CONSIDERATION OF PROPOSALS FOR AMENDMENT OF APPENDICES I AND II

Proposals submitted pursuant to Resolution on Ranching

A. PROPOSAL

Maintenance of Ugandan population of *Crocodylus niloticus* in Appendix II

B. PROPONENT

The Republic of Uganda

C. SUPPORTING STATEMENT

1. Taxonomy

11. Class : Reptilia

12. Order : Crocodylia

13. Family : Crocodylidae

14. Species: *Crocodylus niloticus*

15. Common Names: English: Nile crocodile
French: Crocodile du Nil
Spanish: Cocodrilo del Nil

16. Code Numbers:

2. Biological Data

Uganda is a landlocked country lying astride the Equator between about 4°N and 1°S and stretