparser, a total of 19 nest sites were identified, out of which a total of 11 sites were active. It is also very difficult to see exactly what is going on at these nest sites and great care has to be taken when trying to ascertain exactly what is on the nest. Adult birds always show pink facial skin while in our experience juveniles show pale white facial skin and short black feathers on the head.



Nest site no.	June status	Details	September findings	Breeding success
HV0005	Inactive	Not checked	Empty	0
HV0006	Active	2 ads present	1 x chick	1
HV0007	Inactive	Empty	Empty	0
HV0008	Active	Brooding	1 x chick	1
HV0008a	Inactive	Alternate site	Empty	0
HV0009	Inactive	Collapsed	1 x chick	1
HV0010	Inactive	Empty	1 x chick	1
HV0012	New	New	Empty	0
HV0013	New	New	1 x chick	1
HV0014	New	New	1 x chick	1
HV0015	New	New	1 x chick	1
HV0016	New	New	1 x Adult on nest	1
HV0017	New	New	1 x Adult on nest	1
HV0018	New	New	Empty	0
HV0019	New	New	Empty	0
HV0020	New	New	Empty	0
HV0021	New	New	Empty	0
HV0022	New	New	1 x Adult on nest	1
HV0023	New	New	1 x chick	1

The Hooded Vulture used three species of tree as nesting sites:

1. *Diospyros mespiliformis* (17 sites - 90%)
2. *Berchemia discolour* (1 site - 5%)
3. *Ficus burkei (thonningii)* (1 site - 5%)

The birds tend to nest in small, quite closely-spaced groups and in one case, there were three active nest sites in a 100 metre stretch of woodland.

Eagles

At present, there are no real issues of concern regarding the eagle populations in the IBA. Points of concern or interest are noted in the individual species accounts.

African Fish-Eagle

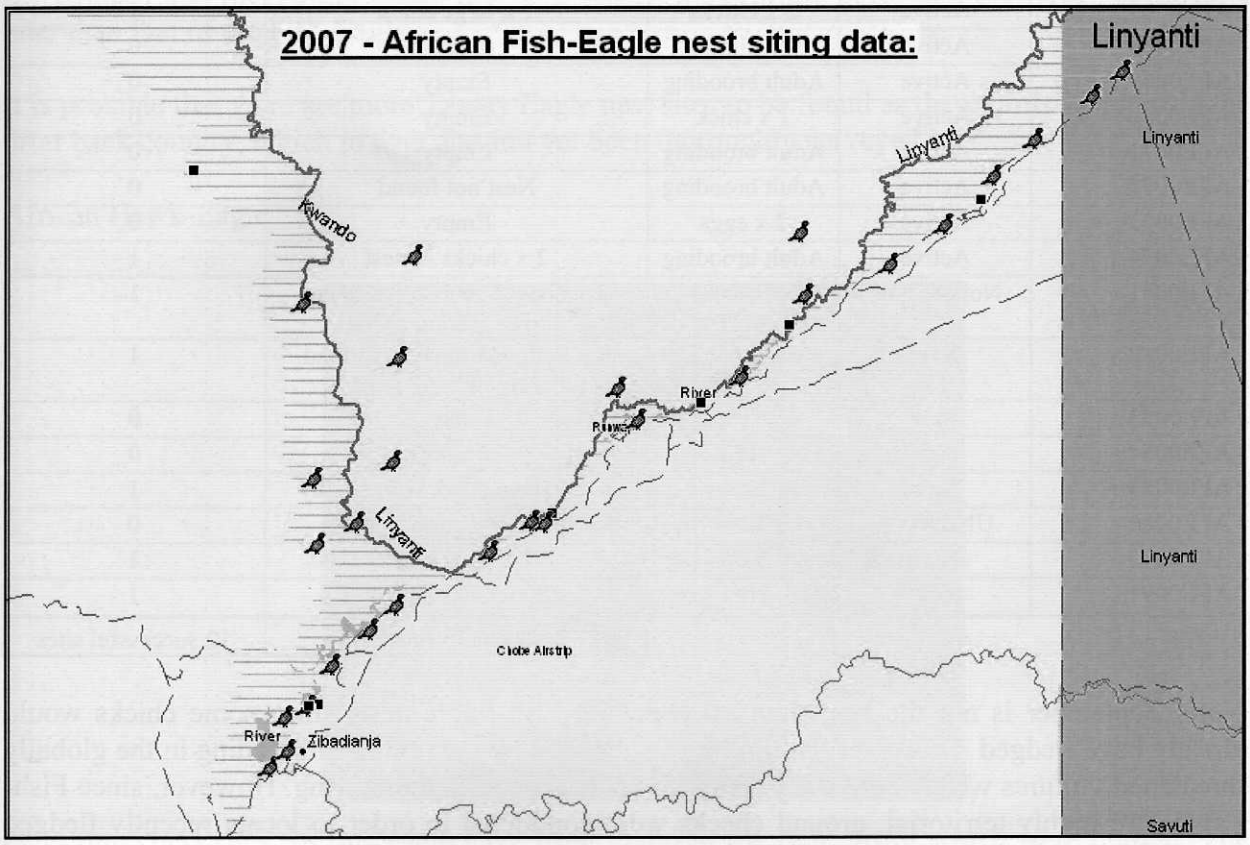
There is a very healthy breeding population of this species in the IBA. A total of 37 nest sites were recorded this year as opposed to the 18 recorded last year. Twenty-eight of these sites were active during 2007. The extra nest sites recorded this year are probably explained by the fact that the monitoring took place a month earlier than last year, and in June this year there were already several nests in which there were well-fledged chicks that would shortly be leaving the nest – last year, the first survey flights were carried out at the end of July when some chicks had already fledged.

An interesting observation made during the survey is the fact that, as for last year, two nests were each found to contain three well-grown chicks. At site AFE0082, three fledged immature birds were noted in close proximity to the nest. While this species has been recorded as laying up to four eggs in one nest, it is unusual for African Fish-Eagles to raise 3 chicks in one breeding attempt. The highest ever recorded breeding productivity for this species in Southern Africa, was recorded at Lake Chivero in Zimbabwe where three chicks were raised in 10% of the breeding attempts. The fact that in both years, nests holding three well-grown chicks have been observed would indicate that the IBA is an extremely productive area for this species.

The density of nests for this species is extremely high, and as is shown in the map of the nest sites overleaf. This map clearly shows that in 50.5 kilometres of riparian frontage along the Linyanti faultline, there are 21 active nest sites. On average, there is a one nest every 2.4 kilometres.

The nesting activity falls away sharply as one proceeds north-east along the fault-line. This is explained simply by the fact that the area has dried up enormously over the last decade, and the original wetlands in the western part of Chobe National Park are now mostly dry.

The comparative paucity of nests along the Kwando River system is difficult to explain, as from the air it all looks like suitable Fish-Eagle habitat and there are ample nesting sites available.



Nest site no.	June status	Details	September findings	Breeding success
AFE0002	Inactive	Empty	Empty	0
AFE0003	Active	1 x chick	1 x large chick	1
AFE0004	Not checked	At campsite	Not checked	0
AFE0005	Active	2 x chicks	Empty	0
AFE0006	Active	Adult brooding	Empty	0
AFE0007	Inactive	Empty	Empty	0
AFE0008	Active	Adult brooding	Empty	0
AFE0009	Active	Adult brooding	Empty	0
AFE0010	Active	1 chick/1 egg	Empty	0
AFE0016	Inactive	Empty	Empty	0
AFE0017	Active	1 x chick	Empty	0
AFE0018	Active	**3 x chicks**	Empty - 1 x immature seen during ground check	1
AFE0019	Active	Adult brooding	Dead chick in nest	0
AFE0021	Inactive	Broken	Empty	0
AFE0027	Active	2 x chicks	Empty	0
AFE0028	Inactive	Empty	Empty	0
AFE0033	Active	Adult brooding	2 x large chicks	1
AFE0063	Active	Adult brooding	Empty - 1 x immature found during ground check	1
AFE0064	Active	Adult brooding	1 x large chick and 1 fledged chick seen during ground check	1
AFE0065	Active	Adult brooding	1 x adult sitting in nest	0

Nest site no.	June status	Details	September findings	Breeding success
AFE0066	Active	Adult brooding	Empty	0
AFE0067	Active	**3 x chicks**	1 x large chick	1
AFE0068	Active	2 x chicks	Empty	0
AFE0069	Active	Adult brooding	Empty	0
AFE0070	Active	1 x chick	Empty	0
AFE0071	Active	Adult brooding	Empty	0
AFE0072	Active	Adult brooding	Nest not found	0
AFE0073	Active	2 x eggs	Empty	0
AFE0074	Active	Adult brooding	2 x chicks in nest	1
AFE0081	Not checked	Not checked	2 x fledged immatures found during ground check	1
AFE0082	New	New	3 x fledged immatures found during ground check	1
AFE0083	New	New	Empty	0
AFE0084	New	New	Empty	0
AFE0085	New	New	1 x fledged chick seen nearby	1
AFE0086	UNID0076	UNID0076	1 x adult sitting in nest	0
AFE0090	New	New	1 x large chick	1
AFE0091	New	New	2 x chicks in nest	1
			17 chicks raised	12 successful sites

Note: September is not the best time for checking Fish-Eagle nests since some chicks would already have fledged – however the timing was dictated by the timing of breeding in the globally threatened vultures which were the primary focus of the aerial monitoring. However, since Fish-Eagles are highly territorial, ground checks were conducted in order to locate recently fledged chicks, and this proved reasonably successful.

This species could suffer a decline if the factors detailed in Part 3 (Pressure/Threats) continue to develop. Of particular concern is the proliferation of *Salvinia*, which if allowed to continue, could lead to extensive loss of the open water that this bird needs to conduct its hunting activities.

Tawny Eagle

Twelve nest sites were surveyed and nine were found to be active; however only three nests had

chicks, two of which were still white downy birds. Current literature indicates that the breeding cycle of this species starts at the same time as that of the African Fish-Eagle. However we are of the opinion that the Tawny Eagle breeding season may, in the north of Botswana, start a little later than that of the Fish-Eagle.

It is possible that there are more Tawny Eagle nest sites to be found as these birds will nest in the drier back country, which to date, has not yet been thoroughly surveyed.

African Hawk-Eagle

Only three nest sites for this eagle have been found in the IBA, all of which were unused. The laying season for this species according to the literature, peaks in June and July in Southern Africa - this may explain why there were no active sites found in late June. It is highly likely that there are more nest sites of this species still to be found in the IBA, but as they tend to nest in the mid- to upper-storey of the trees, searching for their nest sites while the trees are still well vegetated is difficult.

Wahlberg's Eagle

This small summer intra-African breeding migrant eagle starts its breeding cycle soon after arriving in Southern Africa in early summer. There are two nest sites in Linyanti that we feel are Wahlberg's Eagle sites. However due to the fact that we have not been in the IBA when these birds are present, we cannot verify these sites.

Martial Eagle

Only one breeding site for this 'Bird of Concern' has been recorded for the IBA and this site is just across the Linyanti in Namibia. This site was not active during 2007. However, a pair of birds was seen perched together very close to the nest tree during both June and September. It is likely that there is an alternative site in the area, but it has not been located yet.

It is disappointing that only one Martial Eagle nest has been found in the IBA. There is at least one other pair within the boundaries of the IBA, but their nest has not been found. There is no apparent reason why there should not be a few more pairs in the IBA as the area could easily support a greater population of this species.

Bateleur Eagle

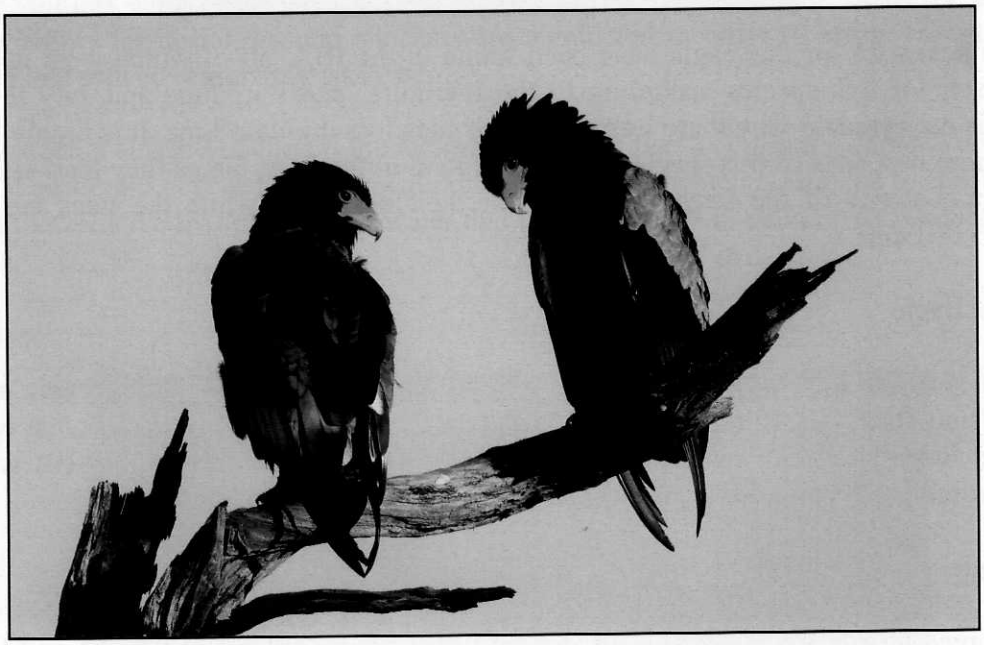


Photo: G Atkinson

Only one nest site for this very abundant species has been recorded in the IBA and this was not active during 2007. The breeding sites of this eagle have proved extremely difficult to find and even in areas such as the Khwai, which supports a huge population of this eagle, no nest sites have been found. The fact that the preferred sites are usually well below the canopy in large well-foliaged trees, may explain why the nests are so difficult to find.

Bat Hawk

During 2006, an unoccupied nest site was found that looked like a Bat Hawk nest and accordingly was recorded as such. This year, that particular site was unoccupied. However, during the June survey flights, a second nest site was found close-by in a similar tree – although a bird was sitting tight on the nest, its identity was not clear. Consequently it was photographed from the Gyrocopter and this showed conclusively that it was a Bat Hawk.

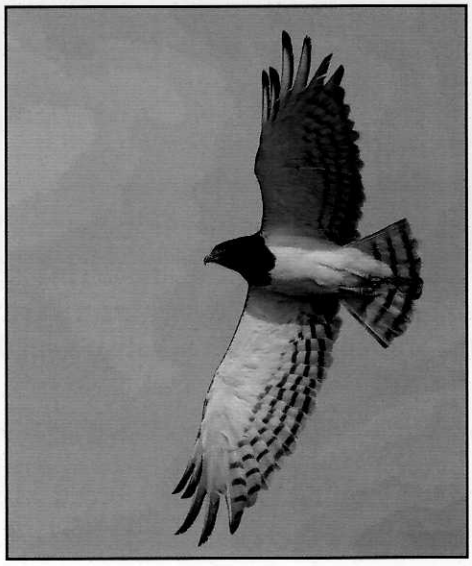
However, during the September monitoring period, the nest was empty – it is unknown whether or not the birds bred successfully.

Brown Snake-Eagle

Last year, one nest site was recorded for this species. However there is some uncertainty about the identity of the nest, so it has been removed from the database. During ground work, at least two pairs of these birds have been seen – in time, their nest sites may be located.

Black-chested Snake-Eagle

It is surprising that not only have no nests of this species been found, but also that only one sighting of this Eagle has been recorded during the monitoring (September 2007).



Verreaux's Eagle-Owl

Currently there are four nest sites for this species, only one of which was active during 2007. Interestingly, the current active nest was used by an African Fish-Eagle last year. This species will take over any old raptor or even Hamerkop nest. Current literature indicates that the peak laying period for this species in Botswana is September to October.

Secretarybird

During 2006, two nest sites were monitored; neither was active this year. As this species is recorded as breeding all year round we are not concerned at the lack of active sites. However there are, within the IBA (particularly as a result of the drying up of the area), large areas of suitable habitat for this species and it is disappointing that no active nest sites were found this year. It is possible that fires in the area could impact negatively on the species.

Storks

There are two species of large tree-nesting storks that breed in the IBA. The details of our findings are set out here:

Marabou Stork

There is one small colony of these birds breeding in the north-eastern corner of the IBA. The site was again active this year with five breeding pairs being recorded.

Saddle-billed Stork

This is another of the water-dependent species that, as a result of the drying up of the area, appears to be an uncommon 'relict' breeding resident.

During 2006, there were three nest sites monitored – two more were added this year, and in total four were active during the first survey in June.

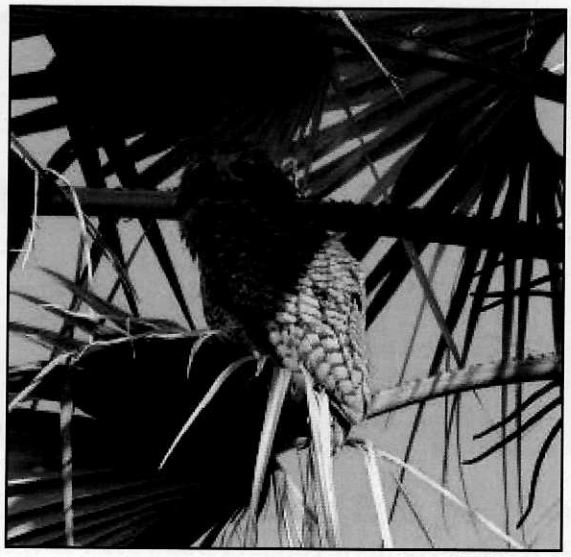
During one of the survey flights in June, two large chicks were photographed on one of the nests (below left) with a baboon nearby – the following day, both chicks were off the nest (photo, below right). Although the baboon was feeding on Jackalberry fruits, it raises the question of how many eggs and chicks are in fact predated by baboons.

These two chicks were again seen in September.

Southern Ground-Hornbill

This species is a 'Bird of Concern' in Botswana and there are three known nests in the IBA. The winter field work periods, being dictated by the vulture breeding cycle, means that no information could be gathered on breeding success for this species which breeds during summer. However, a visit during February would be worthwhile to gather information on this and other summer-breeding species.

Pel's Fishing-Owl



There have been no sightings or records of this 'Bird of Concern' during the course of any of our monitoring trips. Anecdotal information from Pat Carr-Hartley, confirms that even during the 1970s, this species was not seen in the IBA. There is only one recent authenticated sighting of this species in the IBA, made by Russel Friedman and Colin Bell in 1997 in the vicinity of Zibadianja Lediba. Its absence from the area is difficult to explain since the area appears to have suitable habitat for Pel's Fishing-Owls.

One possible explanation could be that the areas of suitable habitat occur in areas of very high Fish-Eagle density. Possibly the competition from the eagles keeps them out of the area. Furthermore the seriously degraded riparian habitat may now not offer enough densely shaded areas for these birds to use for their daytime roosts.

Heronries

During aerial monitoring work, only one small heronry has been found in the IBA. This corroborates the low reporting rates for all herons, egrets and other waterbirds. This heronry is located on the west side of Zibadianja Lagoon. This year, the only birds noted breeding were African Darters. Last year, a small number of African Spoonbills bred at the site. An aerial view of the heronry is shown below - of interest is that one Darter nest has five eggs in it.

Unidentified nest sites

There were 51 unidentified sites in 2006. Ten sites were upgraded to identified sites when they were seen to be occupied, and two more unidentified sites were added during 2007. Some sites have been deleted from the database as the nests have either gone or have collapsed totally. This leaves a total of 32 unidentified sites remaining in the data base.

A few of these sites occur behind the riparian frontage in the Mopane woodland and could possibly be utilised by Wahlberg's Eagles during the summer months. A follow-up monitoring visit during February may aid in classifying many of these unidentified sites.

The unidentified sites will continue to be monitored incidentally during the aerial survey work to see how many of them become occupied by birds. This is particularly important due to the fact that suitable nest sites are going to be at a premium if the destruction of preferred nesting trees continues.

Other observations of interest

White-breasted Cuckoo-Shrike

There are very few records of this species in Botswana. Accordingly, the three different sightings of this bird during 2007 are noteworthy. It would appear that this bird is a rare resident in the IBA and it would be interesting to know if it breeds in the area.

Orange-breasted Waxbill

There are few records of this species outside of the Lechwe Flats in the Chobe National Park. Groups of between five and ten birds were seen on the floodplains just south-west of DumaTau on two occasions. This species is probably a rare resident in the IBA and it is possible that it is under-recorded since there are extensive areas of suitable habitat.

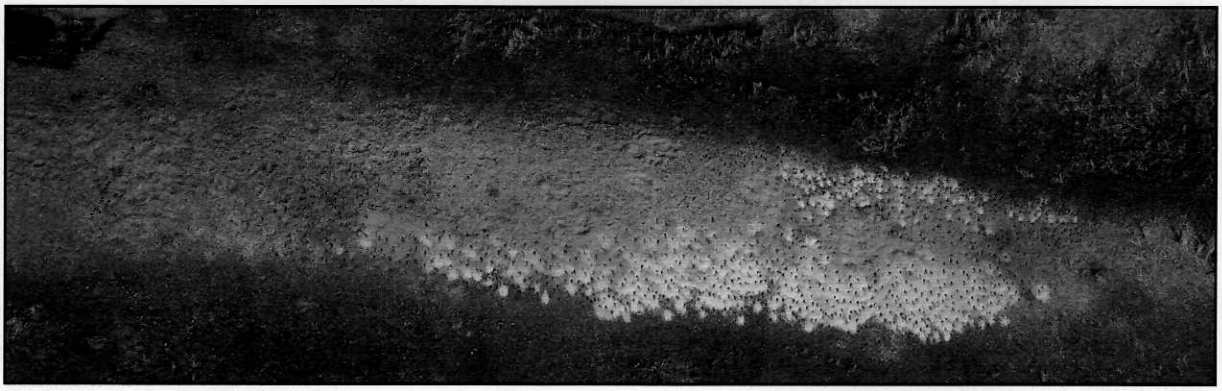
Grey-headed Bush-Shrike

There are also few records of this bird in the north of Botswana where it occurs at the very western limit of its geographical range. This species was recorded at several sites along the riparian frontage of the Linyanti fault-line during monitoring activities. It is an uncommon resident that must breed in the IBA.

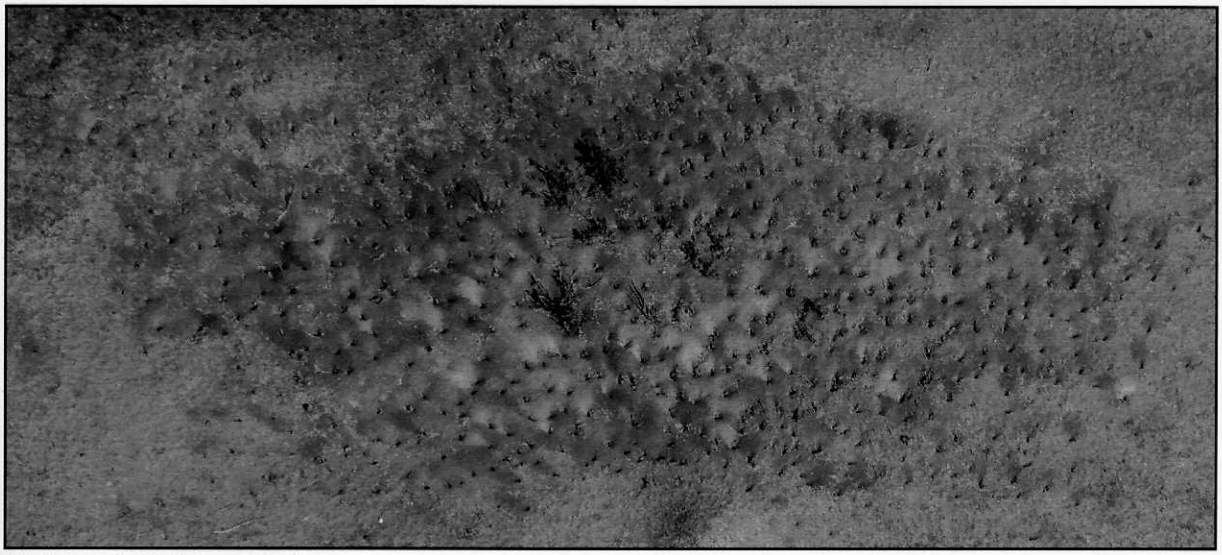
Southern Carmine Bee-eater

The IBA supports good numbers of this summer-breeding visitor. Three large ground-based nesting sites were found and two were photographed from the air.

Using the aerial photographs of the breeding colonies, the following counts of nesting holes was obtained:



Colony 1: 402 nest-holes



Colony 2: 281 nest-holes

Unfortunately it was not possible to photograph the third site.

The Linyanti IBA is an important breeding area for Carmine Bee-eaters and the current low water levels in the IBA have probably been a bonus for this species as it has exposed many ideal sandy breeding spots that are difficult to access and accordingly offer a high degree of security to the nesting birds.

Coqui Francolin

Outside of the Teak woodlands in the Chobe National Park around Kasane, this bird is very rarely recorded in Botswana. Accordingly the three sightings of this species during the course of the monitoring work are noteworthy.

Collared Palm-Thrush

This species has been overlooked in, or is a recent colonizer of the Selinda and Linyanti concessions according to Roche and Nel (2006). Only a single bird was seen during the monitoring in 2007.

APPENDIX 2 – WINTER AFRICAN WATERBIRD COUNT

The annual winter waterbird count from King's Pool airstrip to the mouth of the Savuti channel was carried out on 29th June, and a total of 34 species was recorded. Of interest is the low number of egrets and herons counted.

In addition to the waterbird count, a total bird count was done for the record, along the same transect. A total of 83 species of birds were seen, the full details are listed in the table on page 47.

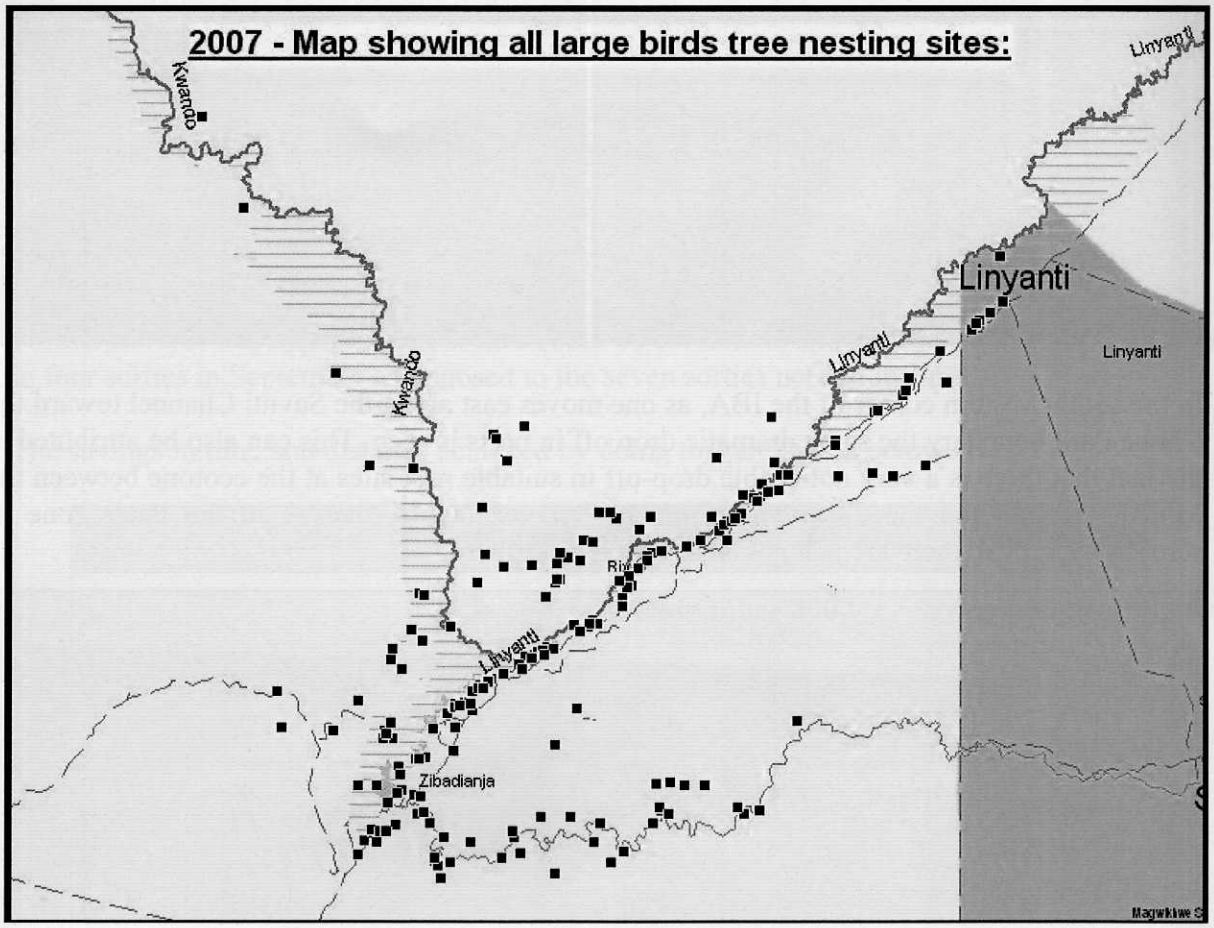
African Waterbird Census – 29th June, 2007

No.	SPECIES	No. counted
1	Bee-eater, Little	66
2	Bee-eater, White-fronted	31
3	Coucal, Coppery-tailed	7
4	Crake, Black	1
5	Crane, Wattled	2
6	Darter, African	13
7	Duck, White-faced	650
8	Duck, Comb	2
9	Egret ,Little	6
10	Egret, Cattle	7
11	Egret, Great	1
12	Egret, Yellow-billed	3
13	Fish-Eagle, African	5
14	Goose, Egyptian	18
15	Greenshank	2
16	Hamerkop	10
17	Heron, Black	1
18	Heron, Rufous-bellied	2
19	Heron, Squacco	3
20	Ibis, African Sacred	1
21	Ibis, Hadeda	2
22	Jacana, African	153
23	Kingfisher, Pied	16
24	Lapwing, African Wattled	6
25	Lapwing, Blacksmith	108
26	Lapwing, Long-toed	5
27	Marsh-Harrier, African	2
28	Martin, Banded	2
29	Pygmy-Goose, African	22
30	Roller, Lilac-breasted	20
31	Stonechat, African	20
32	Stork, Saddle-billed	5
33	Wagtail, Cape	6
34	Widowbird, Fan-tailed	1

Total bird count

Species	No.	Species	No.
African Darter	13	White-fronted Bee-eater	31
Squacco Heron	3	Little Bee-eater	66
Rufous-bellied Heron	2	Lilac-breasted Roller	20
Cattle Egret	7	African Hoopoe	1
Great Egret	1	Bennett's Woodpecker	2
Yellow-billed Egret	3	Grey-rumped Swallow	1
Black Heron	1	Brown-throated Martin	11
Little Egret	6	Banded Martin	2
Saddle-billed Stork	5 + 2 chicks	Lesser Striped Swallow	26
African Sacred Ibis	1	Cape Wagtail	6
Hadeda Ibis	2	Rosy-throated Longclaw	2
White-faced Duck	650	African Pipit	5
Spur-winged Goose	50	Plain-backed Pipit	21
Comb Duck	2	Dark-capped Bulbul	36
Egyptian Goose	18	African Red-eyed Bulbul	16
African Pygmy-Goose	22	Kurrichane Thrush	1
African Fish-Eagle	5	White-browed Scrub-Robin	1
Hooded Vulture	3	African Stonechat	20
White-backed Vulture	16	Hartlaub's Babbler	45
Brown Snake-Eagle	1	Greater Blue-eared Starling	100
Bateleur	7 + 1 juv	Burchell's Starling	178
African Marsh-Harrier	2	Southern Grey-headed Sparrow	10
Gabar Goshawk	2	Helmeted Guineafowl	26
African Hawk-Eagle	2	Hamerkop	10
Red-necked Falcon	1	African Jacana	153
Red-billed Spurfowl	44	Grey Go-away-bird	15
Swainson's Spurfowl	3	Red-faced Mousebird	12
Black Crake	1	Red-billed Hornbill	16
Wattled Crane	2	Southern Ground-Hornbill	3
Long-toed Lapwing	5	Chinspot Batis	1
Blacksmith Lapwing	108	Brown-crowned Tchagra	1
African Wattled Lapwing	6	Black-backed Puffback	1
Crowned Lapwing	2	Swamp Boubou	3
Common Greenshank	2	Fork-tailed Drongo	32
Double-banded Sandgrouse	3	Zitting Cisticola	6
Cape Turtle-Dove	48	Tawny-flanked Prinia	5
Red-eyed Dove	5	Luapula Cisticola	1
Emerald-spotted Wood-Dove	1	Golden Weaver	1
Coppery-tailed Coucal	7	Red-collared Widowbird	1
Meyer's Parrot	4	Blue Waxbill	14
African Palm-Swift	3	Pin-tailed Whydah	12
Pied Kingfisher	16	**TOTAL NO. OF SPECIES**	**83**

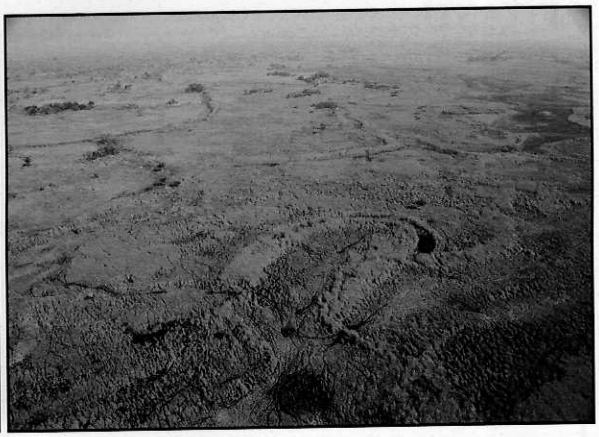
APPENDIX 3 – DISTRIBUTION OF NESTS OF LARGE TREE-NESTING BIRDS IN LINYANTI



The map above shows the positions of all the 235 nest sites that were monitored during 2007 and which are currently in the database. For the purpose of clarity, each waypoint label has been removed, as this allows clearer viewing of the positioning of all the nest sites.

It is interesting to note that, as one moves north up the Kwando River, the occurrence of nest sites drops away very dramatically, in spite of the fact that there would appear to still be many suitable nesting sites. This can be explained by the fact the Kwando River has a very different structure to that of the Linyanti system. The Linyanti system has, in essence been 'captured and directed' by the Linyanti fault-line, and so exhibits a very clearly defined riparian frontage, albeit badly degraded now, comprised of trees such as *Diospyros mespiliformis*, *Acacia nigrescens*, *Berchemia discolor*, *Garcinia livingstonei* and various *Combretum* species. The Kwando River displays the characteristics of an old river system, meandering in a greatly reduced floodplain where there is no clearly defined riparian frontage. Accordingly the vegetation here is different and is dominated by 'islands' made up of *Combretum imberbe* and a mosaic of the aforementioned trees that occur at low densities.

The photos overleaf show these differences, with the left hand photo showing the riparian frontage of the Linyanti fault-line, while the right hand picture shows the old meanders of the Kwando River floodplain.



In the south-western corner of the IBA, as one moves east along the Savuti Channel toward the Chobe Park boundary the same dramatic drop off in nests is seen. This can also be attributed to the fact that there is a very noticeable drop-off in suitable nest sites at the ecotone between the Mopane/*Acacia* and the *Terminalia*/*Philenoptera* vegetation zones – in the latter zone of scrubby-type bush there are just not any suitable nest sites.

Finally, as one moves north-east along the faultline and into the Chobe National Park, there is also a dramatic drop off in nests. This is due entirely to the fact that as one proceeds north-east of the park boundary, the Linyanti floodplains are dry for large parts of the year.

APPENDIX 4 – FLIGHT ROUTING MAPS FOR THE 2007 MONITORING

Over the course of the monitoring, we have been able to improve our flying techniques and as is detailed here, this has resulted in a huge saving in time and consequently considerable savings in expenditure for flying.

During the first trip in June of this year, both aircraft were used and it was felt that a maximum of 30 nests per sortie could be checked. It became immediately apparent that the Gyrocopter's greater maneuverability, coupled with the fact that it is not affected by wind conditions, made it better suited for this kind of work. Accordingly during the second trip in September, we only used the Gyrocopter for the nest checking and other monitoring flights.

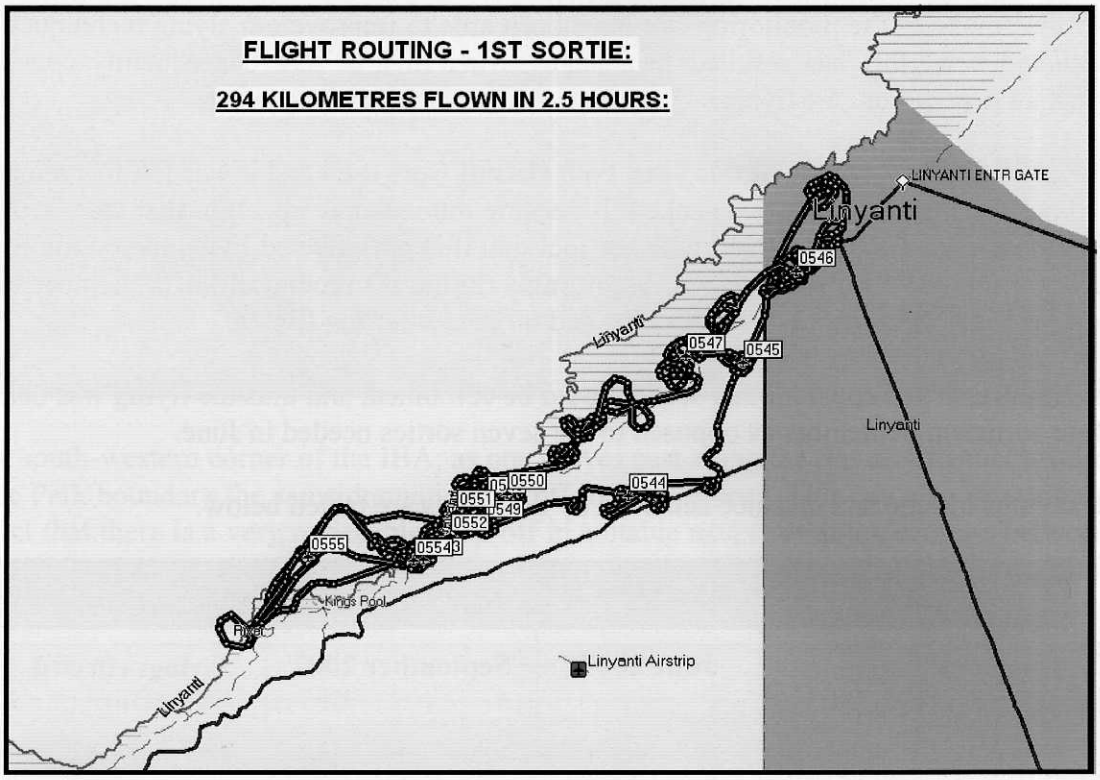
Furthermore, it was apparent that sorties could be combined, and thus the flying was completed in four sorties in September as opposed to the seven sorties needed in June.

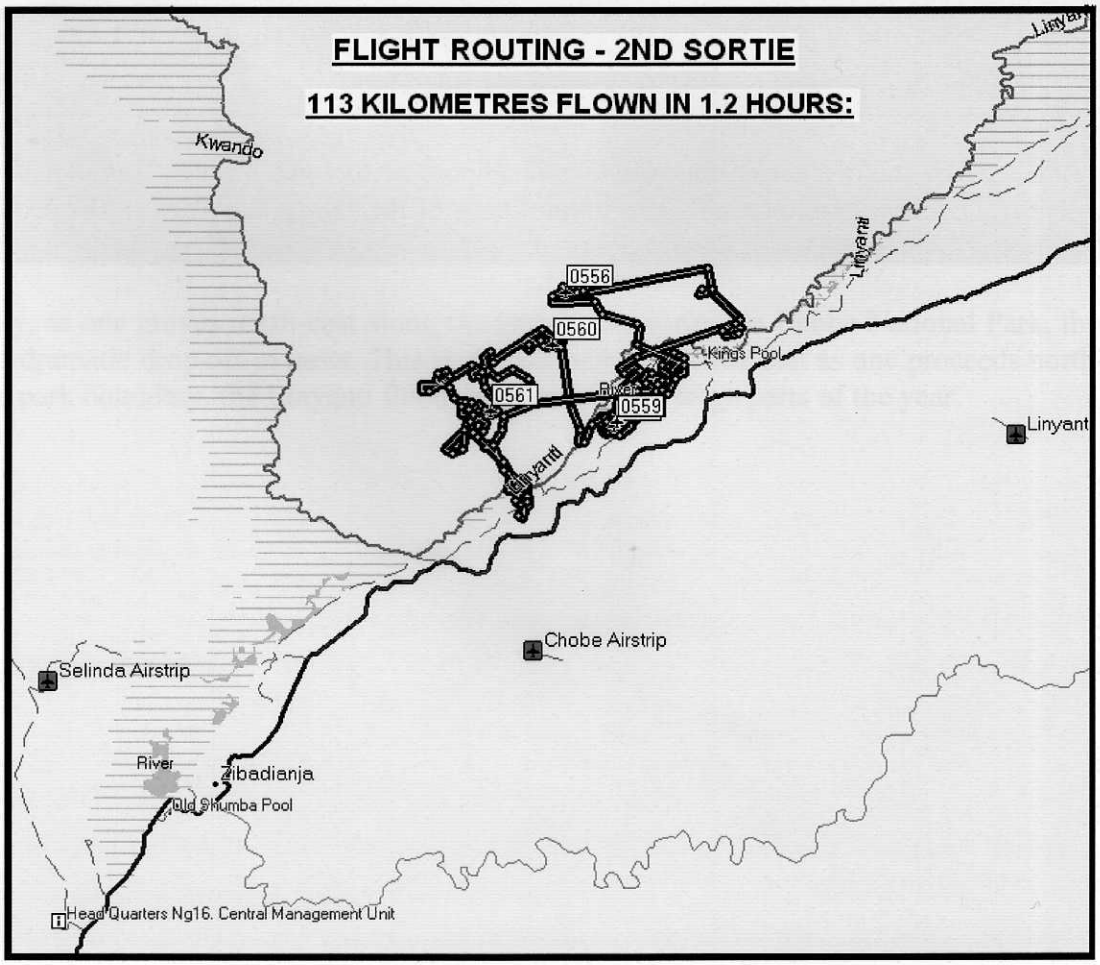
The savings in time and distance achieved by doing this are tabled below.

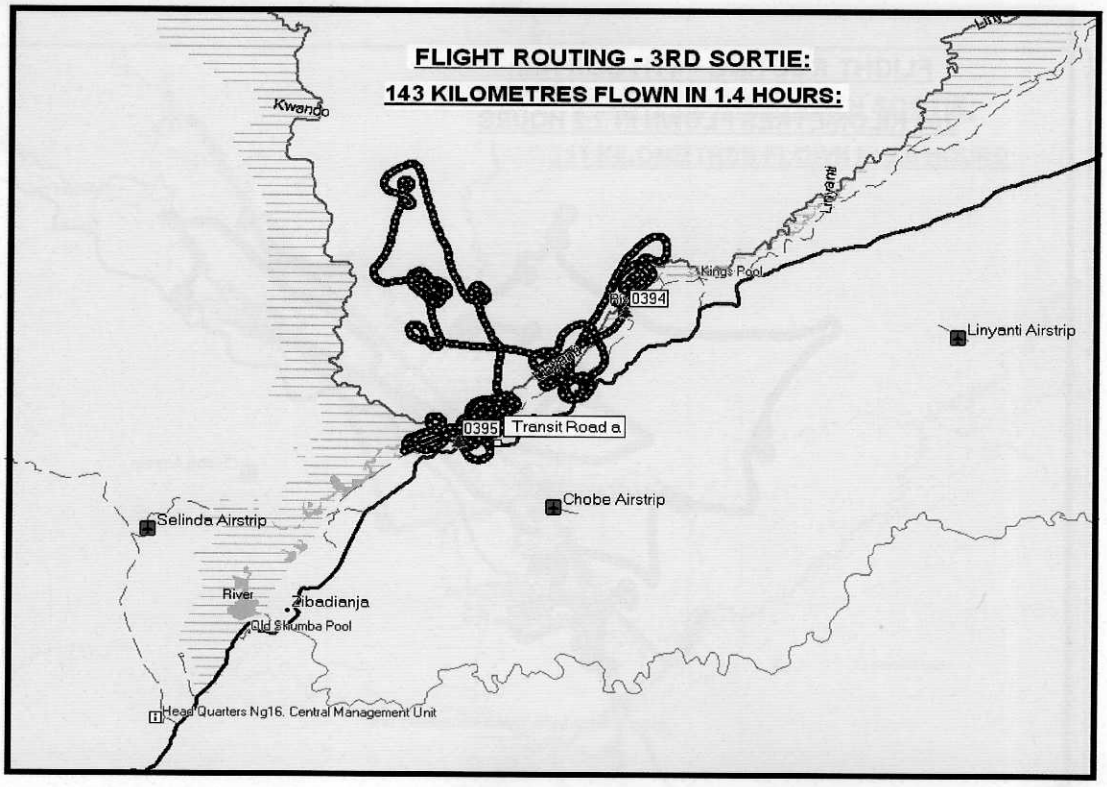
Flight comparisons between the two 2007 trips			
	June 2007	**September 2007**	**Savings effected**
Total no of sorties flown	7	4	**3**
Distance flown in kilometres	1,427	950	**477**
Time flown in hours	15.90 hours	10.95 hours	**4.95** hours

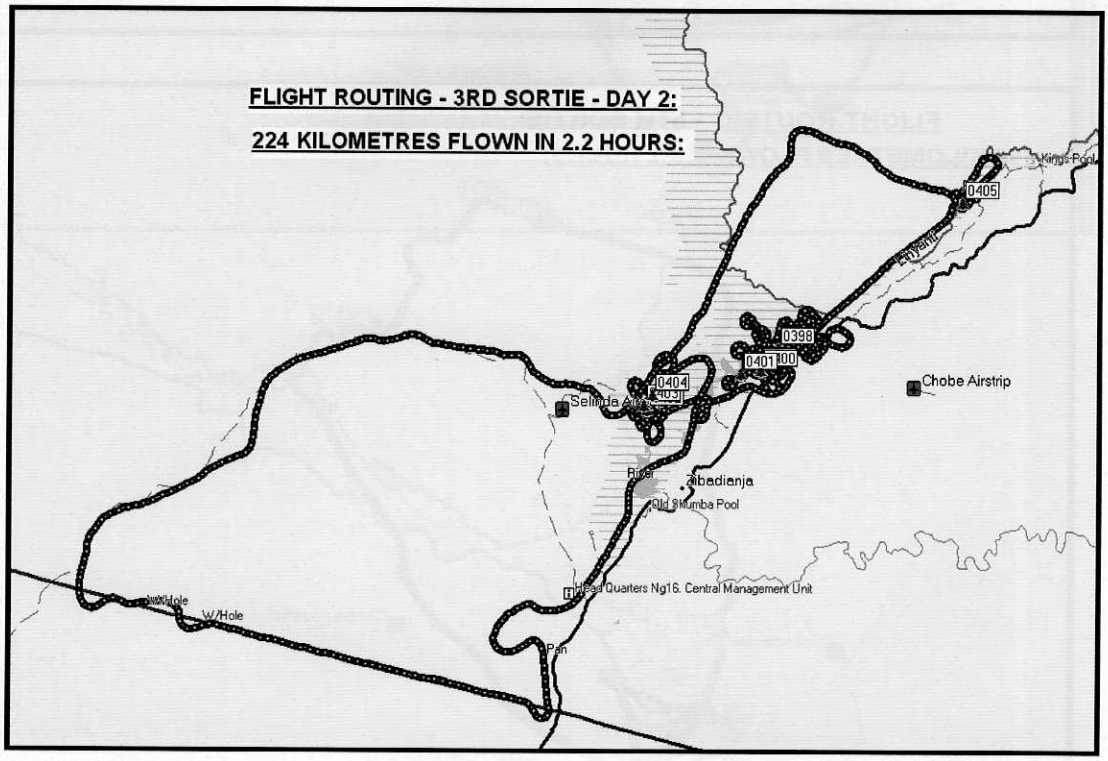
In this age of rapidly escalating costs, it is important to look for cost savings wherever possible. The savings effected by the streamlining of the flying activities in the second trip have been of importance and were welcomed.

June flight map details

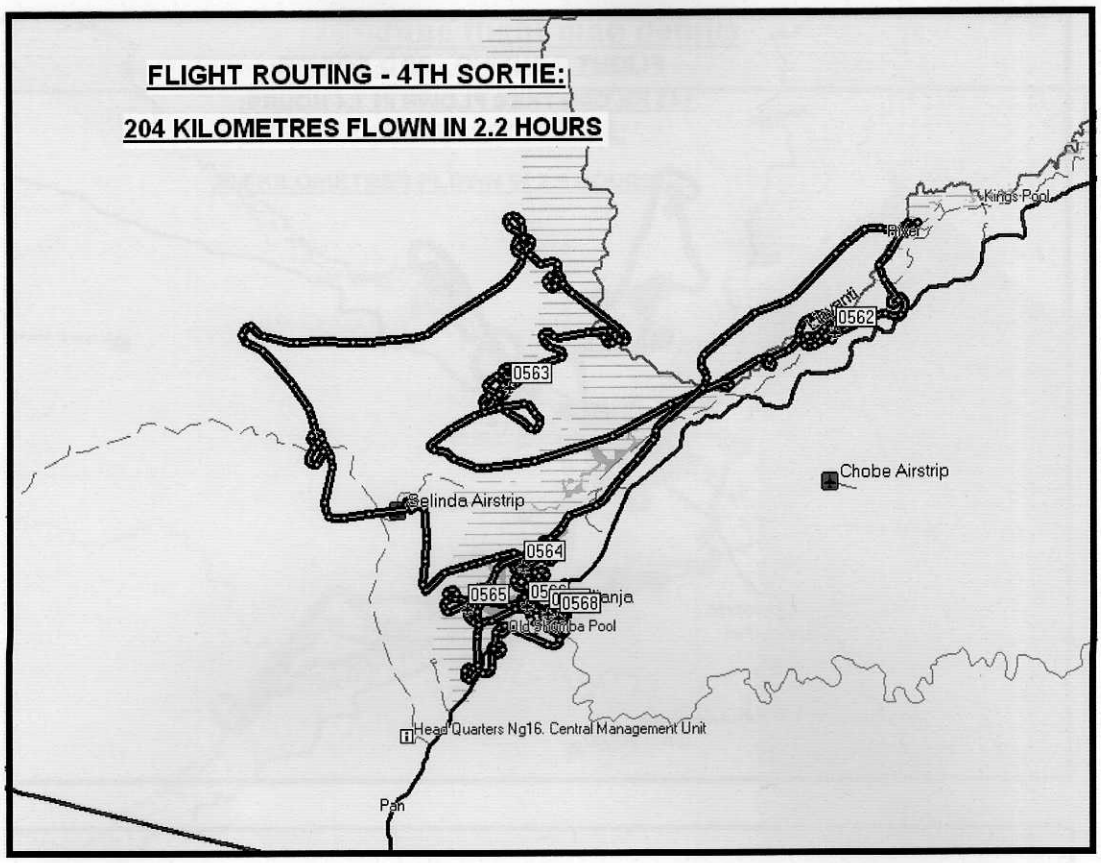


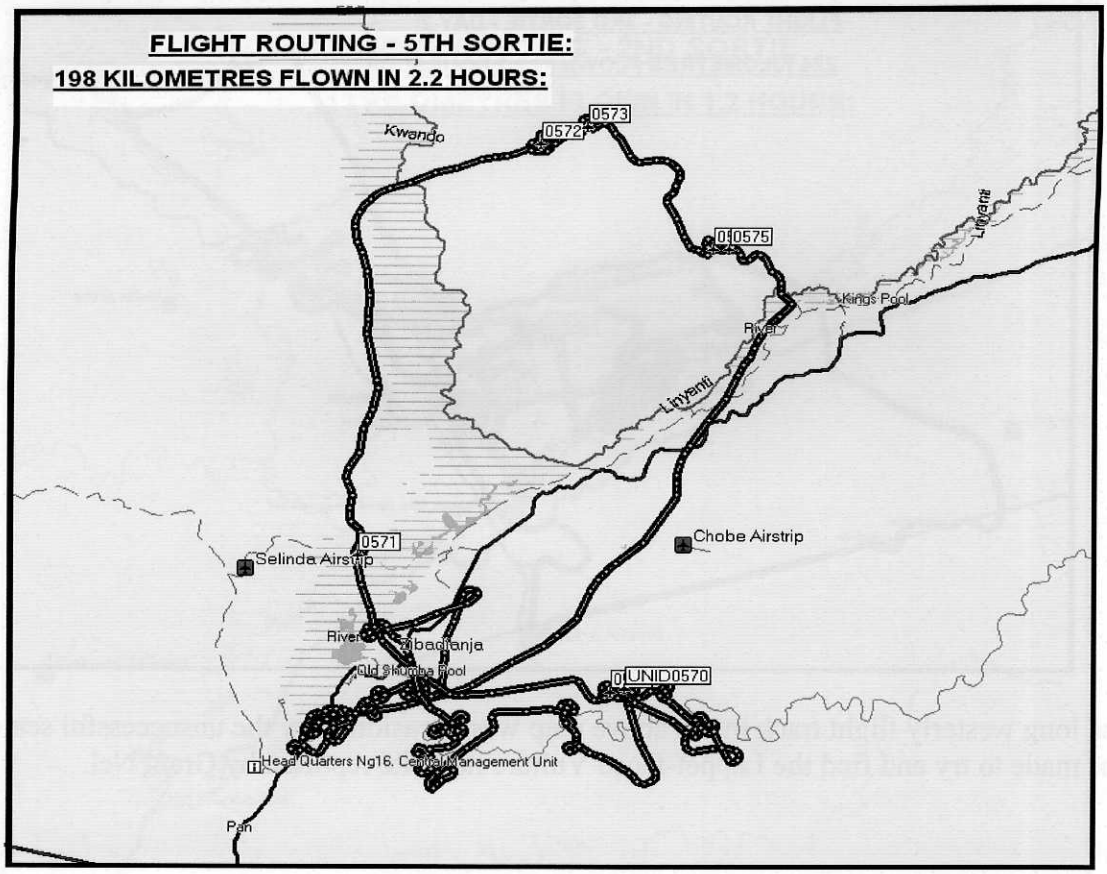


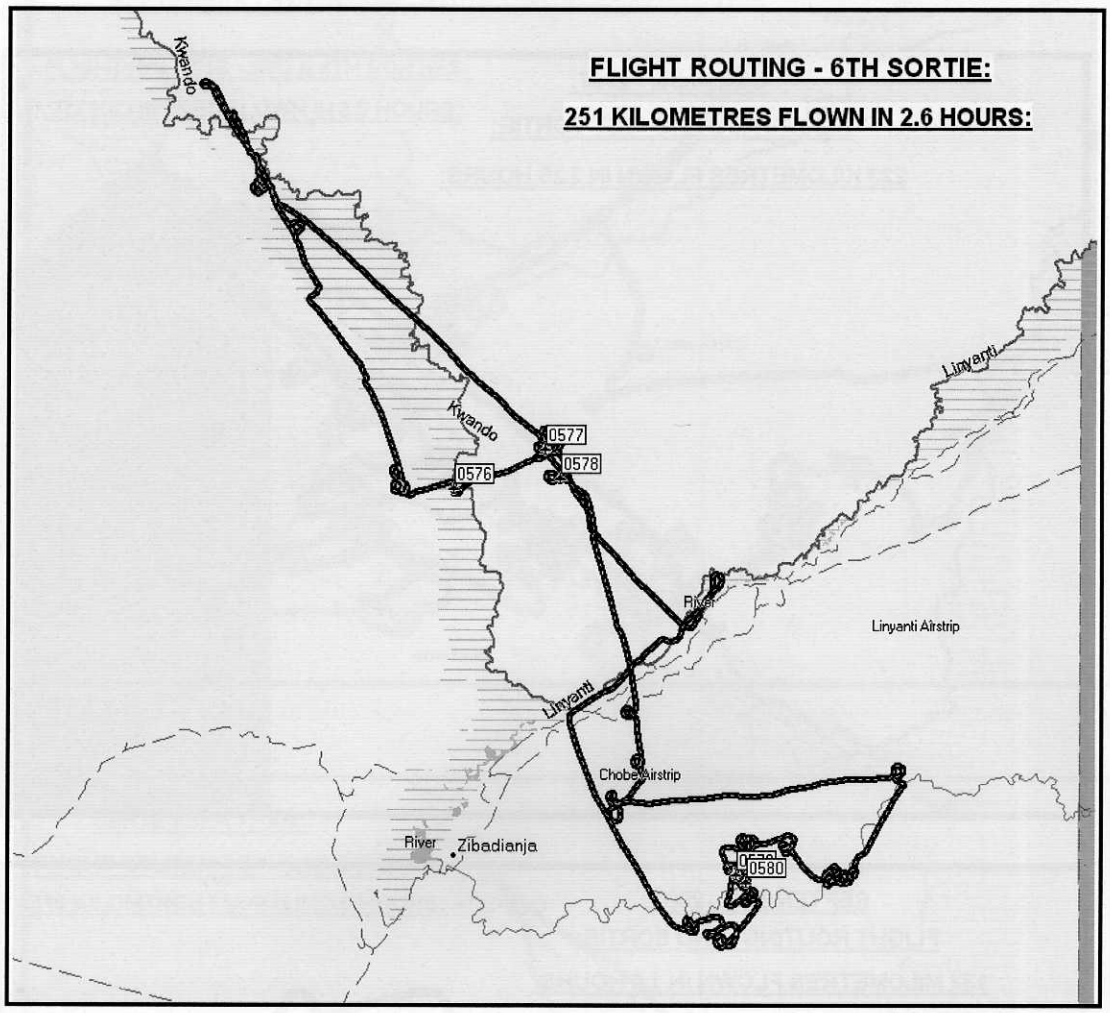




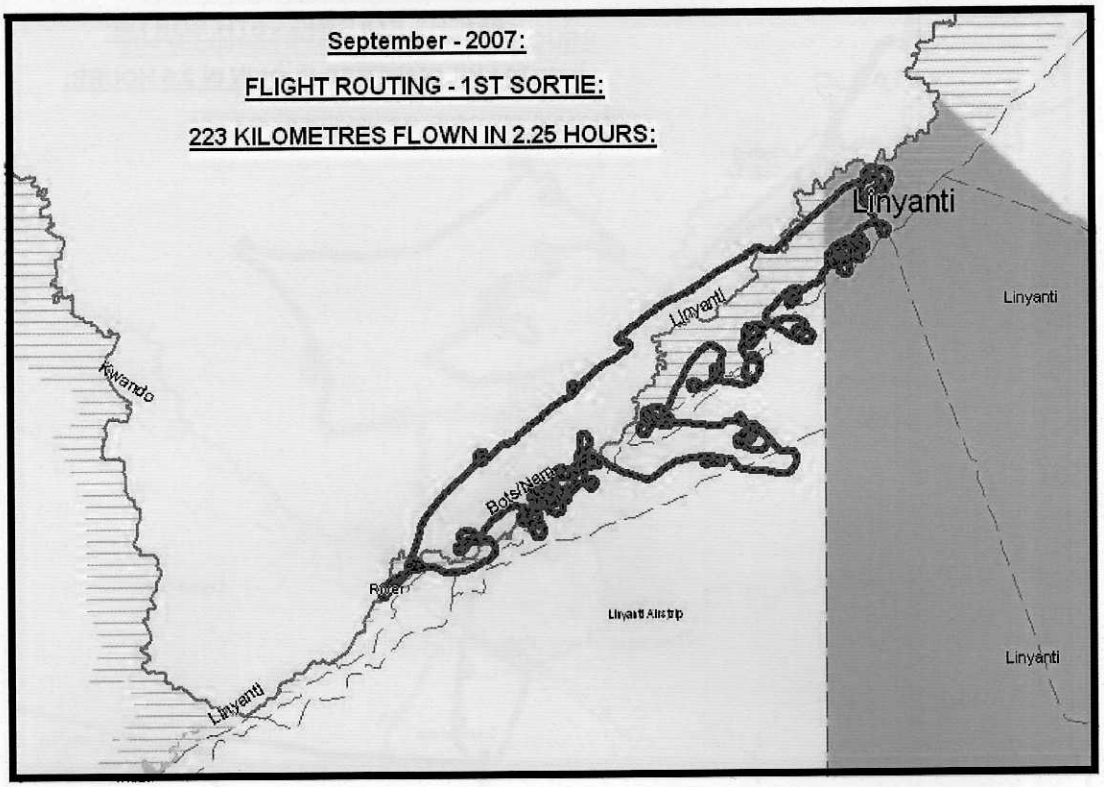
The long westerly flight track in the above map was occasioned by the unsuccessful search that was made to try and find the Lappet-faced Vulture nest site reported by Grant Nel.

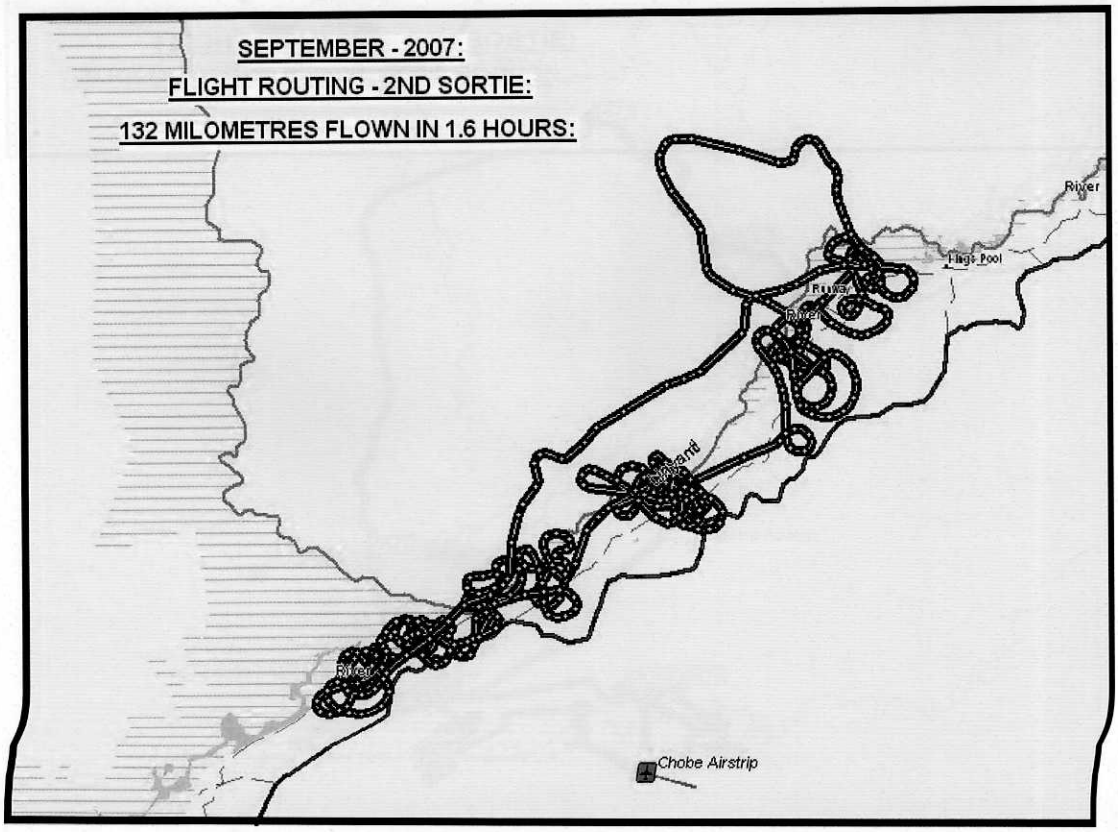

FLIGHT ROUTING - 4TH SORTIE:
204 KILOMETRES FLOWN IN 2.2 HOURS
Kings Pool
River
0562
0563
Chobe Airstrip
Selinda Airstrip
0564
0565
0568
Old Skimba Pool
Head Quarters Ng16. Central Management Unit
Pan

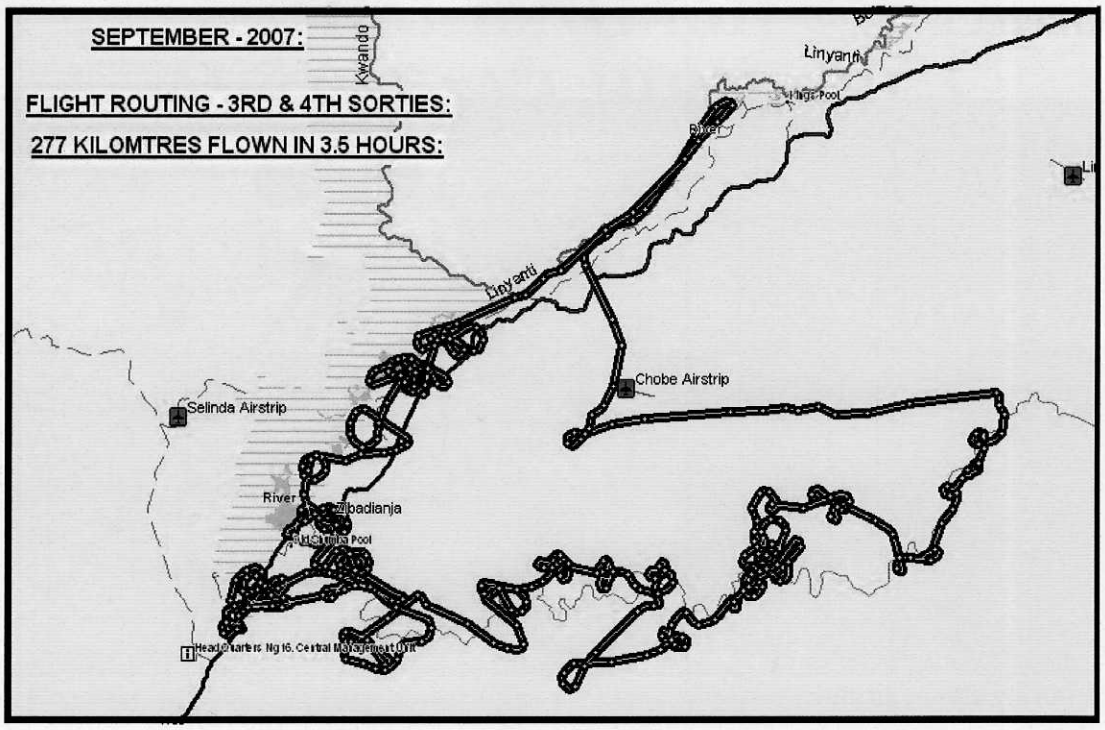

FLIGHT ROUTING - 5TH SORTIE:
198 KILOMETRES FLOWN IN 2.2 HOURS:
Kwando
0573
0572
0575
Linyanti
Kings Pool
River
Linyanti
Chobe Airstrip
0571
Selinda Airstrip
Old Skimba Pool
UNID0570
Head Quarters Ng16. Central Management Unit
Pan

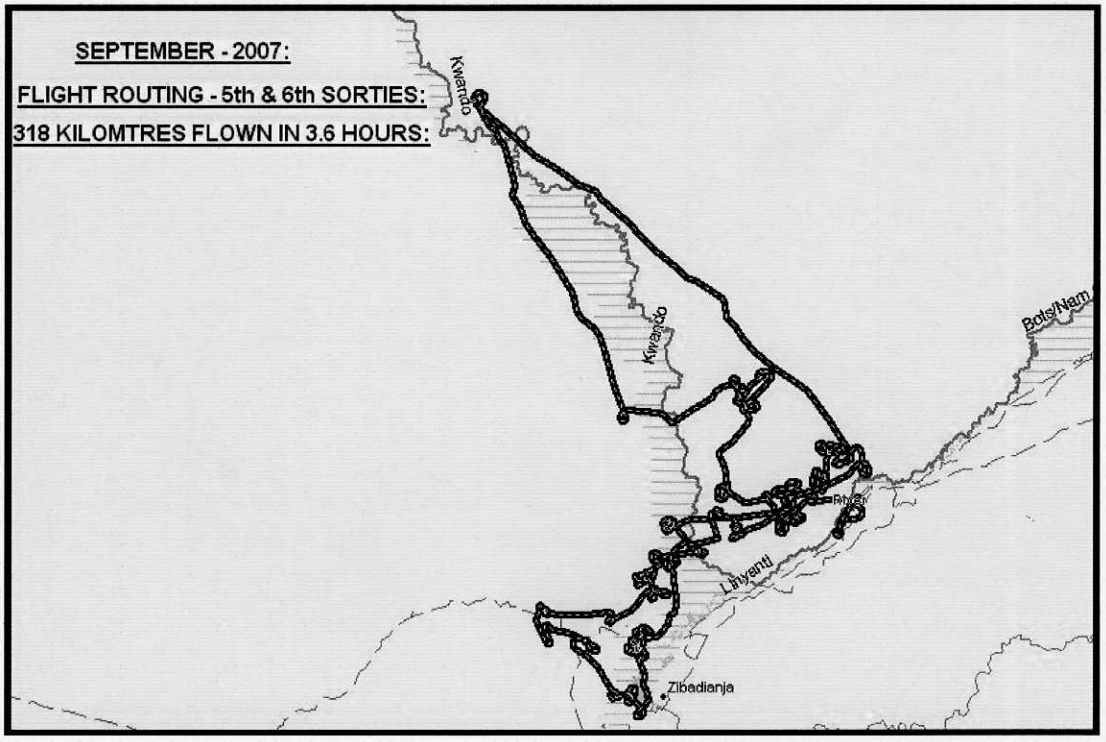

FLIGHT ROUTING - 6TH SORTIE:
251 KILOMETRES FLOWN IN 2.6 HOURS:
Kwando
Kwando
Linyanti
Linyanti
0577
0578
0576
0580
River
Linyanti Airstrip
Chobe Airstrip
River
Zibadianja

September flight map details






SEPTEMBER - 2007:
FLIGHT ROUTING - 3RD & 4TH SORTIES:
277 KILOMTRES FLOWN IN 3.5 HOURS:
Kwando
Linyanti
Chobe Airstrip
Selinda Airstrip
River
Zibadianja

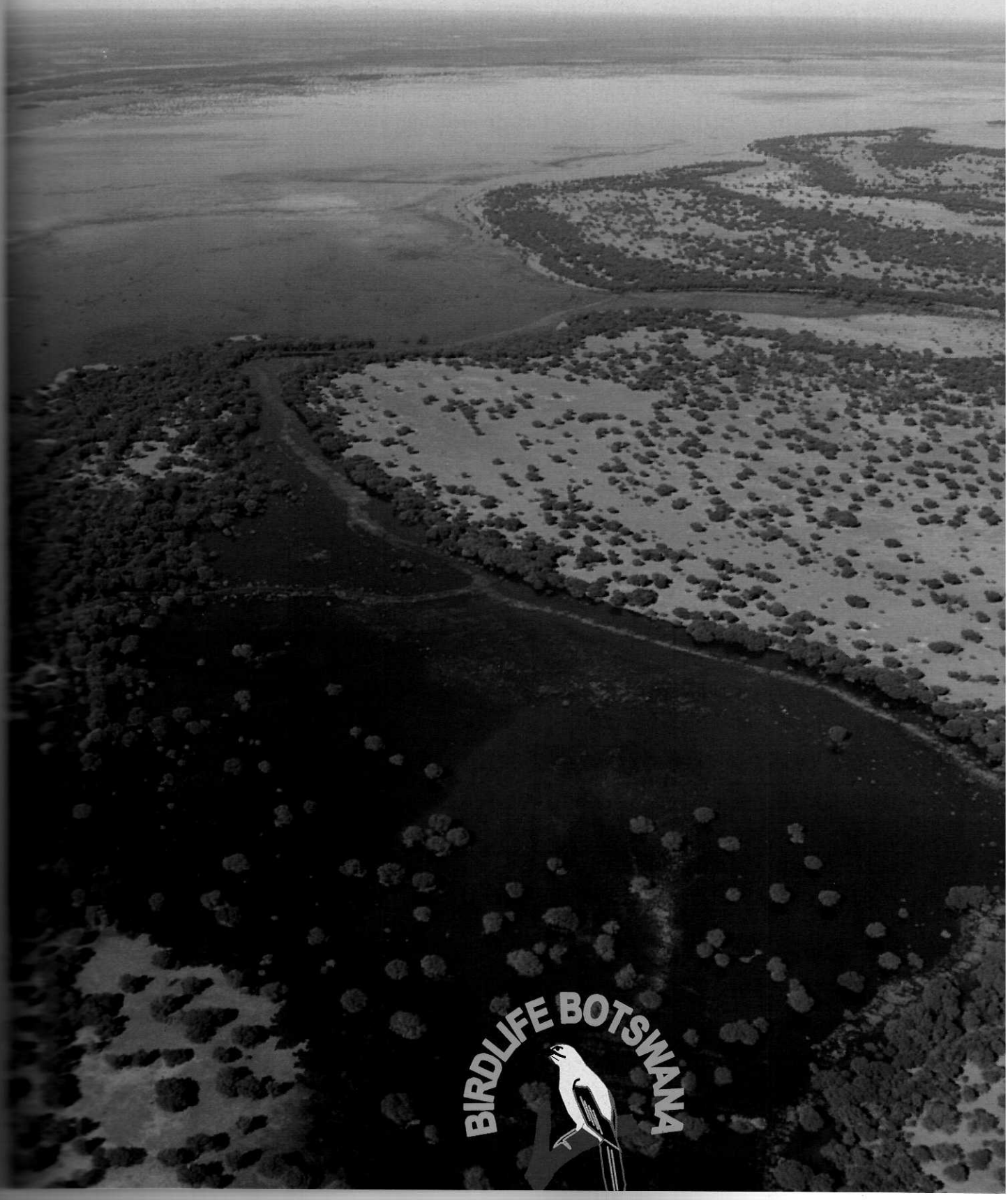

SEPTEMBER - 2007:
FLIGHT ROUTING - 5th & 6th SORTIES:
318 KILOMTRES FLOWN IN 3.6 HOURS:
Kwando
Kwando
Linyanti
Zibadianja

TAILPIECE

Monitoring can be tiring!

LAKE NGAMI IMPORTANT BIRD AREA

MONITORING REPORT 2007



BIRDLIFE BOTSWANA

LAKE NGAMI IMPORTANT BIRD AREA

MONITORING REPORT 2007

by P Hancock, M Muller and K Oake

INTRODUCTION

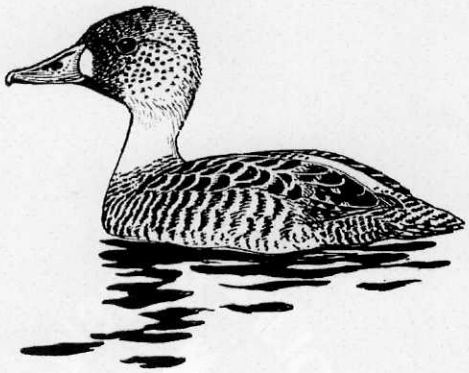
As part of Birdlife Botswana's commitment to maintaining a network of sites that are critical for birds both nationally and internationally, the Lake Ngami Important Bird Area (IBA) is monitored annually following BirdLife's global monitoring framework. This framework is based on the State – Pressure – Response model that has been adopted by the Convention on Biological Diversity (CBD), and this report is divided into three parts paralleling these components. Part 1 deals with the state of the Lake Ngami IBA, with particular emphasis on the 'trigger' species of birds that 'qualify' the area as an IBA. Part 2 focuses on pressures or threats to the IBA - these were originally identified by Tyler and Bishop (1998), but some of these have been superceded and a current set of issues has been identified through fieldwork. These threats need to be ranked so that they can be incorporated into the global monitoring framework. Part 3 of the report describes the conservation action undertaken in response to the identified threats. These actions are a measure of progress made towards addressing or mitigating the threats. The actions also need to be objectively ranked for incorporation in the framework.

Appendices contain additional information on the birds of Lake Ngami.

ACKNOWLEDGEMENTS

Special thanks to P Wolski – Harry Oppenheimer Okavango Research Centre – for providing information on the hydrology of Lake Ngami, including the satellite images showing the extent of flooding. Also to M Ntsosa from the Dept. of Meteorological Services for providing rainfall data at short notice.

A Flatt and R Randall were part of the team that conducted the count on 29th July, and are thanked for their valuable inputs. Many people contributed to the success of the second count on 4th December – *mekoro* were loaned by D Sandenbergh/D and R Dugmore (The Bridge/Kalahari Kavango), A Bimson (Sedia Hotel), N Kendrick (Okavango River Lodge) and P Comley (Safari and Guide Services) and ably poled by M Motswagole, L Dichaba, B France and K Bikitsane. The Reed family – Mike, Brent and Grant – volunteered as counters, and made constructive suggestions as to how to improve future counts.



OBJECTIVE

The objective of this project was to gather quantitative data for the ongoing monitoring of the Lake Ngami IBA, to determine if there were any negative anthropogenic changes impacting on the area generally, and its avifauna in particular.

THE GLOBAL MONITORING FRAMEWORK

The global monitoring framework requires that data are collected on environmental parameters that could influence bird numbers, to provide a context for the monitoring of the 'trigger' species, and then the trigger species are monitored in an objective way to determine their trends. The trigger species for Lake Ngami are shown in Table 1 below:

Table 1. Trigger species for the Lake Ngami IBA (Tyler and Bishop, 1998, updated with information from Hancock *et al.*, 2005)

1. <u>Globally Threatened Species</u> • Cape Vulture. • Lappet-faced Vulture. • White-backed Vulture. • Lesser Kestrel • Wattled Crane. • Slaty Egret. • Corn Crake. • Lesser Flamingo • Black-winged Pratincole. • African Skimmer. • European Roller.
2. <u>Range- and Biome-restricted species</u> • Dickinson's Kestrel • Burchell's Sandgrouse. • Bradfield's Hornbill. • Hartlaub's Babbler. • Kalahari Scrub-Robin. • Barred Wren-Warbler. • Burchell's Starling • Meves's Starling. • White-bellied Sunbird.
3. <u>Congregatory Waterbirds</u> • Little Grebe • Great White Pelican • African Spoonbill • African Darter • Reed Cormorant

- Great Egret
- Little Egret
- Black-crowned Night-Heron
- Marabou Stork
- Greater Flamingo
- Red-billed Teal
- Hottentot Teal
- Comb Duck
- Collared Pratincole
- Whiskered Tern
- Black-winged Stilt
- Caspian Plover

PART 1 – STATE OF THE LAKE NGAMI IBA

Environmental setting

Background

Lake Ngami occupies the north-eastern part of a shallow sedimentary basin, south-west of the Okavango Delta, of which it is an integral part. It was originally fed by the Thaoge River (the western distributary of the Okavango), and during the 19th century, was a substantial waterbody – it took the explorer David Livingstone several days to circumnavigate its perimeter, for example. Once the Thaoge ceased to flow, the lake flooded seasonally, fed by the Nhabe and Kunyere Rivers, and in the 80 years prior to 1983, had only been dry for two consecutive years, five times. However, since then it has been dry most of the time, due to the low water levels in the Okavango system during the 1990s.

During the late 1990s, there was a major change in the distribution of water in the Okavango Delta (Wolski and Murray-Hudson, 2006) with more water flowing down the western side (towards Lake Ngami, via the Kunyere – the Nhabe no longer flows to the lake); however the low flows being experienced at that time meant that it was only in 2000 that the Kunyere floodwaters reached the lake, although they were inadequate to flood part of the lake bed (Tyler and Tyler, 2001). In 2001, a few square kilometres of the lake bed were flooded (see; Brewster *et al.*, 2002). With the higher flood levels experienced subsequently, the lake has flooded substantially every year since 2004.

Hydrology

The hydrology of the lake is the key determinant of the system, and the most important factor as far as birds are concerned.

Table 2. Extent of flooding at Lake Ngami for the years 2004 to the present.

Year	Extent of flooding
2004	52 km^2
2005	25.5 km^2
2006	20.3 km^2
2007	51.9 km^2

Since the lake flooded in 2004, the groundwater has become recharged, and this has affected flood levels in subsequent years. Local rainfall also plays an important role in the hydrology of the lake. This effect is particularly noticeable by the end of summer because if local rains have been good (as they were in the summer of 2005/6), the previous year's floodwaters can persist until the lake floods once again. However as illustrated in Figure 1, the 2007 rains were well below average, and the lake bed had dried out completely before the 2007 floodwaters arrived at the end of June (the Kunyere flooded past Toteng on 22nd June).

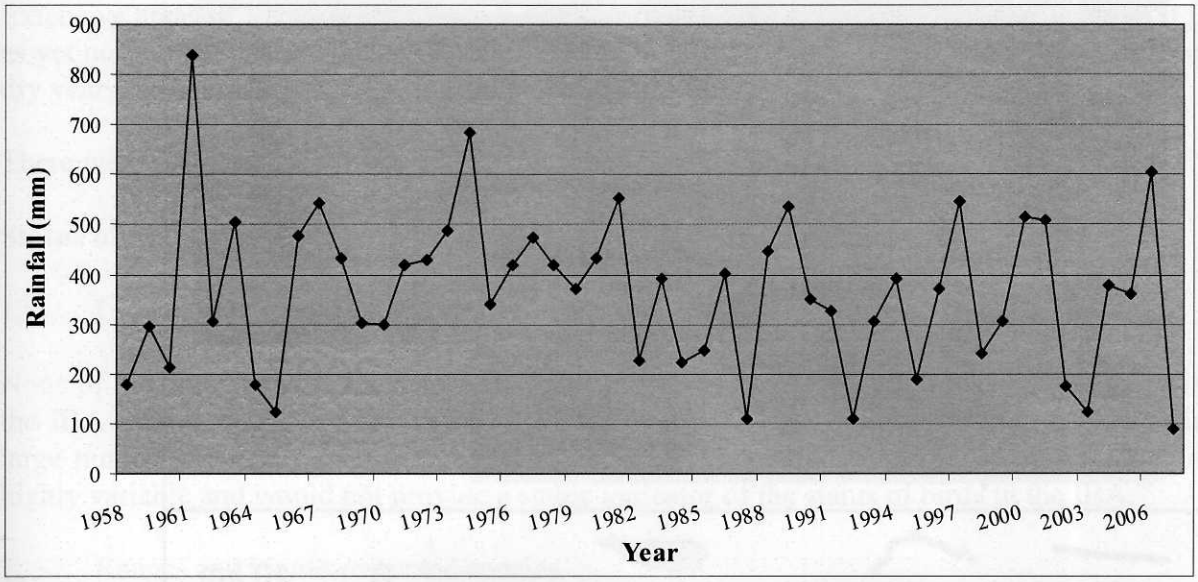


Figure 1. Long-term rainfall pattern for Lake Ngami area (from the nearest meteorological station, in Sehithwa).

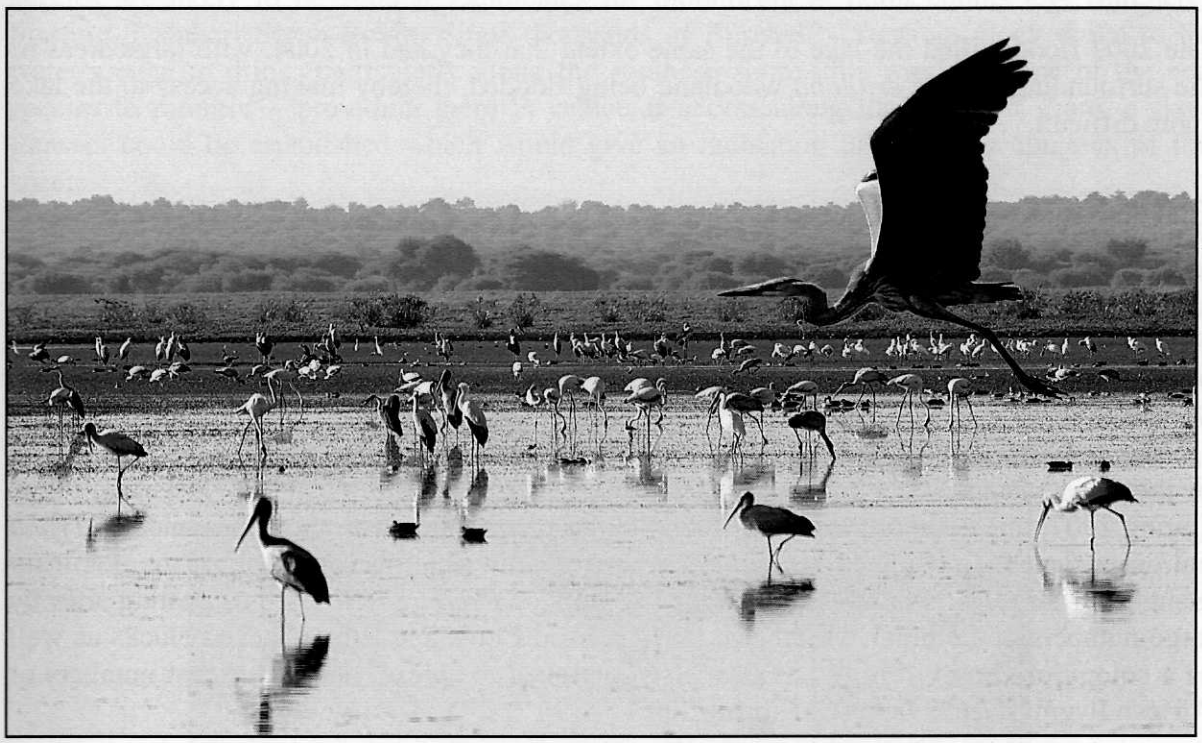


Figure 2. Concentration of waterbirds feeding in the drying remains of the 2006 floodwaters.

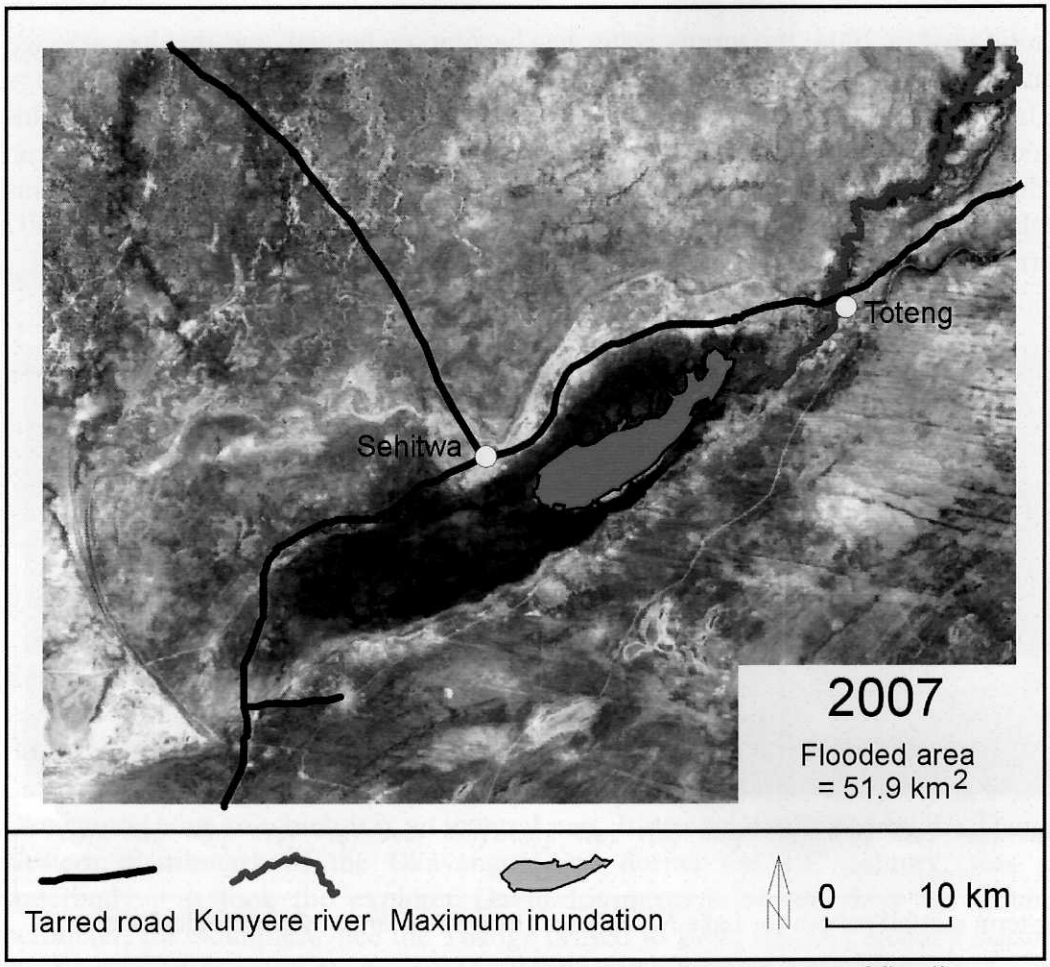


Figure 3. Satellite image of Lake Ngami, showing the maximum extent of flooding.

The 2007 floods filled the lake to the same extent that they had in 2004, with large areas of the surrounding *Acacia erioloba* woodland being flooded, thereby making access to the lake shore difficult.

Vegetation

With the lake holding water for the fourth year in succession, there was a definite increase in aquatic plants. During 2004, the lake was simply a large waterbody that had flooded into a semi-arid environment – a giant ephemeral pan; by 2006, it was already acquiring the characteristics of a more permanent wetland. *Panicum repens* became quite widespread and was interspersed in places by tufts of *Pycreus nitidus*. A few *Nymphaea* waterlilies were seen for the first time, as was *Potamogeton thunbergi* - species favoured by African and Lesser Jacanas respectively. However, most noticeable was the proliferation of *Ludwigia stolonifera* in the open water of the lake, which was used extensively by nesting Whiskered Terns. During 2007, this trend towards more aquatic plants continued with the appearance of *Typha* bulrushes, and the continued spread of *Pycreus nitidus* which became one of the dominant plants over large parts in the lake centre. The tufts of *Pycreus* were used as nesting sites by large numbers of Common Moorhens, Red-knobbed Coots and White-backed Ducks as well as a colony of Glossy Ibis. Waterlilies also continued to spread, and significant numbers of African Pygmy-Geese were seen during 2007.

The high water levels flooded some of the extensive stands of the exotic weeds, *Xanthium strumarium* and *Datura innoxia* that were growing along the 2006 shoreline, but it is not

certain whether they were killed or will continue to proliferate. *Xanthium* (*Motlhabakolobe*) is toxic and during November 2007, numerous cattle died after eating this plant, causing herders to remove their livestock from the lake precinct (P Ndjarakana, pers. comm.).

Notwithstanding the increase of aquatic vegetation, large areas of open water remain, and these have been colonised by the submerged aquatic Oxygen Weed *Lagarosiphon illicifolius*, used for nesting by Little Grebes and Black-winged Stilts, among other waterbirds.

Extensive areas of *Acacia erioloba* woodland were inundated during the 2007 floods, but it is as yet not known whether any of these trees, which have encroached onto the lake bed during dry years, will be killed.

There were no fires in the vicinity of Lake Ngami during 2007.

Status of the avifauna

1. Globally threatened species

None of the globally threatened species at Lake Ngami are suitable as indicators of change in the IBA – most occur in low numbers. The Black-winged Pratincole, although occurring in large numbers (*e.g.* Penry and Tarboton recorded 10,000 at the lake in November, 1989) is highly variable and would not provide a stable indicator of the status of birds in the IBA.

2. Range- and biome-restricted species

No monitoring of birds in this category was undertaken during 2007. However, several species are likely to be suitable candidates for monitoring at point counts *e.g.* Burchell's Starling, Kalahari Scrub-Robin. Since thousands of Burchell's Starlings flock down to the water's edge to drink, particularly along the southern shore, this would be one of the best species to monitor – providing there is vehicular access along the southern shore, a fixed transect could be established which would give an indication of trends in numbers of this species.

Figure 4. Burchell's Starling, a suitable species for monitoring at Lake Ngami. Photo: R Rule.

A constant-effort ringing station at Lake Ngami may also be a useful method for monitoring some of these range- and biome-restricted species, and the possibility of establishing this should be investigated during 2008.

3. Congregatory waterbirds

As soon as the 2007 floodwaters reached Lake Ngami, waterbirds were quick to colonise the area. On 29th June, the following species were present in low numbers: Egyptian Goose, Red-billed Teal, Grey Heron, Saddle-billed Stork, African Sacred Ibis, Blacksmith Lapwing and Black-winged Stilt. As the lake filled, the variety and numbers of waterbirds increased.

Two waterbird counts were conducted during 2007; the first, conducted in July, aimed to count all waterbirds present, while the second, conducted during December, focussed on 'trigger' species only *i.e.* those birds which 'qualify' Lake Ngami as an IBA.

The first count was conducted by M Muller, A Flatt, R Randall and P Hancock on 29th July, a month after the lake had started filling. The count was conducted by vehicle, starting at the south-eastern end of the Lake, at S20.43897° E22.84860°, and following the lake edge along the southern side in a westerly direction, circling round the western end, still following the water's edge, then proceeding along the northern shore in an easterly direction until access to the water's edge was terminated (S20.45726° E22.77287°) by the water having flooded into the tree-line. A GPS track of the route followed was kept.

Coverage of the lake was incomplete – firstly the whole perimeter could not be traversed, and secondly from the perimeter only a small fraction of birds could be seen. A spotting scope was used to improve coverage. Table 3 shows the numbers of waterbirds counted.

Table 3. Waterbird numbers counted at Lake Ngami on 29th July, 2007

SPECIES	No.	SPECIES	No.
Grebes		Abdim's Stork	0
Little Grebe	0	Woolly-necked Stork	0
Black-necked Grebe	0	African Openbill	0
Great-crested Grebe	0	Saddle-billed Stork	0
Pelicans		Marabou Stork	54
White Pelican	0	Yellow-billed Stork	0
Pink-backed Pelican	0	**Ibises and spoonbills**	
Cormorants and darters		Sacred Ibis	38
White-breasted Cormorant	0	Glossy Ibis	17
Reed Cormorant	0	Hadeda Ibis	0
African Darter	0	African Spoonbill	0
Herons and egrets		**Flamingos**	
Grey Heron	81	Greater Flamingo	300
Black-headed Heron	25	Lesser Flamingo	0
Goliath Heron	0	**Ducks and geese**	
Purple Heron	0	White-faced Duck	458
Great Egret	29	Fulvous Duck	0
Yellow-billed Egret	20	White-backed Duck	0
Little Egret	1	Egyptian Goose	187
Black Heron	0	South African Shelduck	0
Slaty Egret	0	Yellow-billed Duck	2

SPECIES	No.	SPECIES	No.
Cattle Egret	0	African Black Duck	0
Squacco Heron	10	Cape Teal	0
Rufous-bellied Heron	0	Hottentot Teal	0
Green-backed Heron	0	Red-billed Teal	1276
Black-crowned Night Heron	0	Cape Shoveler	0
White-backed Night Heron	0	Southern Pochard	13
Little Bittern	0	African Pygmy-Goose	0
Dwarf Bittern	0	Comb Duck	31
Hamerkop	0	Spur-winged Goose	44
Storks		Maccoa Duck	0
White Stork	0	Unidentified duck	0
Black Stork	0	Other species of duck?	
Raptors		Common Sandpiper	0
African Fish-Eagle	6	Green Sandpiper	0
African Marsh-Harrier	6	Wood Sandpiper	0
Osprey	0	Marsh Sandpiper	0
Montagu's Harrier	0	Common Greenshank	18
Cranes		Curlew Sandpiper	0
Wattled Crane	0	Little Stint	0
Blue Crane	0	Sanderling	0
Grey Crowned Crane	0	Ruff	0
Crakes, moorhens, coot		African Snipe	0
African Rail	0	Black-tailed Godwit	0
African Crake	0	Curlew	0
Black Crake	0	Whimbrel	0
Striped Crake	0	Other species of wader?	
Baillon's Crake	0	Unidentified waders	0
Spotted Crake	0	Pied Avocet	0
Red-chested Flufftail	0	Black-winged Stilt	358
Purple Swamphen	0	Water Dikkop	0
Allen's Gallinule	0	**Pratincoles**	
Common Moorhen	0	Black-winged Pratincole	0
Lesser Moorhen	0	Collared Pratincole	53
Red-knobbed Coot	2	Rock Pratincole	0
Finfoot and jacanas		**Gulls and terns**	
African Finfoot	0	Grey-headed Gull	5
African Jacana	0	Caspian Tern	0
Lesser Jacana	0	Whiskered Tern	5
Waders		White-winged Tern	0
Painted Snipe	0	**African Skimmer**	0
Common Ringed Plover	0	**Kingfishers**	
White-fronted Plover	0	Giant Kingfisher	0
Chestnut-banded Plover	0	Pied Kingfisher	0
Kittlitz's Plover	8	Malachite Kingfisher	0
Three-banded Plover	0	Grey-hooded Kingfisher	0
Caspian Plover	0	Woodland Kingfisher	0
Grey Plover	0	**Wagtails**	

SPECIES	No.	SPECIES	No.
Crowned Lapwing	331	African Pied Wagtail	0
Blacksmith Lapwing	193	Cape Wagtail	0
White-crowned Lapwing	0	Yellow Wagtail	0
Wattled Lapwing	0	Any other species?	
Long-toed Lapwing	0		
Ruddy Turnstone	0	**TOTAL NO. BIRDS**	3571
Terek Sandpiper	0	**TOTAL NO. SPECIES**	28

Table 4. Numbers of 'trigger' species counted on 29th July, 2007.

Trigger species	No.	Trigger species	No.
African Skimmer	0	Great White Pelican	0
African Spoonbill	0	Hottentot Teal	0
Black-crowned Night-Heron	0	Little Grebe	0
Black-winged Pratincole	0	Little Egret	1
Black-winged Stilt	358	Marabou Stork	54
Caspian Plover	0	Red-billed Teal	1276
Collared Pratincole	53	Reed Cormorant	0
Comb Duck	31	Slaty Egret	0
Great Egret	29	Wattled Crane	0
Greater Flamingo	300	Whiskered Tern	5

Due to the high flood level of Lake Ngami, the second count could not be conducted by vehicle driving around the perimeter of the Lake, since the tracks were inundated and the water had flooded right up into the woodland. Instead four *mekoro* (traditional dugout canoes) were used – two started at the eastern end of the Lake and proceeded westwards along the northern and southern shores, until they met up with the other two which had started at the western end and proceeded eastwards along the northern and southern shores respectively. The route followed by the *mekoro* was several hundred metres from the shoreline, but within sight of it, giving greater (but still incomplete) coverage of the interior of the Lake. The results of this count, which was conducted on 4th December, 2007, cannot be compared directly with those of the July count due to the differences in the methodology. The counters were M Muller, M Reed, B Reed and G Reed.

Table 5. Numbers of 'trigger' species counted on 4th December, 2007.

Trigger species	No.	Trigger species	No.
African Skimmer	0	Great White Pelican	557
African Spoonbill	35	Hottentot Teal	146
Black-crowned Night-Heron	87	Little Grebe	184
Black-winged Pratincole	7	Little Egret	621
Black-winged Stilt	1163	Marabou Stork	5
Caspian Plover	0	Red-billed Teal	6669
Collared Pratincole	0	Reed Cormorant	1284
Comb Duck	34	Slaty Egret	3
Great Egret	701	Wattled Crane	0
Greater Flamingo	1067	Whiskered Tern	1017

The numbers of birds shown above are unfortunately not directly comparable with the counts conducted during previous years due to differences in methodology. However, some species

counts *e.g.* Red-billed Teal, Whiskered Tern, Greater Flamingo, Great Egret and Reed Cormorant are among the highest recorded in recent years.

Figure 5. The large numbers of some species such as Reed Cormorants were difficult to count

Other species were conspicuously fewer *e.g.* Marabou Stork, Collared Pratincole, Caspian Plover - in the case of the former, probably due to the fact that the birds are highly nomadic and opportunistic, while in the case of the pratincoles and Caspian Plover, they are not successfully counted by the method used which does not include their habitat. For a robust, usable indicator of bird numbers at Lake Ngami, it is proposed that a suite of 'resident' waterbirds be used in combination to give one index – species to be included are Reed Cormorant, Black-crowned Night-Heron, Great Egret, Little Egret, Black-winged Stilt, Comb Duck, Hottentot Teal, Red-billed Teal, Great White Pelican and Whiskered Tern. This should cater for individual variation in species numbers when the counts are conducted. During 2008, priority should be given to establishing a standardised methodology for monitoring birds at Lake Ngami.

Conclusion to Part 1

The following generalisations may guide future monitoring in this IBA:

- At present, the globally threatened birds occurring at Lake Ngami are not suitable indicators for measuring changes in bird status in the IBAa.
- Range- and biome-restricted species offer some potential for future monitoring, and this should be investigated and implemented during 2008.
- Congregatory waterbirds offer the best option for monitoring at present; however, the methodology needs to be refined and standardised.

In conclusion, during 2007, there were healthy populations of waterbirds at Lake Ngami, due largely to the good flood which created a sizeable area of suitable, productive habitat.

PART 2 – PRESSURES ON THE ENVIRONMENT

When "Important Bird Areas of Botswana" was compiled by Tyler and Bishop (1998), Lake Ngami was dry, with no known prospect of it filling again. Consequently, the threats to the area were largely speculative, but the following issues are partially or wholly true:

- "Overhunting may be contributing to the general decline in the large game and the terrestrial game birds such as sandgrouse *Pterocles* spp. There is no bag limit or closed season during the sensitive breeding season."
- "During times of flooding, and when waterbirds are nesting, disturbance from livestock and people, and removal of eggs for food cause serious losses."

Hunting of gamebirds generally remains a threat to the avifauna of the IBA – probably the highest ranking threat. This extends even to species that are not hunted – for example, in 2004, a suitable island existed for Great White Pelicans to breed on, and many birds were seen in breeding plumage, but due to disturbance from hunting, the area was abandoned and the birds never bred. Hunting of waterfowl during the same year, from July to September (the legal hunting season) was at a time that many ducks were breeding (see nest records from K Oake in the BirdLife Botswana Nest Record Scheme) and this practice is unsustainable. Hunting of birds, and associated disturbance, is currently the most serious threat to the avifauna of Lake Ngami.

The issue of disturbance from livestock is debateable. Cattle possibly trample some nests, especially those of Collared Pratincoles; this species breeds on the short grasslands adjacent to the water, and birds can be seen performing their distraction displays as grazing cattle approach their nests. However, the vegetation along the lake edges is kept short by the livestock grazing pressure, and maintained as suitable habitat for both Collared and Black-winged Pratincoles – the latter is a globally threatened species, and the International Single Species Action Plan for the Conservation of the Black-winged Pratincole (AEWA, 2004) highlights the importance of cattle grazing in maintaining suitable habitat for this species. This threat is much less important than hunting.

A third potential threat may be the proliferation of noxious weeds at the lake, specifically *Xanthium strumarium* and *Datura innoxia*. From the point of view of the avifauna, these plants have both positive and negative implications – for example, they have spread at the expense of indigenous vegetation, but do form a protective barrier around the lake restricting human access. Also, Grey Herons and Reed Cormorants have been recorded building their nests on the dry stems of *X. strumarium*. It is possible that these plants may disappear as natural plant succession progresses, particularly if the lake continues to fill – it is important to monitor the distribution and extent of these plants.

Figure 6. Dense stands of *Xanthium* make access to parts of the lake difficult.

PART 3 – RESPONSE – CONSERVATION ACTIONS TAKEN FOR THE ENVIRONMENT

In 2004, when Lake Ngami first filled after a long hiatus, the influx of waterfowl attracted quite a lot of local hunters since the hunting season was still open. These hunters were unaware of, or disregarded, the fact that many of the waterbirds commenced breeding shortly after arriving at the lake, and hunting was conducted regularly – an action that BirdLife Botswana regarded as unsustainable. Consequently BirdLife Botswana and other concerned parties, including the Dept. of Wildlife and National Parks, were involved in getting the Minister of Environment, Wildlife and Tourism to gazette the lake as a 'no hunting area', which was done during November 2004. Unfortunately this gazettement was valid for only one year, and expired in November 2005; it has not been renewed or extended.

Rather, BirdLife Botswana has been working towards a longer term solution to the issue of hunting and its associated disturbance. The local community from the surrounding villages of Bothatogo, Sehithwa and Legothwana has been mobilised to form a Site Support Group, and assisted to register a Community-based Organisation – the Bosele Lake Ngami Conservation Trust. This Trust has as one of its objectives the conservation and sustainable utilization of resources found in and around Lake Ngami, including the avifauna. The Trust is currently in the process of getting Controlled Hunting Area NG 38 (the boundaries of which coincide exactly with those of the IBA) gazetted as a Community Photographic Area *i.e.* an area over which the Trust will have jurisdiction, but where hunting will not be permitted. The members of the Trust are interested in promoting avi-tourism as a means of conserving the biodiversity of the area and improving livelihoods; BirdLife Botswana has trained some of the members as specialist bird guides, and continues to assist with marketing of the area and building local capacity through the BirdLife/SwedBio project. This is a positive step towards securing the IBA and its avifauna.

The Bosele Lake Ngami Conservation Trust has the potential to address current and future issues related to the conservation of the IBA; BirdLife Botswana will continue to support the Trust until it is self-sustaining.

REFERENCES

AEWA. 2004. International Single Species Action Plan for the Conservation of the Black-winged Pratincole *Glareola nordmanni*. African-Eurasian Waterbird Agreement Technical Series No. 4. 41 pp.

BREWSTER, CA, HANCOCK, P, MULLER, M, REED, G, TYLER, SJ and TYLER, L. 2002. Waterbirds at Lake Ngami in September 2001 – January, 2002. Babbler 40: 37-40.

BREWSTER, CA. 2005. A Survey of the Waterbirds at Lake Ngami in December, 2004. Babbler 46: 25 – 31.

HANCOCK, P, OAKE, K, TYLER, SJ and BREWSTER, C. 2005. Monitoring waterbirds at Lake Ngami. June, 2004 to January, 2005.

NDJARAKANA, P. Personal communication. Lake Ngami Conservation Trust, PO Box 100, Sehithwa. Cell: 71335575.

PENRY, EH and TARBOTON, W. 1990. Redwinged Pratincoles breeding at Lake Ngami. Babbler 19: 7-11.

TYLER, SJ AND BISHOP, DR. 1998. Important Bird Areas of Botswana. In: The Important Bird Areas of southern Africa. Barnes, KN (ed.) pp. 333-354. BirdLife South Africa, Johannesburg.

TYLER, L and TYLER, SJ. 2001. Lake Ngami holds water briefly. Babbler 38: 12.

WOLSKI, P AND MURRAY-HUDSON, M. 2006. Recent changes in flooding in the Xudum distributary of the Okavango Delta and Lake Ngami, Botswana. South African Journal of Science 102: 173 – 176.

APPENDIX 1 – NOTES ON OTHER BIRD SPECIES OF THE LAKE NGAMI IBA

This section contains noteworthy information on a range of birds found in the Lake Ngami IBA, particularly observations of new or rare species, and nesting birds. The information is not restricted to waterbirds.

Little Grebe

This is one of the trigger species for the lake and occurs in large numbers and breeds prolifically. The following are the nesting observations made during 2007:

Date	No. w. 1 egg	No. w. 2 eggs	No. w. 3 eggs	No. w. 4 eggs	No. w. 5 eggs
23/9/07	2	1	1	1	1
28/10/07	1	1	2	1	
15/12/07	1			1	

Reed Cormorant

A small Reed Cormorant breeding colony was found on 8/10/07 in flooded Acacias on the south-eastern side of the lake, together with a few Grey Heron nests. African Spoonbills and Sacred Ibis were also seen around this colony, but by the beginning of October were not nesting here.

African Darter

On 8/10/07, a breeding colony of 32 African Darter pairs was found in flooded Acacias at the eastern end of the lake. There were a number of African Sacred Ibis nests at the same site.

Grey Heron

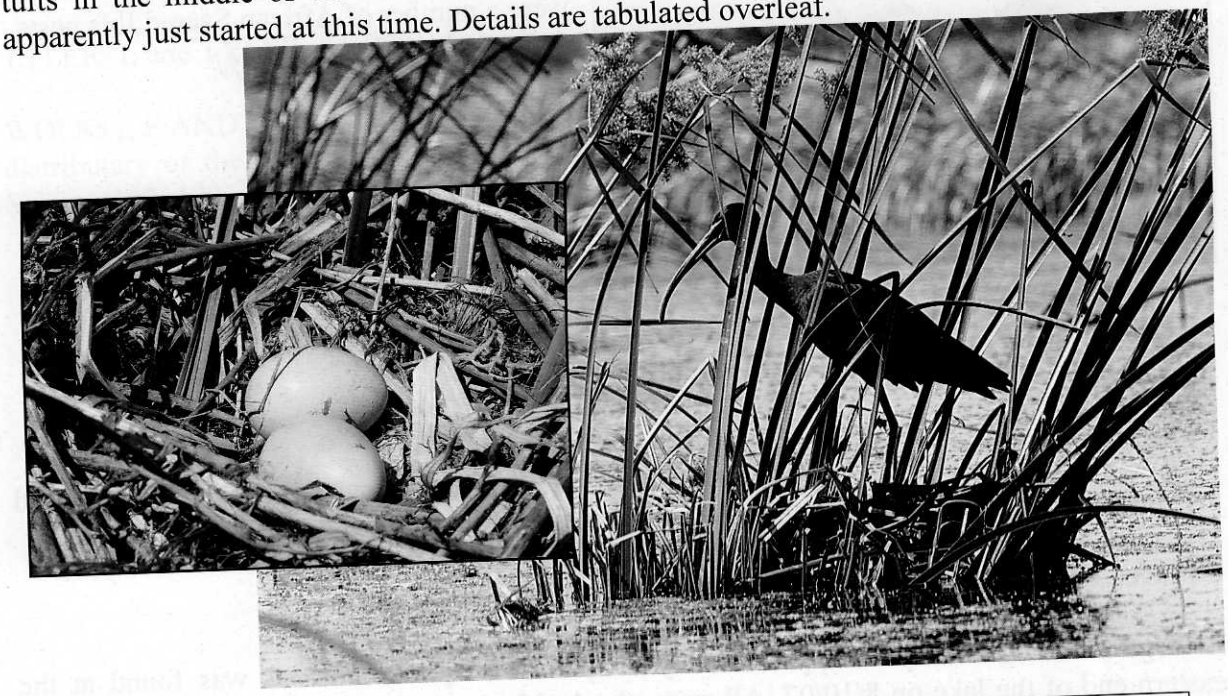
A few Grey Heron nests were found (one with one egg) together with several Reed Cormorant nests, on 8/10/07, on the south-eastern side of the lake.

Squacco Heron

A large breeding colony of approximately 75 pairs of Squacco Herons was found at the eastern end of the lake on 8/10/07. All nests checked had eggs, most with clutches of two or three eggs. The colony was located in Acacias standing in shallow water. When revisited on 27/10/07, most of the nests were deserted – there were only five birds still incubating, and one with three chicks (see photograph).

Glossy Ibis

This species is common at the lake and there was a colony in flooded Acacias at the eastern end of the lake during 2004. During 2007, a colony was found on 28th October in *Pycreus* tufts in the middle of the lake. These nests were just above water level, and laying had apparently just started at this time. Details are tabulated overleaf.



Date	No. w. 1 egg	No. w. 2 eggs	No. w. 3 eggs	No. w. 4 eggs	No. w. 5 eggs
28/10/07	5	7	3	0	1

Glossy Ibis

This species is common at the lake and there was a colony in flooded Acacias at the eastern end of the lake during 2004. During 2007, a colony was found on 28th October in *Pycreus* tufts in the middle of the lake. These nests were just above water level, and laying had apparently just started at this time. Details are tabulated overleaf.

Date	No. w. 1 egg	No. w. 2 eggs	No. w. 3 eggs	No. w. 4 eggs	No. w. 5 eggs
28/10/07	5	7	3	0	1

Hadeda Ibis

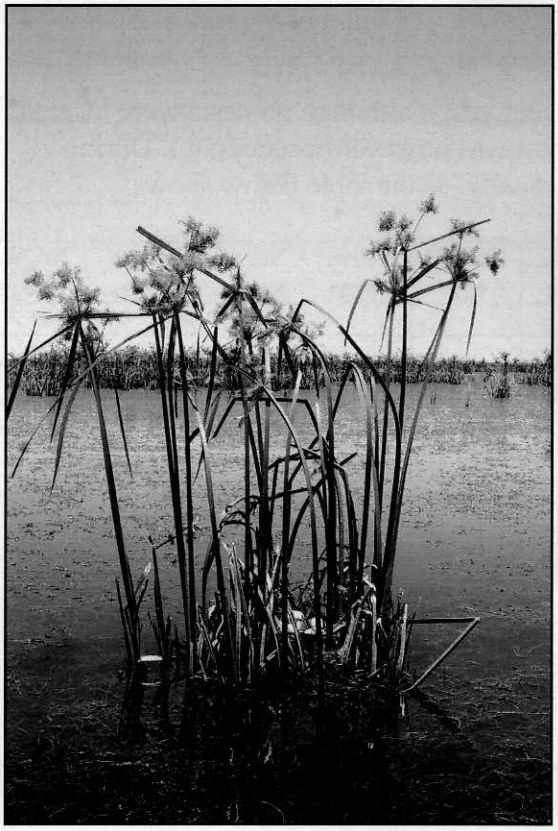
Since the lake filled in recent years, this species has not been present until October this year when four individuals were noted.

African Sacred Ibis

On 8/10/07, a few pairs of African Sacred Ibises were seen nesting in dead Acacias together with African Darters at the eastern end of the lake.

Fulvous Duck

This species has bred at Lake Ngami every year since it flooded in 2004, in different habitats as the vegetation at the lake has changed. In the first year, it bred in rank *Cynodon dactylon* at the base of small, flooded Acacias, but subsequently used floating mats of *Panicum repens*.



With the proliferation of *Pycreus nitidus*, it has used these clumps for nesting. Large clutches are laid *e.g.* 20 eggs on 15/12/07.

Date	No. w. 1 egg	No. w. 5 eggs	No. w. 9 eggs	No. w. 10 eggs	No. w. 12 eggs	No. w. 20 eggs
5/1/07				1		
20/1/07					1	
11/11/07			1			
18/11/07		1				
2/12/07	1					
15/12/07						1

White-backed Duck

Photo: A Froneman

This species has been common at Lake Ngami in recent years, although no nests were located until 2006 when K Oake found a single nest – this nest was however unsuccessful. During 2007 however, White-backed Ducks have bred prolifically, as the table below shows:

Date	No. w. 1 egg	No. w. 2 eggs	No. w. 3 eggs	No. w. 4 eggs	No. w. 5 eggs	No. w. 6 eggs	No. w. 7 eggs	No. w. 8 eggs	No. w. 9 eggs	No. w. 10 eggs
29/9/07	1				1					
7/10/07					1					
8/10/07					1					
13/10/07									1	
27/10/07					1	1				
28/10/07			1		1	3	1	1	1	
4/11/07						1				
11/11/07		1		2	1	2	1			
18/11/07	1		1	1						
25/11/07				1*		1			1**	
15/12/07	2	3		1			1			1

* Three ducklings and 1 egg in nest

** Three ducklings and six eggs

White-backed Duck

Photo: A Froneman

This species has been common at Lake Ngami in recent years, although no nests were located until 2006 when K Oake found a single nest – this nest was however unsuccessful. During 2007 however, White-backed Ducks have bred prolifically, as the table below shows:

Date	No. w. 1 egg	No. w. 2 eggs	No. w. 3 eggs	No. w. 4 eggs	No. w. 5 eggs	No. w. 6 eggs	No. w. 7 eggs	No. w. 8 eggs	No. w. 9 eggs	No. w. 10 eggs
29/9/07	1				1					
7/10/07					1					
8/10/07					1					
13/10/07									1	
27/10/07					1	1				
28/10/07			1		1	3	1	1	1	
4/11/07						1				
11/11/07		1		2	1	2	1			
18/11/07	1		1	1						
25/11/07				1*		1			1**	
15/12/07	2	3		1			1			1

* Three ducklings and 1 egg in nest

** Three ducklings and six eggs

Almost all of these nests were built in tufts of *Pycreus* sedge, and many were lined with Oxygen weed.

Western Marsh-Harrier

There were two independent sightings of this species early in 2007; on 7th January, Rob de Rover and Tisha Greyling observed a single bird, and Andre Bernon reported one on 11th January (possibly the same bird?).

Common Quail

A few individuals of this species were seen and photographed at Lake Ngami by M Muller during July, 2007.

African Purple Swamphen

Several nests thought to belong to this species were found during November, but this requires confirmation.

Allen's Gallinule

Several nests thought to belong to this species were found during September and October, but the birds were not seen, so this requires confirmation.

Common Moorhen

This is a common breeding species at the lake. During 2007, many nests were found in clumps of *Pycreus* sedge, as follows:

Date	No. w. 1 egg	No. w. 2 eggs	No. w. 3 eggs	No. w. 4 eggs	No. w. 5 eggs	No. w. 6 eggs	No. w. 7 eggs
2/9/07					1		
23/9/07							1
29/9/07					1		
7/10/07	1						
8/10/07		1			1		
27/10/07				1	2		
28/10/07	2			1	1		
15/12/07		1				2	

Moorhen chicks were seen during late October although other individuals were still laying at this time.

Red-knobbed Coot

Red-knobbed Coots have regularly bred at Lake Ngami over the past few years. Their large, floating nests are quite conspicuous; however this year many were made on trampled down *Pycreus* tufts. The details of nests recorded during 2007 are shown overleaf:

Date	No. w. 1 egg	No. w. 2 eggs	No. w. 3 eggs	No. w. 4 eggs	No. w. 5 eggs	No. w. 6 eggs	No. w. 7 eggs
29/9/07	1				1		1
27/10/07				1	1	1	
28/10/07						1	
15/12/07	1			1			

African Jacana

With the continuing spread of *Nymphaea* waterlilies, this species has increased and during 2007, birds were seen breeding at the lake. Only two nests were recorded, each with four eggs on 29/9/07, but there were probably many more.

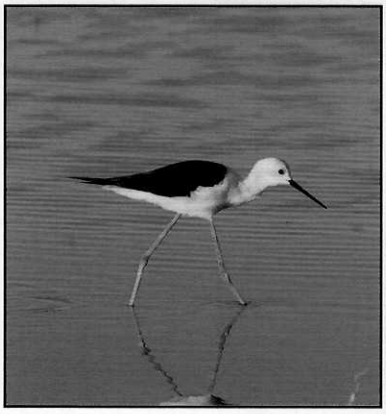
Kittlitz's Plover

This species is abundant along the muddy shoreline where it breeds in large numbers. However, only one nest was recorded during 2007, with two eggs, on 23/9/07.

Black-tailed Godwit

Andre Bernon saw at least 10 Black-tailed Godwits at the Lake on 11th January.

Black-winged Stilt



Black-winged Stilt and nest.
Photo (left): G Reed

The shallow margins of the lake are very suitable for feeding and nesting by this species. The following breeding information was collected:

Date	No. w. 1 egg	No. w. 2 eggs	No. w. 3 eggs	No. w. 4 eggs
23/8/07	2	3	1	1
15/12/07		1	3	

Burchell's Courser

Three individuals of this species were seen at the western end of the lake by M Muller, R Randall, A Flatt and P Hancock during July, 2007 – they were photographed by M Muller.

Collared Pratincole

During early November, four nests were found each with one egg. By late November, the site was deserted, so it is not clear whether breeding was successful.

Lesser Black-backed Gull

Andre Bernon reported a single bird at the Lake on 11th January.

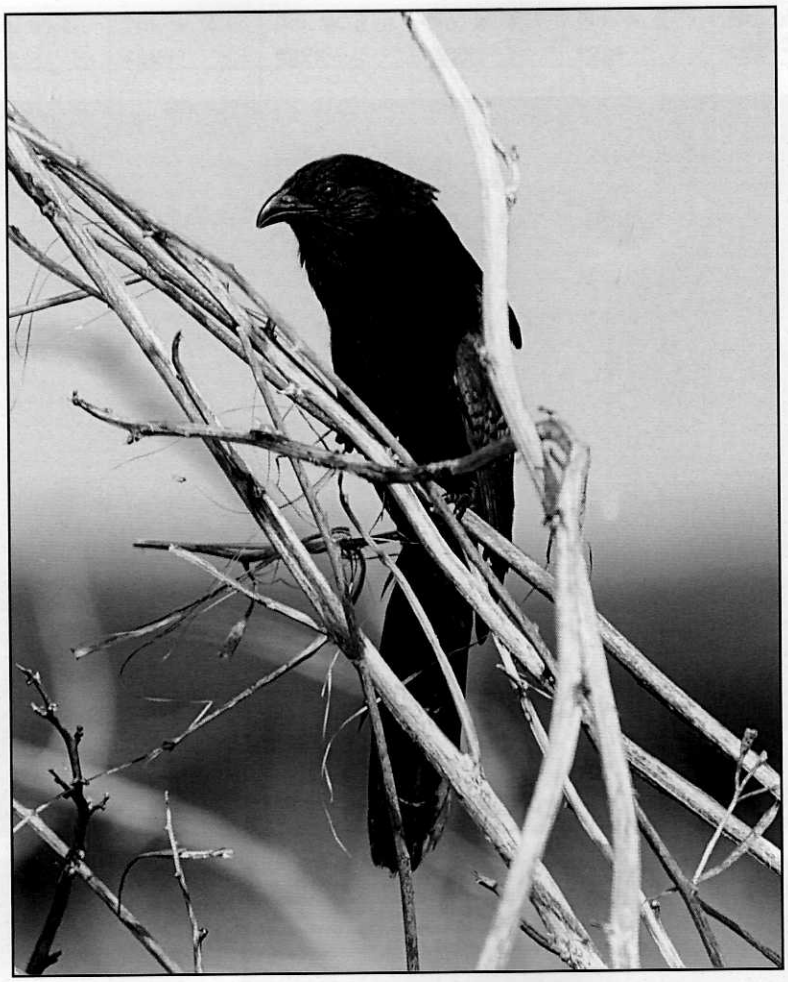
Whiskered Tern

This is one of the trigger species for the lake, and breeds prolifically on floating islands of *Ludwigia stolonifera* – below are some of the breeding observations made during 2007:

Date	No. w. 1 egg	No. w. 2 eggs	No. w. 3 eggs	No. w. 1 chick
28/10/07	4	4	3	1

Black Coucal

This bird has not been recorded at Lake Ngami in the past – the first sighting, of two birds, was made by K and M Oake during January, 2007, when the photo overleaf was taken.



MAKGADIKGADI PANS IMPORTANT BIRD AREA

MONITORING REPORT 2007

BIRDLIFE BOTSWANA

MAKGADIKGADI PANS IMPORTANT BIRD AREA

MONITORING REPORT 2007

by G McCulloch, P Hancock and B Bridges

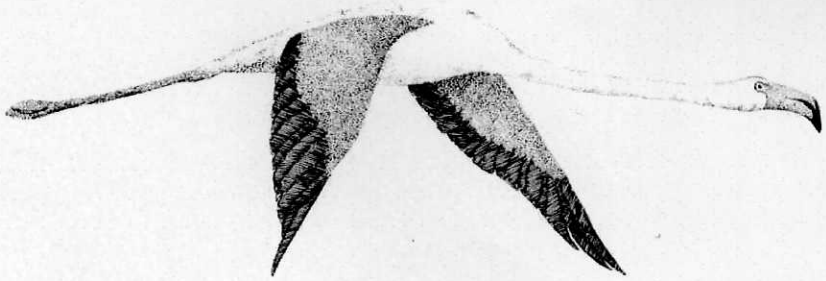
INTRODUCTION

As part of Birdlife Botswana's commitment to maintaining a network of sites that are critical for birds both nationally and internationally, the Makgadikgadi Pans Important Bird Area (IBA) is monitored annually following BirdLife's global monitoring framework. This framework is based on the State – Pressure – Response model that has been adopted by the Convention on Biological Diversity (CBD), and this report is divided into three parts paralleling these components. Part 1 deals with the state of the Makgadikgadi Pans IBA, with particular emphasis on the 'trigger' species of birds that 'qualify' the area as an IBA. Part 2 focuses on pressures or threats to the IBA - these were originally identified by Tyler and Bishop (1998), but some of these have been superceded and a current set of issues has been identified through fieldwork. These threats need to be ranked so that they can be incorporated into the global monitoring framework. Part 3 of the report describes the conservation actions undertaken in response to the identified threats. These actions are a measure of progress made towards addressing or mitigating the threats. The actions also need to be objectively ranked for incorporation in the framework.

Appendices contain additional information on the birds of the Makgadikgadi Pans IBA.

ACKNOWLEDGEMENTS

Special thanks to M Ntsosa from the Department of Meteorological Services for providing rainfall data for Sua Pan at short notice.



OBJECTIVE

The objective of this project was to gather quantitative data for the ongoing monitoring of the Makgadikgadi Pans IBA, to determine if there were any negative anthropogenic changes impacting on the area generally, and its avifauna in particular.

THE GLOBAL MONITORING FRAMEWORK

The global monitoring framework requires that data are collected on environmental parameters that could influence bird numbers, to provide a context for the monitoring of the 'trigger' species, and then the trigger species are monitored in an objective way to determine their trends. The trigger species for the Makgadikgadi Pans IBA are shown in Table 1 below:

Table 1. Trigger species for the Makgadikgadi Pans IBA (Tyler and Bishop, 1998)

1. <u>Globally Threatened Species</u> • Cape Vulture. • Lesser Kestrel • Wattled Crane. • Pallid Harrier. • Lesser Flamingo • Black-winged Pratincole. Additional species • Lappet-faced Vulture. • White-backed Vulture. • Chestnut-banded Plover
2. <u>Range- and Biome-restricted species</u> • Burchell's Sandgrouse. • Bradfield's Hornbill. • Hartlaub's Babbler. • Kurrichane Thrush. • Arnot's Chat. • White-throated Robin-Chat. • Kalahari Scrub-Robin. • Barred Wren-Warbler. • Stierling's Wren-Warbler. • Burchell's Starling • Meves's Starling. • White-bellied Sunbird.

3. Congregatory waterbirds

- Great White Pelican
- African Spoonbill
- Greater Flamingo
- Kittlitz's Plover

PART 1 – STATE OF THE MAKGADIKGADI PANS IBA

Environmental setting

Background

At present, the boundaries of the IBA have not been precisely defined, but the area includes the whole of Ntwetwe and Sua Pans (including Nata Sanctuary), as well as the Makgadikgadi Pans National Park *i.e.* it extends westwards to include the Boteti River which may be regarded as part of the Okavango system. Other than the two protected areas mentioned above, the bulk of the IBA is communal grazing land which is subdivided into Controlled Hunting Areas (CHAs) by the Department of Wildlife and National Parks, for administrative purposes. The Gaing-o Community Trust operates a tourist campsite at Lekhubu Island, but this is the only Community-based Organisation in the IBA, and they do not lease a whole CHA. Several veterinary fences, such as the recently constructed fence around the Makgadikgadi Pans National Park, also subdivide the IBA into arbitrary units as far as the avifauna is concerned. The area is shown in the satellite image in Figure 1.

Figure 1. Satellite image showing the extent of the Makgadikgadi Pans.

The area includes the seasonally inundated salt pans surrounded by grasslands, low tree and bush savanna and Mophane woodlands. Sua Pan is fed by five seasonal rivers, the main one being the Nata River which enters the pan from the north-east; its delta in the Nata Sanctuary rarely dries out completely and is therefore particularly important for waterfowl. Ntwetwe Pan, and the southern part of Sua Pan fill with rainwater when rainfall is good. Rainfall is one of the principal determinants of the system, particularly for the suite of waterbirds that are trigger species for this IBA.

Rainfall and hydrology

Rainfall figures for the Makgadikgadi area are shown in Figure 2; they are from the nearest meteorological station, at Sua Pan. They show that the long-term average is approximately 399mm annually, and that in 2004, 2005 and 2006 rainfall was just above average. Sua Pan was dry during 2004 but flooded to a significant extent in 2005; water levels were maintained during 2006, but gradually dried out during 2007. This is important for waterbirds; if Sua Pan dries out while flamingos or pelicans are still breeding, this can result in total breeding failure. It is thus important when interpreting the results of monitoring, to separate changes in bird numbers due to environmental factors, from those as a result of human impact. Ntwetwe Pan is far more fragmented than Sua, and level of flooding here is not as important as in Sua Pan since it is not a critical habitat for the trigger species.

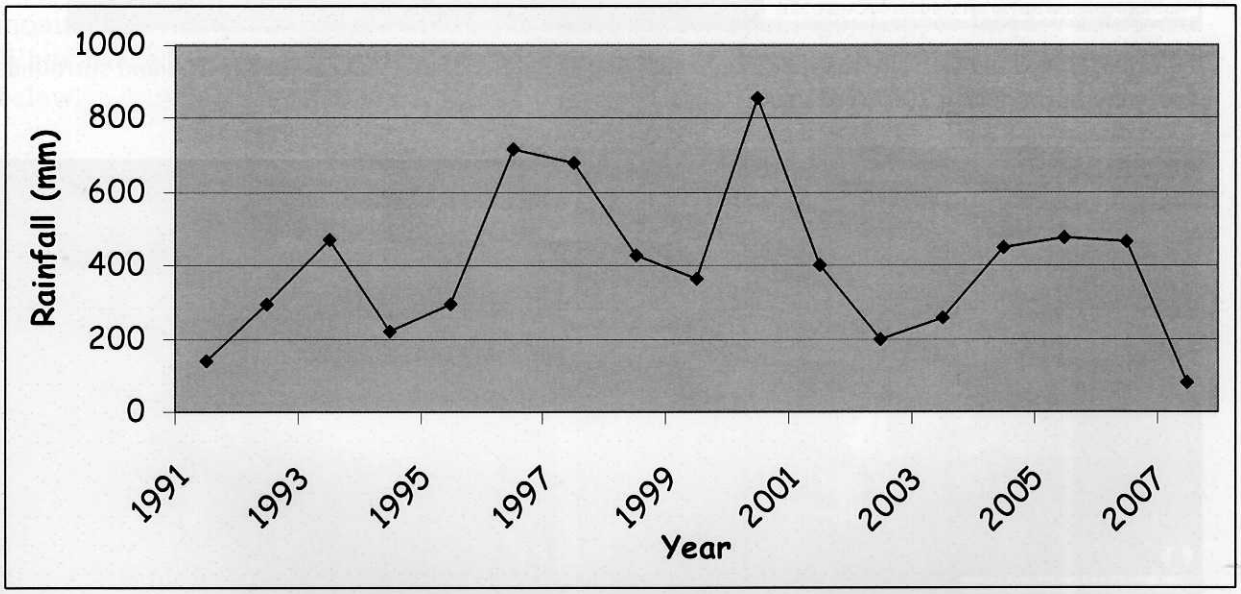


Figure 2. Annual rainfall at Sua Pan from 1991 to the present.

Fire

The distribution and extent of fires during 2007 is shown in Figure 3 overleaf – from the Web Fire Mapper for Botswana (http://maps.geog.umd.edu/activefire_html/checkboxes/botswana_checkbox.html)

For comparative purposes, the extent of fires during 2005 and 2006 is shown in Figure 4.

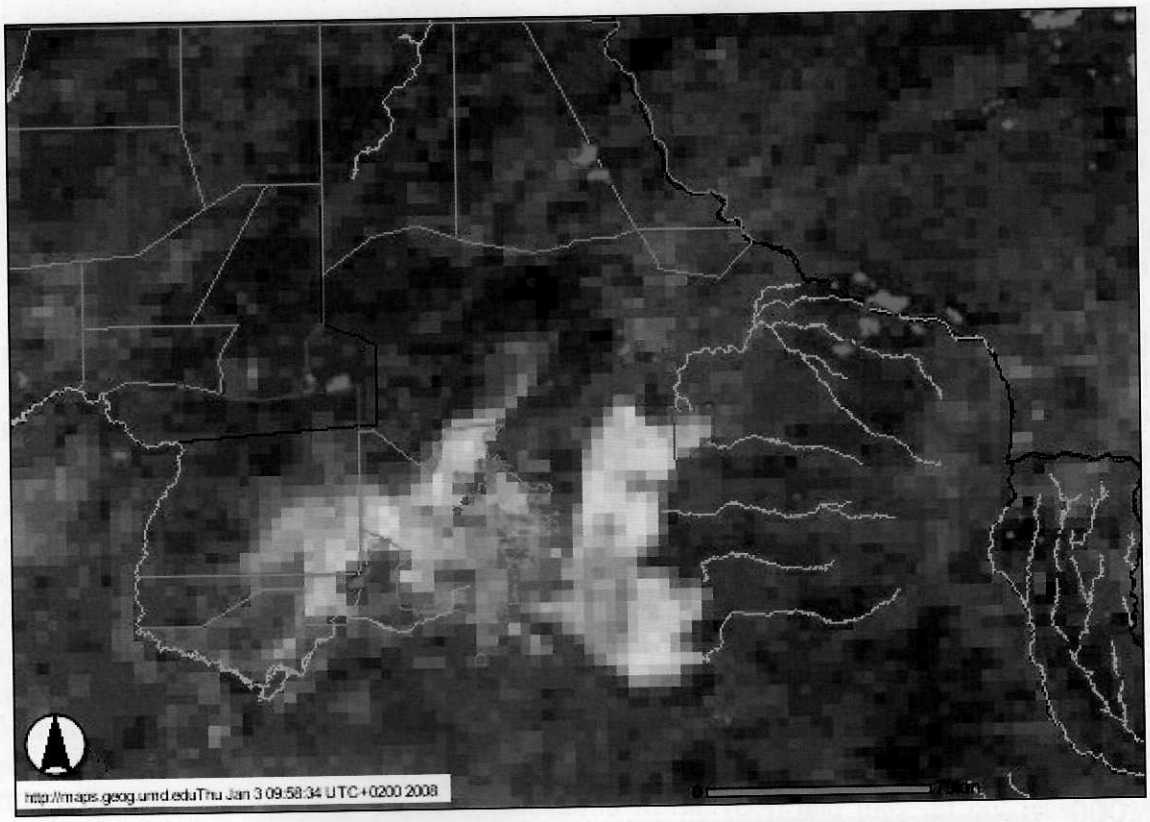


Figure 3. Botswana web fire mapper image showing the areas of the Makgadikgadi IBA and surrounds that were burnt during 2007 (red dots).

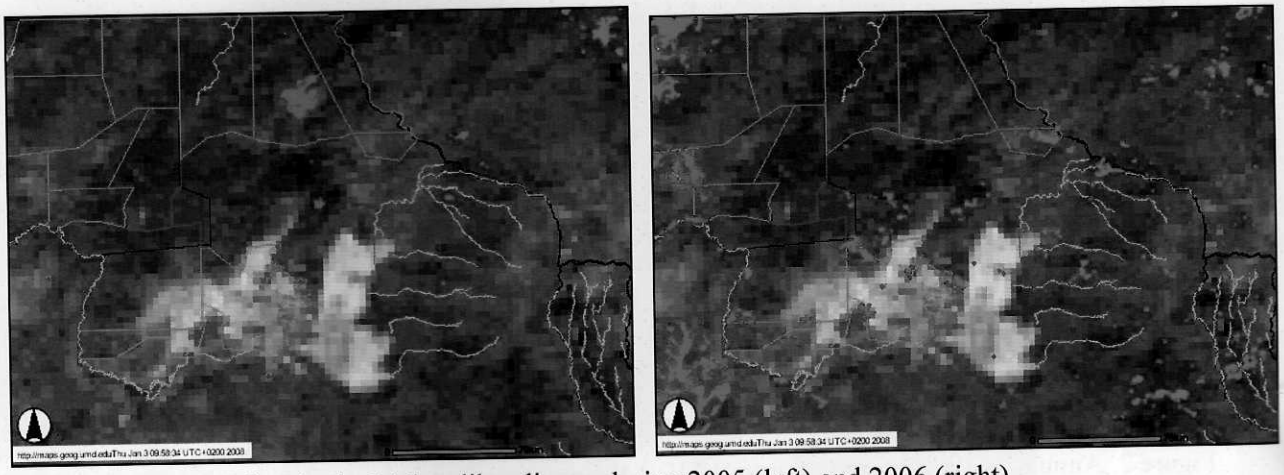


Figure 4. Extent of fires in the Makgadikgadi area during 2005 (left) and 2006 (right)

There were relatively few wildfires during 2005 and 2007, but in some years, uncontrolled fires burn extensive areas of grassland in the western part of the IBA. This happened for example, in 2001 (see Figure 5 overleaf).

These fires occur predominantly during the dry winter months. It is possible that they destroy the *Acacia mellifera* and *Terminalia prunioides* shrubs that are used by Lappet-faced Vultures for nesting, or disrupt breeding since they coincide with the peak raptor breeding season; this aspect requires further monitoring in the future.

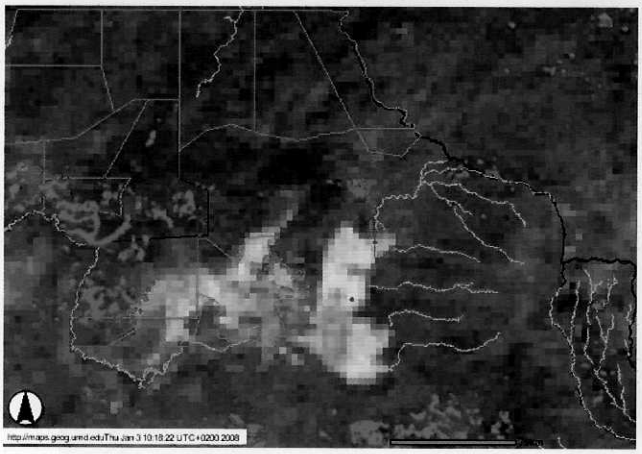


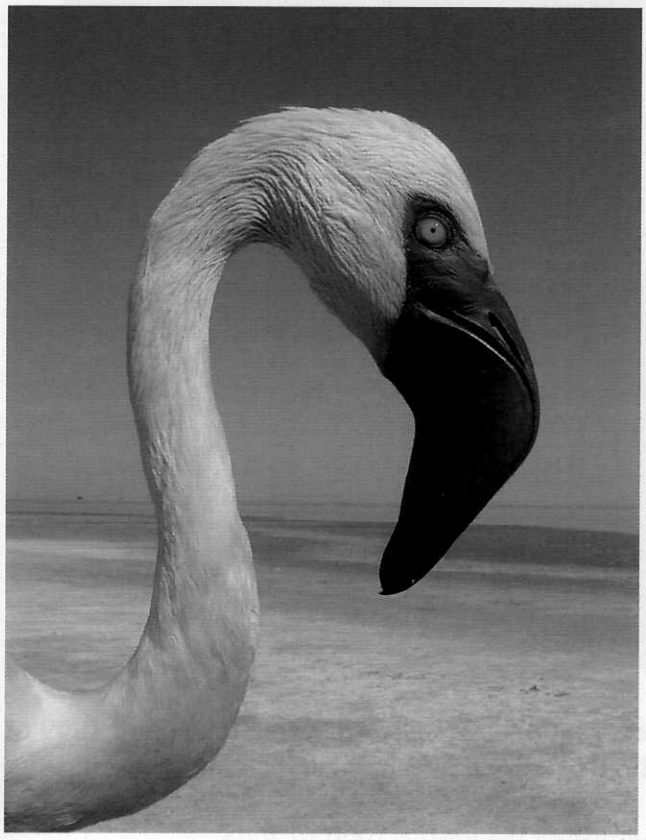
Figure 5. Extent of fires in the western part of the IBA during 2001.

Status of the Avifauna

1. Globally threatened species

Not all globally threatened species found in the Makgadikgadi Pans IBA are suitable for monitoring - the primary species monitored are Lesser Flamingo, Lappet-faced Vulture and White-backed Vulture. Different methods are used to monitor these species, as described below:

Lesser Flamingo



Lesser Flamingos are the flagship species for the Makgadikgadi Pans IBA. Large numbers converge on the Pans after good rains, and breed in the southern basin of Sua Pan (see McCulloch, 2003; McCulloch and Irvine, 2004; McCulloch, 2005). This area, currently unprotected, is one of only four sites where this species breeds in Africa – it is the most important site in Southern Africa, since Etosha Pan in Namibia seldom has water nowadays.

The total number of birds, and the number of breeding birds are counted from photos taken from the air at intervals during the year – although tedious, the birds are relatively easily counted from high resolution photos such as that shown in Figure 6 overleaf.

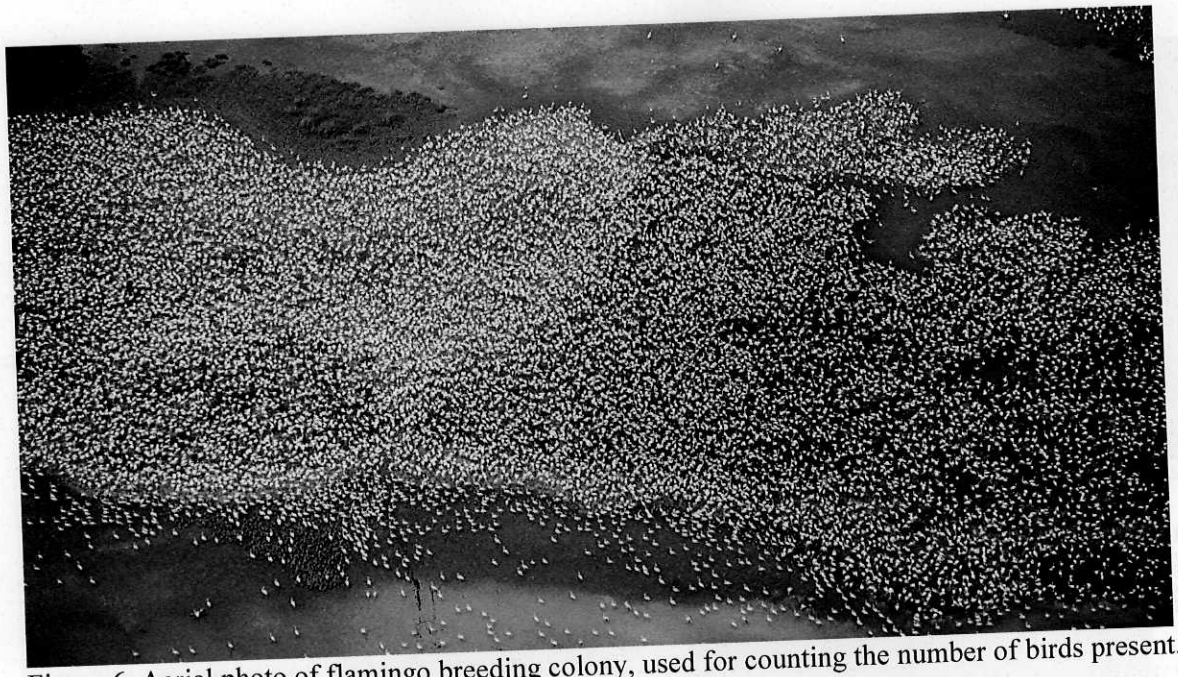


Figure 6. Aerial photo of flamingo breeding colony, used for counting the number of birds present.

The chicks leave the nests while still flightless, and form up into large crèches that are visible from the air, as shown in Figure 7 below.

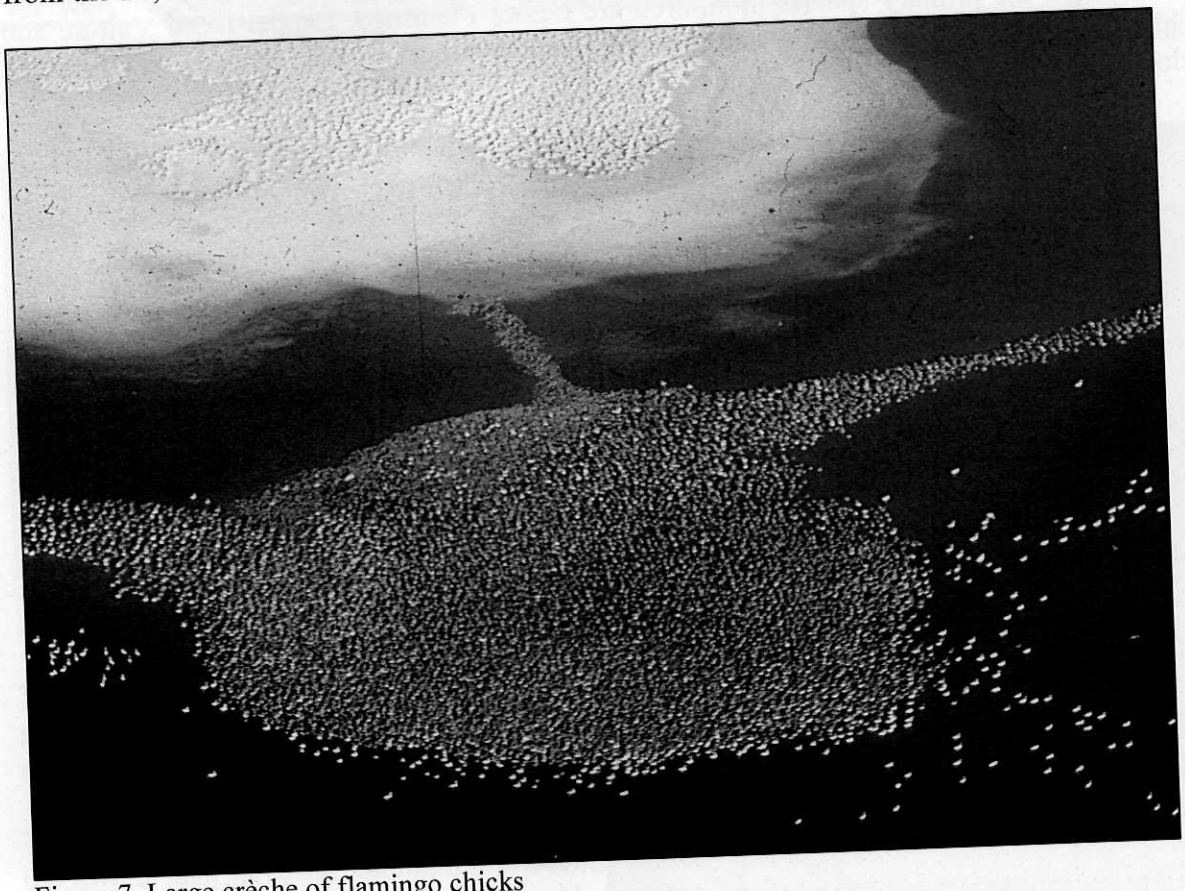


Figure 7. Large crèche of flamingo chicks

Table 2 overleaf shows the numbers of Lesser Flamingos at Sua Pan during the period 1999 to 2006. Table 3 shows the number of breeding pairs and the number of chicks, during the period 1999 to 2007.

Table 2. Lesser Flamingo numbers at Sua Pan during the period 1999 to 2004.

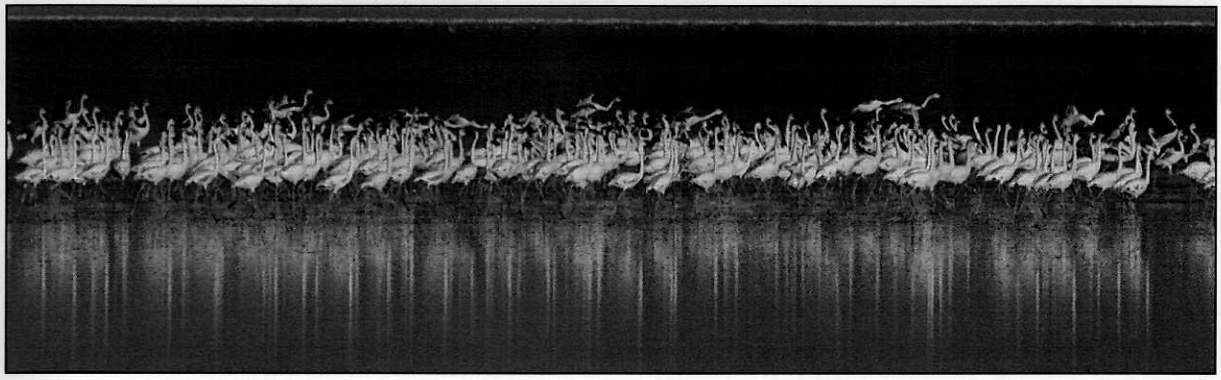
Year	Numbers
1999/2000 wet season	19,700 – 149,300 (4 counts)
2000/2001 wet season	157,600 (1 count)
2001/2002 wet season	No data available
2002/2003 wet season	No data available
2003/2004 wet season	85,444 (1 count)

Table 3. Number of breeding pairs of Lesser Flamingos, and number of chicks, at Sua Pan.

Year	Numbers
1999/2000 wet season	64,300 pairs bred (6 counts) 30,600 chicks fledged
2000/2001 wet season	19,340 pairs bred (2 counts) +/-3,000 chicks fledged
2001/2002 wet season	Dry – no young raised
2002/2003 wet season	Dry – no young raised
2003/2004 wet season	5,210 pairs bred, no young survived
2004/2005 wet season	34,990 pairs bred. High success.
2005/2006 wet season	90,690
2006/2007 wet season	25,000 pairs bred, no young survived

Large numbers of Lesser Flamingos were present at Sua Pan during 2007. This is probably the result of ideal conditions prevailing at Sua at the time, coupled with less favourable conditions elsewhere in the sub-region, since Lesser Flamingos are highly nomadic and move readily to optimal feeding areas.

The Lesser Flamingos commenced breeding early in the year – on 13th January, 25,000 pairs had occupied the main flamingo breeding area in the central south basin of Sua Pan. However, a severe lack of rainfall during the months of January and February rendered the south basin extremely hot and dry, and left the colony exposed to predation by vultures and eagles. As many as 44 Lappet-faced Vultures visited the colonies on a daily basis and systematically devoured flamingo eggs and small chicks, causing complete desertion of the colonies by the end of February. Some few thousand chicks remained close to the abandoned colonies, during an aerial survey on the 7th of March. These were progressively predated upon by vultures and eagles and disappeared by the beginning of May. This however, is due entirely to natural factors, and should not be construed as the result of any anthropogenic threat.



Lappet-faced Vulture

Photo: J Liversedge

Based on current knowledge, this IBA is the most important breeding area in Botswana for the Lappet-faced Vulture, with several nests around Sua Pan, and numerous nests around Ntwetwe Pan and in the Makgadikgadi Pans National Park.

Lappet-faced Vulture monitoring commenced during 2006, with 50 nests being located from the air using two light survey aircraft (an AirCam and a Gyrocopter), piloted by M Muller and B Bridges, who funded and conducted the survey.

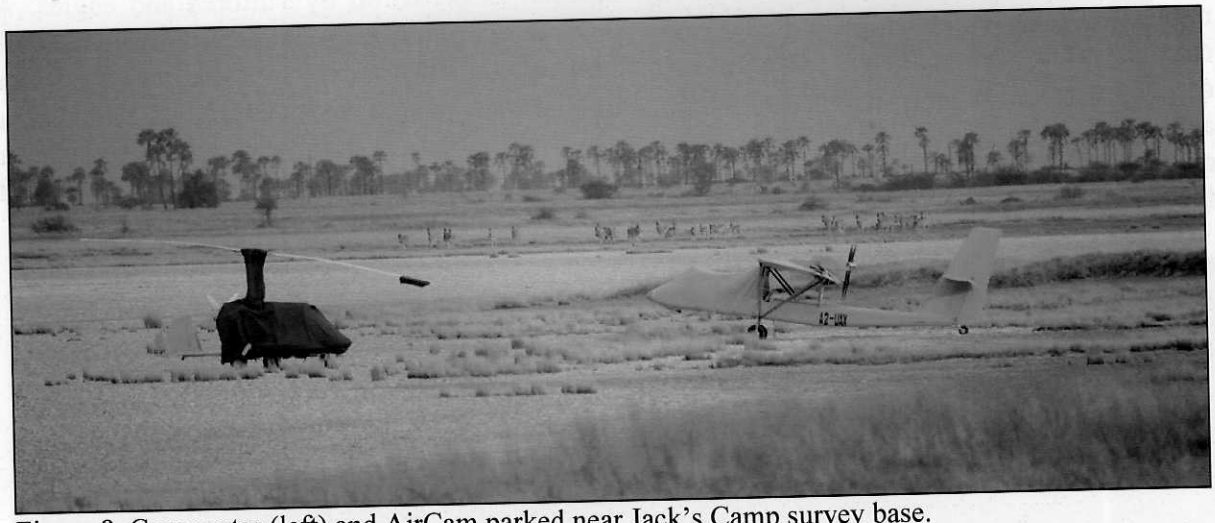


Photo: M Muller

Figure 8. Gyrocopter (left) and AirCam parked near Jack's Camp survey base.

The aircraft were flown at approximately 70km per hour, 25m above ground level. Since both aircraft were two-seaters, the pilot and the observer looked for nests, with the observer recording the nest contents, tree species that the nest was in, nest location in the tree (approx. height above ground, whether on top of the canopy or below) and the geographical co-ordinates using a hand-held Global Positioning System (Garmin 296, set for WGS 84, and decimal degrees). Each nest was assigned a permanent number (see Hancock *et al.*, 2007).

These nests were checked early in the 2007 breeding season (July), and again later before the juvenile birds fledged from the nest (November), and several new nests were found. Breeding success was defined as the number of active nests (*i.e.* in which an egg was laid) from which a chick fledged or was very likely to fledge due to its large size when the nest was last checked). Nests were clearly visible from the air, as illustrated in Figure 9; nest contents could also be recorded if the adult was not sitting.

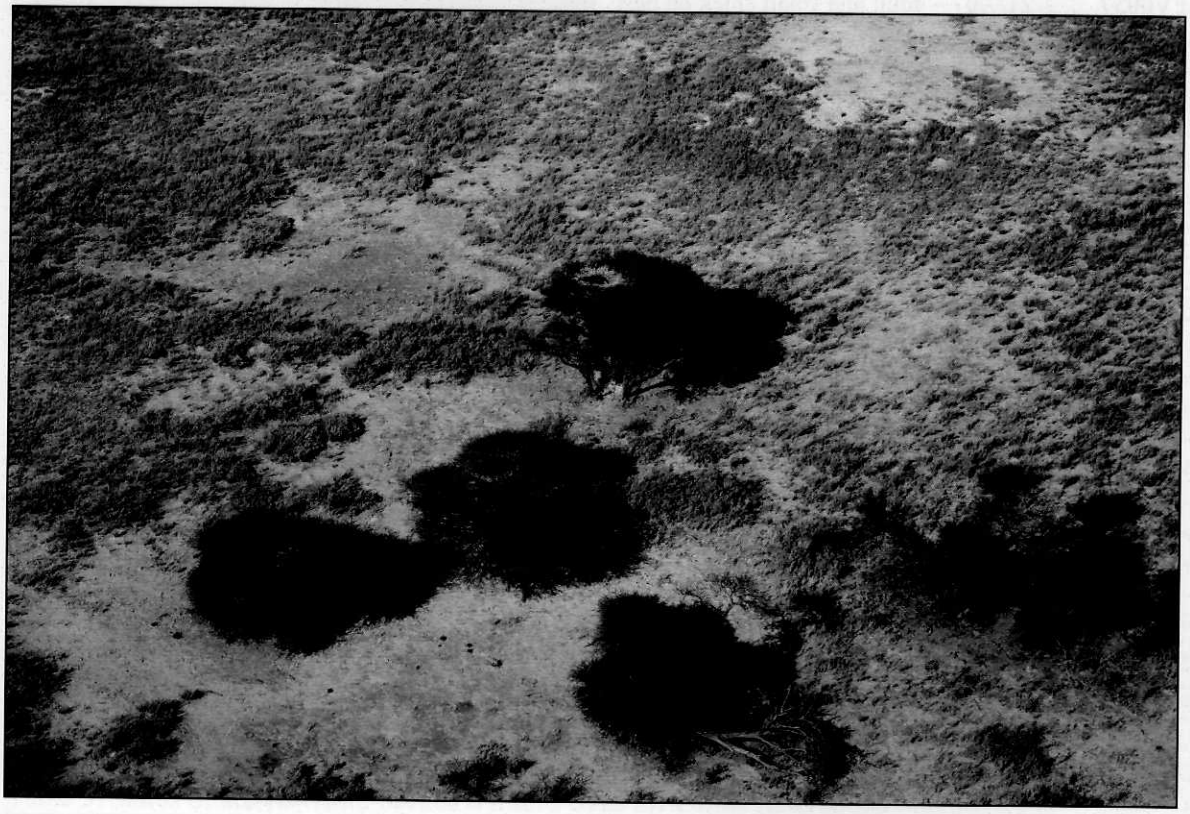


Photo: M Muller

Figure 9. Lappet-faced Vulture nest (arrowed) on canopy of *Acacia tortilis* on edge of tree island.

The results of the survey are shown in Table 4.

Table 4. Status of active Lappet-faced Vulture ***Torgos tracheliotos*** nests in the Makgadikgadi IBA in 2007.

Nest no.	Survey 1	Survey 2
LFV0007	21/7/07 – adult in incubating position	11/11/07 – nest empty (unsuccessful)
LFV0008	21/7/07 – not checked	6/11/07 – nest empty
LFV0012	21/7/07 – not checked	24/11/07 – large fledgling on nest
LFV0030	21/7/07) – adult in incubating position	11/11/07 – not checked
LFV0032	21/7/07 – nest empty	11/11/07 – nest empty
LFV0033	21/7/07 – nest empty	11/11/07 – nest empty
LFV0034	21/7/07 – nest empty	11/11/07 – nest empty
LFV0037	21/7/07 – nest empty	11/11/07 – nest empty
LFV0038	21/7/07 – adult in incubating position	5/11/07 – large fledgling on nest
LFV0039	21/7/07 – nest empty	11/11/07 – nest empty
LFV0043	21/7/07 – nest empty	6/11/07 – nest empty
LFV0044	21/7/07 – nest collapsed, not used	6/11/07 – nest collapsed, not used
LFV0045	21/7/07 – nest empty	6/11/07 – nest empty
LFV0046	21/7/07 – not checked	24/11/07 – nest empty
LFV0047	21/7/07 – not checked	24/11/07 – nest empty

Nest no.	Survey 1	Survey 2
LFV0048	19/7/07 – adult in incubating position	24/11/07 – large fledgling on nest
LFV0049	21/7/07 – not checked	24/11/07 – nest empty
LFV0052	19/7/07 – adult in incubating position	11/11/07 – not checked
LFV0053	19/7/07 – adult in incubating position	11/11/07 – not checked
LFV0054	19/7/07 – adult in incubating position	30/10/07 – large fledgling on nest
LFV0055	21/7/07 – nest empty	11/11/07 – nest empty
LFV0056	21/7/07 – nest empty	11/11/07 – nest empty
LFV0057	21/7/07 – adult and small chick on nest	11/11/07 – large fledgling on nest
LFV0058	21/7/07 – nest empty	11/11/07 – nest empty
LFV0059	21/7/07 – nest empty	11/11/07 – nest empty
LFV0060	21/7/07 – nest empty	11/11/07 – nest empty
LFV0061	21/7/07 – adult in incubating position	11/11/07 – nest empty (unsuccessful)
LFV0062	21/7/07 – nest empty	11/11/07 – not checked
LFV0063	21/7/07 – adult in incubating position	6/11/07 – large fledgling on nest
LFV0064	21/7/07 – nest empty	6/11/07 – nest empty
LFV0065	21/7/07 – nest empty	6/11/07 – nest empty
LFV0066	21/7/07 – nest empty	6/11/07 – nest empty
LFV0067	21/7/07 – adult in incubating position	6/11/07 – large fledgling on nest
LFV0068	21/7/07 – adult in incubating position	5/11/07 – nest empty (unsuccessful)
LFV0069	21/7/07 – nest empty	5/11/07 – nest empty
LFV0070	21/7/07 – adult in incubating position	6/11/07 – nest empty (unsuccessful)
LFV0071	21/7/07 – nest collapsed	6/11/07 – nest collapsed
LFV0072	21/7/07 – nest empty	6/11/07 – nest empty
LFV0073	21/7/07 – nest empty	6/11/07 – not checked
LFV0074	21/7/07 – adult and small chick in nest	6/11/07 – nest empty (unsuccessful)
LFV0075	21/7/07 – nest empty	6/11/07 – nest empty
LFV0076	21/7/07 – disused nest	6/11/07 – disused nest
LFV0081	21/7/07 – not checked	5/11/07 – broken egg, nest abandoned
LFV0082	21/7/07 – not checked	6/11/07 – nest empty and collapsed
LFV0083	21/7/07 – not checked	6/11/07 – nest empty
LFV0084	21/7/07 – not checked	6/11/07 – nest empty
LFV0085	21/7/07 – not checked	6/11/07 – nest empty
LFV0086	21/7/07 – not checked	11/11/07 – nest empty
LFV0087	21/7/07 – not checked	11/11/07 – nest empty
LFV0088	21/7/07 – not checked	11/11/07 – large fledgling on nest

Only 14 out of the 50 nests were active during mid-July (of these, only 13 were checked again during November). There are two possible explanations for this low number: Firstly, in several instances, there are two or three nests in close proximity, of which only one is active. This could be due to there being fairly high attrition of nests, necessitating a new nest being constructed at regular intervals, or Lappet-faced Vulture may use alternative nest sites depending on local conditions. Secondly, many of the nests from which chicks fledged during 2006 were inactive during 2007 – pairs that are successful may only breed every second year.

Eight chicks fledged or were close to fledging from active nests, by mid-November (including LFV0088 which, although not known in July must have been active). This gives a breeding success of 57%. This is much lower than the breeding success during 2006 where 12 out of the 13 pairs (92%) successfully fledged a chick. However Mundy *et al.* (1992) state that breeding success for this species, in four different African national parks, was remarkably similar, ranging from 40 to 50% - in total 123 young were thought to be successfully reared from 277 pair-years, a 44% success rate – the 2007 breeding success rate is still higher than the 'norm' for the species.

From the above, it is concluded that this trigger species is doing well in the IBA.

White-backed Vulture

Photo: J Macdonald

The Makgadikgadi Pans IBA is very important as a feeding and breeding area for the White-backed Vulture. This species is monitored concurrently with the Lappet-faced Vulture, using the Gyrocopter and AirCam to locate nests from the air and monitor breeding success.

Table 5. Status of active White-backed Vulture ***Gyps africanus*** nests in the Makgadikgadi IBA in 2007.

Nest no.	Survey 1	Survey 2
WBV0400	17/8/07 – nest active	11/11/07 - not checked
WBV0434	21/7/07 – nest empty	11/07 – not checked
WBV0435	21/7/07 – adult in incubating position	11/07 – not checked
WBV0436	**21/7/07 – 1 egg in nest, adult present**	**11/11/07 – large fledgling on nest**
WBV0437	21/7/07 – chick in nest	11/07 – not checked
WBV0438	**21/7/07 – chick in nest**	**11/11/07 – adult and fledgling flying**
WBV0439	**21/7/07 – 1 egg in nest, no adult seen**	**11/11/07 – nest empty**
WBV0440	**21/7/07 – 2 adults on empty nest**	**11/11/07 – large fledgling on nest**
WBV0447	19/7/07 – adult in incubating position	11/11/07 – not checked
WBV0449	21/7/07 – adult in incubating position	11/11/07 – not checked
WBV0452	**21/7/07 – adult in incubating position**	**11/11/07 – large fledgling on nest**
WBV0453	21/7/07 – adult in incubating position	11/11/07 – not checked
WBV0454	**21/7/07 – 1 egg in nest, adult present**	**11/11/07 – large fledgling on nest**
WBV0455	**21/7/07 – adult in incubating position**	**11/11/07 – large fledgling on nest**
WBV0456	**21/7/07 – adult in incubating position**	**11/11/07 – large fledgling on nest**
WBV0457	**21/7/07 – adult in incubating position**	**11/11/07 – large fledgling on nest**
WBV0458	**21/7/07 – adult in incubating position**	**11/11/07 – large fledgling on nest**
WBV0459	**21/7/07 – not checked**	**6/11/07 – large fledging on nest**
WBV0460	**21/7/07 – adult on empty nest**	**6/11/07 – large fledgling on nest**
WBV0461	**21/7/07 – nest empty**	**6/11/07 – nest empty**
WBV0463	**21/7/07 – adult in incubating position**	**11/11/07 – large fledgling on nest**
WBV0464	**21/7/07 – adults near empty nest**	**11/11/07 – nest empty**
WBV0465	**21/7/07 – adult on empty nest**	**11/11/07 – large fledgling on nest**
WBV0466	**21/7/07 – nest empty**	**11/11/07 – nest empty**

Nest no.	Survey 1	Survey 2
WBV0467	**21/7/07 – nest empty**	**11/11/07 – nest empty**
WBV0468	**21/7/07 – adult on empty nest**	**11/11/07 – large fledgling on nest**
WBV0469	**21/7/07 – adult on empty nest**	**11/11/07 – large fle dgling on nest**
WBV0470	**21/7/07 – two adults perched on tree**	**11/11/07 – nest empty**
WBV0481	17/8/07 – adult on nest	11/11/07 – not checked
WBV0501	17/8/07 – adult in incubating position	11/11/07 – not checked
WBV0529	19/7/07 – adult in incubating position	11/11/07 – not checked
WBV0530	19/7/07 – adult in incubating position	11/11/07 – not checked
WBV0531	19/7/07 – adult in incubating position	11/11/07 – not checked
WBV0532	19/7/07 – adult in incubating position	11/11/07 – not checked
WBV0533	19/7/07 – adult in incubating position	11/11/07 – not checked
WBV0534	19/7/07 – adult in incubating position	11/11/07 – not checked
WBV0536	19/7/07 – adult in incubating position	11/11/07 – not checked
WBV0527	19/7/07 – adult in incubating position	11/11/07 – not checked
WBV0538	19/7/07 – adult in incubating position	11/11/07 – not checked
WBV0539	19/7/07 – adult in incubating position	11/11/07 – not checked
WBV0540	19/7/07 – adult in incubating position	11/11/07 – not checked
WBV0541	19/7/07 – adult in incubating position	11/11/07 – not checked
WBV0542	19/7/07 – adult in incubating position	11/11/07 – not checked
WBV0543	19/7/07 – adult in incubating position	11/11/07 – not checked
WBV0544	19/7/07 – adult in incubating position	11/11/07 – not checked
WBV0545	19/7/07 – adult in incubating position	11/11/07 – not checked
WBV0546	19/7/07 – adult in incubating position	11/11/07 – not checked
WBV0547	19/7/07 – adult in incubating position	11/11/07 – not checked
WBV0548	19/7/07 – adult in incubating position	11/11/07 – not checked
WBV0549	19/7/07 – adult in incubating position	11/11/07 – not checked
WBV0550	19/7/07 – adult in incubating position	11/11/07 – not checked
WBV0551	**19/7/07 – adult in incubating position**	**5/11/07 – 1 egg only, no adults**
WBV0553	21/7/07 – adult in incubating position	11/11/07 – not checked
WBV0554	**21/7/07 – adult in incubating position**	**6/11/07 – large fledgling on nest**
WBV0555	**21/7/07 – 1 egg, adult present**	**6/11/07 – large fledgling on nest**
WBV0556	**21/7/07 – adult in incubating position**	**6/11/07 – large fledgling on nest**
WBV0557	**21/7/07 – adult on empty nest**	**6/11/07 – large fledgling on nest**
WBV0558	**21/7/07 – adult on empty nest**	**6/11/07 – large fledgling on nest**
WBV0560	**21/7/07 – 1 egg, adult present**	**5/11/07 – large fledgling on nest**
WBV0561	21/7/07 – adults on empty nest	11/11/07 – not checked
WBV0562	21/7/07 – adult in incubating position	11/11/07 – not checked
WBV0563	**21/7/07 – adult in incubating position**	**6/11/07 – large fledgling on nest**
WBV0564	**21/7/07 – adult and small chick on nest**	**6/11/07 – large fledgling on nest**
WBV0565	21/7/07 – adult in incubating position	6/11/07 – not checked
WBV0566	**21/7/07 – adult in incubating position**	**5/11/07 – fledged chick flew from nest**
WBV0567	**21/7/07 – adult in incubating position**	**5/11/07 – large fledgling on nest**
WBV0568	**21/7/07 – adult in incubating position**	**11/11/07 – large fledgling on nest**
WBV0569	**21/7/07 – adult in incubating position**	**11/11/07 – large fledgling on nest**
WBV0609	??/6/07 – adult in incubating position	11/11/07 – not checked
WBV0610a	??/6/07 – adult in incubating position	11/11/07 – not checked
WBV0610b	??/6/07 – adult in incubating position	11/11/07 – not checked
WBV0611	??/6/07 – adult in incubating position	11/11/07 – not checked
WBV0612	??/6/07 – adult in incubating position	11/11/07 – not checked
WBV0627	17/8/07 – adult in incubating position	11/11/07 – not checked
WBV0628	17/8/07 – adult in incubating position	11/11/07 – not checked
WBV0629	17/8/07 – adult in incubating position	11/11/07 – not checked
WBV0630	17/8/07 – adult in incubating position	11/11/07 – not checked
WBV0631	17/8/07 – adult in incubating position	11/11/07 – not checked
WBV0632	17/8/07 – adult in incubating position	11/11/07 – not checked
WBV0633	17/8/07 – adult in incubating position	11/11/07 – not checked
WBV0634	17/8/07 – adult and small chick on nest	11/11/07 – not checked
WBV0635	17/8/07 – adult in incubating position	11/11/07 – not checked
WBV0636	17/8/07 – adult in incubating position	11/11/07 – not checked

Nest no.	Survey 1	Survey 2
WBV0637	17/8/07 – adult in incubating position	11/11/07 – not checked
WBV0638	17/8/07 – adult in incubating position	11/11/07 – not checked
WBV0639	19/8/07 – adult in incubating position	11/11/07 – not checked
WBV0671	26/9/07 – adult and chick on nest	11/11/07 – not checked
WBV0672	26/9/07 – adult and chick on nest	11/11/07 – not checked
WBV0673	26/9/07 – adult and chick on nest	11/11/07 – not checked
WBV0679	**21/7/07 – not checked**	**6/11/07 – 1 egg, no adults**
WBV0680	**21/7/07 – not checked**	**6/11/07 – large fledgling on nest**
WBV0681	**21/7/07 – not checked**	**6/11/07 – large fledgling on nest**
WBV0682	**21/7/07 – not checked**	**6/11/07 – large fledgling on nest**

Note: Only nests marked in bold used in analysis

During 2007, breeding success of 38 pairs of White-backed Vultures in the Makgadikgadi IBA was 79% *i.e.* 30 pairs raised a chick to the fledging stage. This is at the upper end of the range recorded by Mundy *et al.* (1992) who report breeding success rates of 43 to 87% for this species.

Figure 10. White-backed Vulture chick on nest (Photo: G Verdoorn)

Of 108 nests in the BirdLife Botswana database, from the Makgadikgadi Pans IBA, the majority (53%) were in *Terminalia prunioides* trees, with *Acacia erioloba* (19%) being the second preferred species.

However, preferences vary according to area *e.g. Adansonia digitata* (16%) is favoured in the southern part of Sua Pan, while *Acacia erioloba* is the main nesting tree along the western side of Sua. *T. prunioides* is the favoured species in the Makgadikgadi Pans National Park where it forms dense 'tree islands' on slightly elevated ridges.

Figure 11. The Baobab is one of the preferred nesting trees in this IBA (Photo: H Bendsen)

During 2007, two immature White-backed Vultures that had been fitted with patagial tags in the northern Cape of South Africa (as fledglings during late 2006) were resighted along the Boteti River in the western part of the IBA. This may be an important dispersal area for young White-backed Vultures.

Figure 12. K070, tagged in the northern Cape, South Africa, resighted at Menoakwena seven months and 759 kilometres later (Photo: D Dugmore)

This species is currently doing very well in the IBA.

Chestnut-banded Plover

Photo: M Muller

The Chestnut-banded Plover was recently uplisted to globally Near Threatened (see Simmons *et al.*, 2007), and is a suitable species for monitoring, occurring in significant numbers in the

IBA and being relatively easy to count. In light of this, a student was deployed during 2007 to do some preliminary work monitoring this species – the logistics of counting the species along a fixed transect along the edge of Sua Pan was tested and found to be feasible, with the best time for counts being at the end of the dry season (September/October) when water levels are lowest and birds are most concentrated. Fixed transects will therefore be established and monitored from 2008.

Other globally threatened species

None of the other globally threatened species is suitable for monitoring in this IBA *e.g.* Cape Vulture is an occasional visitor to the area, as are Lesser Kestrel and Pallid Harrier. The only possible exception is the Wattled Crane, which visits the area during summer (Hancock and Maude, 2006), and may prove suitable for monitoring.

2. Range- and biome-restricted species

Much work remains to be done regarding monitoring of range- and biome-restricted species. The fixed transects established in the IBA by Glover and Skinner (2005) will provide information on Burchell's Sandgrouse when they become regularized, but this did not take place during 2007 (these transects will also provide supplementary data on Cape, Lappet-faced and White-backed Vultures, and Pallid Harrier).

3. Congregatory waterbirds

Great White Pelican

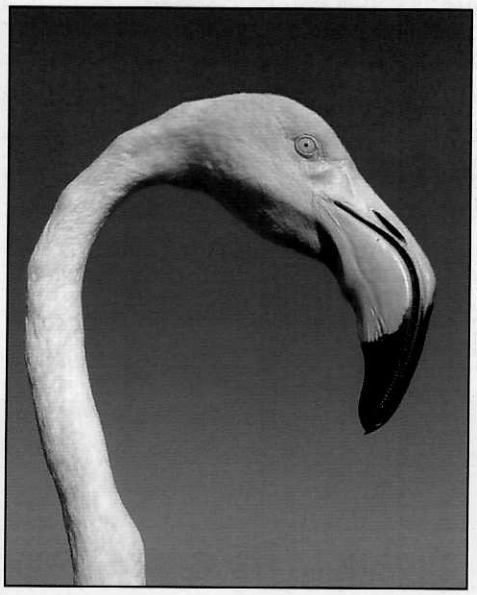
This species is monitored at its breeding site, the Nata River delta. This is the only place where it breeds in the IBA and in Botswana, and it only does so when conditions are favourable.

Photo: R Randall

Figure 13. The Nata River delta, where Great White Pelicans breed on inaccessible islands

During the 2005/6 rainy season, approximately 1,000 km^2 of northern Sua Pan flooded and this was sufficient to attract large numbers of Great White Pelicans to breed. By February, 2007, over 3,200 pelicans were counted at the breeding colony, with many dark brown chicks forming up into rafts next to the adults that were still incubating. The 2006/7 rainy season however was very poor with less than half the annual average rainfall. As the pan dried out, increasing numbers of Black-backed Jackals were able to wade across to the colony, and prey upon the chicks – their impact on chick numbers was however relatively small as the chicks soon learned to take refuge in the deeper waters on the pan. Further than the above, no quantitative data are available.

Greater Flamingo



This species is monitored concurrently with the Lesser Flamingo, using the same methodology i.e. conducting aerial surveys and counting the number of birds shown on high resolution aerial photographs. Numbers of Greater Flamingos present at Sua Pan during 2007 and preceding years, are shown in Table 6. Breeding success is also tabulated (Table 7).

Table 6. Greater Flamingo numbers at Sua Pan during the period 1999 to 2005.

Year	Numbers
1999/2000 wet season	51,200 – 57,209 (4 counts)
2000/2001 wet season	39,300 (1 count)
2001/2002 wet season	No data available
2002/2003 wet season	No data available
2003/2004 wet season	No data available
2004/2005 wet season	27,631 (1 count)

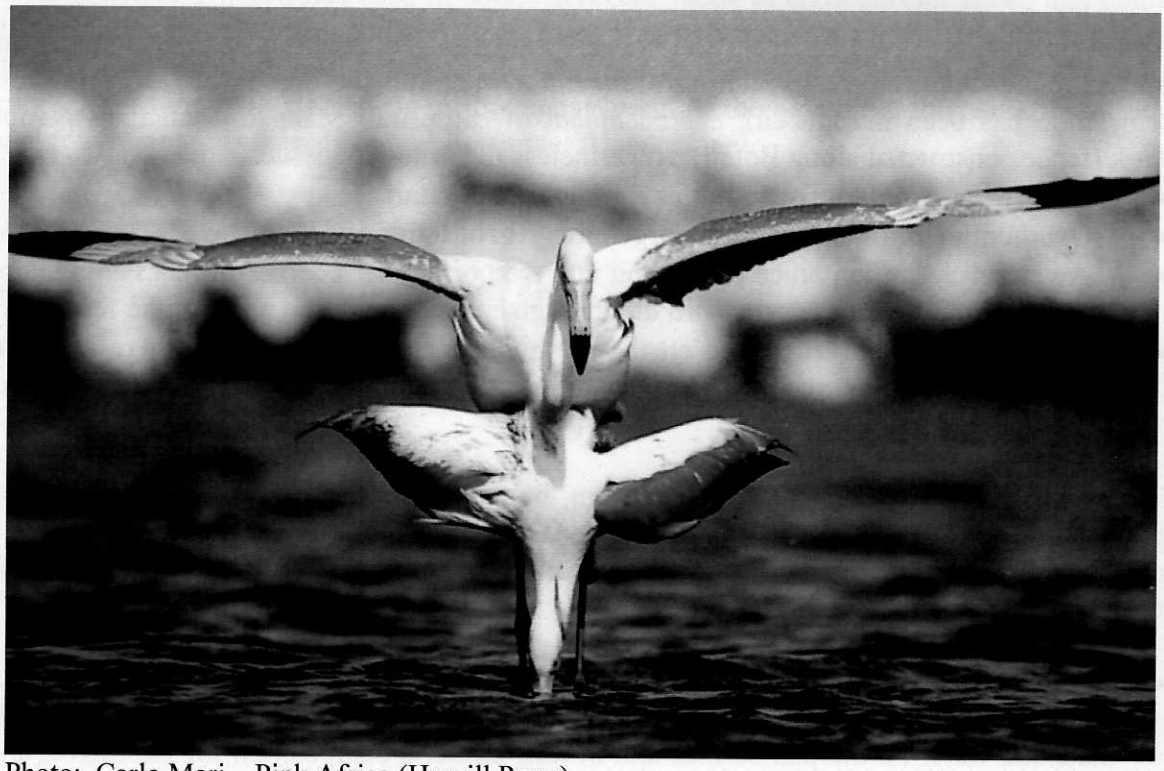


Photo: Carlo Mari – Pink Africa (Harvill Press)

Table 7. Number of breeding pairs of Greater Flamingos, and number of chicks, at Sua Pan.

Year	Number
1999/2000 wet season	23,900 pairs bred (6 counts). 18,490 chicks fledged
2000/2001 wet season	650 pairs bred (2 counts). Unknown success.
2001/2002 wet season	Dry – no young raised.
2002/2003 wet season	Dry – no young raised.
2003/2004 wet season	6,700 pairs bred. Unknown success.
2004/2005 wet season	699 pairs bred. Unknown success.

Greater Flamingos appear to be doing well at present, with breeding success depending on natural factors such as rainfall and flooding levels. There are no cases of human disturbance or other human-induced factors impacting negatively on the species.

PART 2 – PRESSURES ON THE ENVIRONMENT

Tyler and Bishop (1998) detail several threats to the Makgadikgadi Pans IBA, some of which are no longer applicable *e.g.* hunting of sandgrouse during the breeding season (improved legislation has been introduced), encroachment of cattle into Makgadikgadi Pans National Park (fence constructed along Boteti). Nevertheless the following issues remain valid:

- Disturbance from tourist activities *e.g.* motorbike safaris
- Overhunting of (mammals and) large birds *e.g.* bustards and korhaans
- A veterinary cordon fence protruding into the northeastern corner of Sua Pan remains a threat to adult flamingos that still die through collision with the wires of the fence
- "A soda ash factory operates on the northeast edge of Sua Pan and there is concern about the effect on breeding flamingos of abstraction of water from the pan by the soda ash company."

The soda ash factory, although removed from the flamingo breeding area on Sua Pan, could potentially still be an important threat (see Appendix 2 – Soda ash mining and the conservation of flamingos on Sua Pan). The following issues relating to the soda ash project require independent study and monitoring:

- A reduction in the ground water levels on the pan as a result of pumping for water used at the plant, which could potentially cause grass encroachment, a change in the salinity of the flood water on the pan surface and in turn the food composition for flamingos, and a reduction in the flood periods;

- A change in the surface flood water chemistry as a result of the pumping of the bitterns onto the middle pan, causing changes in the plant and crustacean composition and abundance (flamingo food);
- Build-up of pollutants from the activities of the mine in the pan system, resulting in not only impacts to food abundance directly, but heavy metal build up in the system and bio-concentration through the food chain to impact the flamingos directly
- Sulphur dioxide fall out from the coal-burning energy-generating smoke stack impacting on the pH of the surrounding flood water on the pan, which would in turn impact on the composition and abundance of flamingo food.

Although the soda ash factory does not appear to have major negative impacts on the avifauna at present (*e.g.* the Lappet-faced Vulture nest LFV0048, from which a chick was fledged this year is within 2.5km from the factory), because of its far-reaching implications on the functioning of the Sua Pan system must be regarded as the highest ranking threat at present.

PART 3 – RESPONSE – CONSERVATION ACTIONS TAKEN FOR THE ENVIRONMENT

As mentioned above, some of the previous threats have been addressed (gamebird hunting legislation, cattle encroachment into the national park). In addition, a significant improvement that was made in previous years relates to the removal (by the Department of Animal Health and Production) of the mesh off the veterinary fence that protrudes into the northeastern part of Sua Pan, which trapped and killed large numbers of flamingo chicks in the past.

However, the most significant, positive development during 2007 has been BirdLife Botswana's engagement with the Nata Sanctuary and its associated communities. The success of Nata Sanctuary, which has been in doubt in recent years, is an important factor that could influence other communities to afford better protection to other parts of the IBA. The BirdLife Botswana Community Liaison Officer will continue to work with the Nata Sanctuary Trust during 2008 to improve all aspects of the management of the Sanctuary to ensure that it is a model for Community-based Natural Resources Management.

REFERENCES

Glover, J and Skinner, C. 2005. Transect counts in and around the Makgadikgadi Pans National Park, in Nxai Pans National Park and in the Central Kalahari Game Reserve. Babbler 45:37 – 40.

Hancock, P and Maude, G. 2006. Key areas for Wattled Cranes *Grus carunculatus* in Botswana during summer. Babbler 47: 8 – 14.

Hancock, P, Bridges, B and Muller, M. 2007. Inception in 2006 of a long-term project on the Botswana breeding population of Lappet-Faced Vultures *Torgos tracheliotos*: preliminary findings. Babbler 50: 23 - 30.

McCulloch GP. 2003. The Ecology of Sua Pan and its Flamingo Populations. PhD thesis, Trinity College Dublin, Dublin, Ireland.

McCulloch, G and Irvine, K. 2004. Breeding of Greater and Lesser Flamingos at Sua Pan, Botswana, 1998-2001. Ostrich 75 (4): 236 – 242.

McCulloch, G. 2005. Flamingo breeding at Sua Pan. Babbler 46: 41-44.

Mundy, P., Ledger J., Butchart, D. and Piper, S. 1992. Vultures of Africa. Acorn Books, Russel Friedman Books and the Vulture Study Group. Johannesburg, South Africa.

Simmons, R, Baker, N, Braby, R, Dodman, T, Nasirwa, O, Tyler, S, Versfeld, W, Wearne, K and Wheeler, M. 2007. Is the Chestnut-banded Plover an overlooked globally Near Threatened species? Bird Conservation International 17: 283-293.

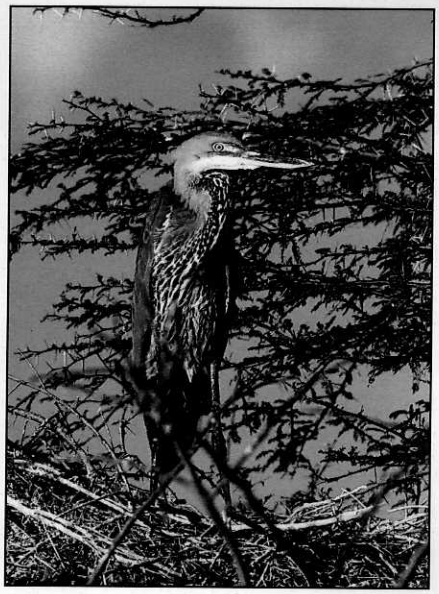
APPENDIX 1 – NOTES ON OTHER BIRD SPECIES OF THE MAKGADIKGADI PANS IBA

During the course of monitoring birds in the IBA, observations were made on several other bird species, and they are recorded below.

Pink-backed Pelican

This species breeds in small numbers in trees in the Nata River delta when conditions are favourable. This is one of only three sites where this species currently breeds in Botswana. No breeding took place during 2007.

Goliath Heron



Although not common in the IBA, this species breeds in trees in the Nata River delta during years of good rainfall. Several nests of this species were observed during early 2007 by M Muller (pers. comm.) and an adult was seen on a nest on 2nd February by P Hancock. When the Nata River dried up, the birds left the area.

Photo: W Tarboton

Grey Crowned Crane

The Grey Crowned Crane, one of Botswana's Birds of Concern, is regularly seen in the Nata Sanctuary and pairs occasionally breed here. In 2007, 12 birds were seen at the Nata River delta and a single bird was observed at the Semowane delta. There were no breeding records during 2007.

Yellow-throated Sandgrouse

Sightings of this species are increasingly rare; it is therefore worth recording that two pairs were seen together in the Nata Sanctuary in January, 2007 by M Muller.

Photo: M Muller

APPENDIX 2 – SODA ASH MINING AND THE CONSERVATION OF FLAMINGOS ON SUA PAN IN THE MAKGADIKGADI PANS IMPORTANT BIRD AREA

By Dr Graham McCulloch

About the Author:

In 1998, Graham McCulloch embarked on a PhD project aimed at understanding the wetland ecology of Makgadikgadi and why it was so important to flamingos. The Makgadikgadi salt pan complex, Botswana, is one of the largest ephemeral wetlands in Africa, and home to hundreds of thousands of flamingos during seasonal flooding; it comprises one of the most important breeding sites in Africa for both Greater and Lesser Flamingos. Research and an increased understanding of the ecological processes and functioning of this wetland were essential considering increasing pressures from a growing number of anthropogenic activities in the area, including the existence of a large soda ash mine operating on its shores, and a worrying gap in our knowledge of their impacts on the wetland's integrity. In addition to gaining valuable knowledge about Makgadikgadi's chemical and biological characteristics and ecosystem functioning, Graham learnt much about its flamingo populations and collected important data on their feeding ecology, breeding success and their migration behaviour to and from the Makgadikgadi using satellite telemetry. He also built up a good relationship with the local community in and around the soda ash mine.

Background on the site

The saltpans of Makgadikgadi regularly host the largest concentrations of flamingos in southern Africa. A relic of an ancient inland lake, the Makgadikgadi comprises the remnants of that dried up lake in the form of two large salt flats, Ntwetwe Pan and Sua Pan, covering approximately 10,000 km^2. Depending on the amount of rainfall, seasonal flooding transforms the pans into vast shallow saline lakes.

Sua Pan covers approximately 3,700 km^2 and can be divided into three hydrologically separate basins, the north, middle and south basins, separated by two sand spits that protrude from the eastern shoreline (Figure 1). For periods during the wet season, five rivers flow intermittently from east to west, in a dendritic drainage pattern, and fill parts of Sua Pan's gently sloping basins. The area of flooding (Figure 1) varies between seasons depending on the amount and intensity of rainfall. In years of high rainfall, the combined input from precipitation and inflowing rivers is sufficient to flood Sua Pan for over a year. The north basin sump is the deepest part of the pan, estimated at 890 m above sea level (asl), and is flooded every year. Variations in the size of temporary lakes occur within seasons owing to the constant change in water balance between rapid input, from precipitation and runoff, and rapid loss by evaporation. By far the largest of Sua Pan's inflowing rivers is the Nata River, which flows into the north basin. It has a large catchment of 22,500 km^2.

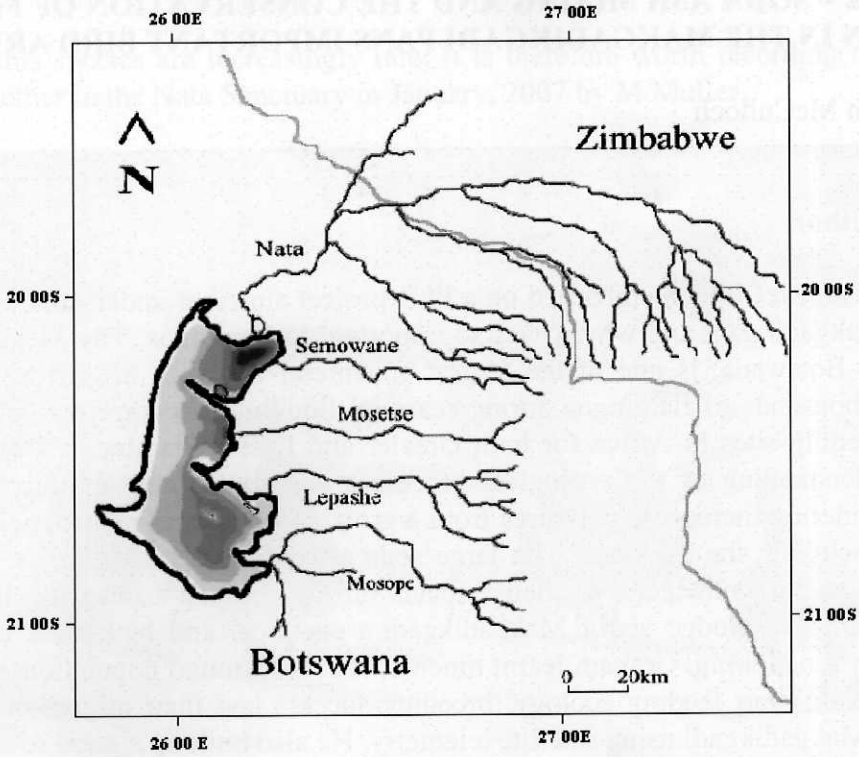


Figure 1. Map of Sua Pan showing the inflowing rivers Nata, Semowane, Mosetse, Lepashe an Mosope and the flooding patterns of the north, middle and south basins at different levels of floodin The small red area encircled in the north basin represents solar ponds belonging to the soda as production plant, Botswana Ash (Pty) Ltd.

Almost as soon as the pans flood, millions of algae and shrimp emerge from their dorma spores and eggs and multiply at incredible rates. Yet again, one of the most primitive an productive ecosystems on earth is rekindled. From all over southern Africa and sometim beyond, flamingos, together with a whole host of other migrant bird species, arrive in the hundreds of thousands to feed on these tiny plants and animals. They arrive not only to fee but more importantly, Makgadikgadi is one of the few places where they get an opportunity t breed.

Owing to its international importance for birdlife, the Makgadikgadi is one of Botswana Important Bird Areas (IBA) and has been proposed as Botswana's second Ramsar sit Increasing development on and around the Makgadikgadi and the lack of an integrate management plan or comprehensive national and/or local legal protection for the wetlands i however, cause for great concern. Certainly, the long term protection of southern Africa flamingo populations and their breeding success at Makgadikgadi necessitates long-ter protection of the wetlands integrity and sustainable use of the wetlands resources.

Abundance and breeding success of flamingos on Sua Pan

The establishment of ephemeral standing waters on the Makgadikgadi triggers the ma migration of both Greater and Lesser Flamingo that arrive in their hundreds of thousan (Hancock, 1990; Simmons, 1996; 2000; Borello *et al.,* 1998). Sua Pan contains one of t most important breeding sites for flamingos in Southern Africa, located in the southern basin

of Sua Pan (Figure 2). Indeed, it is one of only three sites in the whole of Africa, where Lesser Flamingos can breed successfully in large numbers. A number of breeding events observed on Sua Pan comprised over 100,000 breeding Lesser Flamingos (T Liversedge, pers. comm.; McCulloch & Irvine, 2004). After exceptional rains, extensive flooding facilitates continuous breeding so that laying and hatching is staggered and very large colonies of breeding pairs form (Herremans, 1993; McCulloch & Irvine 2004; T Liversedge, pers. comm.).

Flamingo population size and distribution as well as breeding success is greatly influenced by the amount of flooding on Sua pan (McCulloch, 2003). While high water levels provide ideal breeding conditions for flamingos in the south basin, ideal breeding conditions are not the norm. During average to below average rainfall years, the pans dry up around the breeding ground in the south of the pan and breeding success is reduced by increased predation and increased energy requirements exerted on the adults who have to fly to the remaining feeding grounds in the north basin for food. The importance of food availability to breeding success of both species cannot be over-emphasised. Anthropogenic impacts, therefore, to the water levels as a result of reducing flood periods and to food availability and quality as a result of reduced flood period and chemical changes in the wetland ecosystem could, therefore, have major implications on the success of a flamingo breeding population.

Botswana Ash (Pty) Ltd. Soda Ash production

Botswana Ash (Pty) Ltd. is a large soda ash production plant that was built on the edge of Sua Pan (Figure 2) in 1990 and began production in 1992. The aim of this soda ash plant was to utilise the vast resources of brine that lie deep beneath the surface of Sua Pan for the chemical production of Soda Ash (sodium carbonate) and table salt (sodium chloride). The process involves pumping highly saline brine from approximately 40m below the pan surface, via 90 well pumps scattered across the north basin of Sua Pan, to a series of solar ponds (Figure 3). The brine is concentrated through natural evaporation and the remaining salt is harvested and treated to separate the sodium carbonate and sodium chloride. What's left of the brine is then pumped back out onto a Bitterns pond on the edge of the middle section of the pan.

Figure 2. Satellite image of Sua Pan showing Soda Ash mine (green rectangle) and the location of the flamingo breeding colony (pink solid circle).

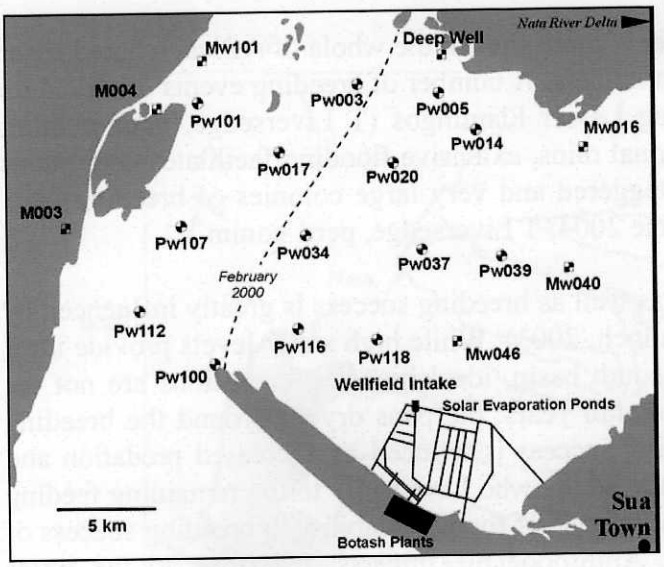


Figure 3. Map of Sua Pan's north basin showing the position of the plant, the solar ponds and the main well points from where they pump sub-surface brine to the solar ponds.

The impacts of BotAsh Soda ash production on flamingo breeding population

The initial development of Botswana Ash caused outrage among environmental specialists and wildlife sympathisers alike. An EIA was conducted in 1989 and reviewed by Ecosurv in 1993, who renewed the EIA in 2003. Some of the main concerns raised in the initial EIA process included:

- Powerlines obstructing flamingo flight from the north to the south of Sua Pan during the breeding season
- Changes in the water levels as a result of the pumping of brine from underneath the pan
- The potential impacts of pollutants from the plant and the activities on the pan on the wetland integrity
- Physical disturbance of soda ash mining activities at the flamingo feeding grounds

Some of the main mitigation measures made from the onset were:

- Burying the powerlines to the brine pumps on the pan so as not to impact on bird flight
- Erecting florescent light bulbs on the main power line to the plant, to reduce the threat of impact by nocturnal movements of birds.
- Containing bitterns in an enclosed pond on the edge of the pan
- Various monitoring recommendations relating to waterlevels, grass encroachment and pollution levels were made and strategies developed to address impacts.

In reality, the BotAsh mine has had little physical impact on the presence of flamingos in the north of Sua Pan. The buried power lines have prevented the erection of a potentially disastrous obstacle for the birds and the reflectors on the main 133KVA power line have worked well, although collisions and mortalities of flamingos do still occur along the line near the edge of the pan, particularly during stormy weather and dusty conditions. There is no disturbance to the breeding colony from the mine, owing to it being situated over 60 kilometres away from the breeding site location.

Concerns

There are concerns about the potential long-term impacts of the soda ash production, which have not yet been identified, but could ultimately be far more serious than some of the negative impacts coming from powerline collisions, for example:

- A reduction in the ground water levels on the pan as a result of pumping for water used at the plant, which could potentially cause grass encroachment, a change in the salinity of the flood water on the pan surface and in turn the food composition for flamingos, and a reduction in the flood periods;
- A change in the surface flood water chemistry as a result of the pumping of the bitterns onto the middle pan, causing changes in the plant and crustacean composition and abundance (flamingo food);
- Build-up of pollutants from the activities of the mine in the pan system, resulting in not only impacts to food abundance directly, but heavy metal build up in the system and bio-concentration through the food chain to impact the flamingos directly
- Sulphur dioxide fall out from the coal-burning energy-generating smoke stack impacting on the pH of the surrounding flood water on the pan, which would in turn impact on the composition and abundance of flamingo food

Although, Botswana Ash has been very supportive of conservation efforts in the area, there is a lack of ongoing and effective monitoring to measure the above changes and in devising mitigation measures to prevent the potential impacts of such changes. This, I believe is something that will require independent work and assessment in order to quantify and qualify.

In summary

Major concerns are the impacts to the following;

- The flood regime is **THE** most important factor determining breeding occurrence and success of flamingos on Sua Pan. Damning of inflowing rivers, pumping surface flood water from the pan, or reducing ground water levels will all have major impacts on flood regime.
- Physical disturbance to the breeding colony will have to be avoided at all costs. Disturbance from vehicles, planes or people on foot will render any breeding attempt, regardless of the conditions, unsuccessful, and the site unviable;
- Any aerial powerlines pose a serious threat to the movements of flamingos during the breeding season, which occurs every night *en masse*, and can result in devastating mortality rates. The position and adequate reflector marking of these lines is very important;
- Pollution generation and disposal will have to be tackled very carefully to avoid direct impact to the flamingos and also their food abundance and quality.

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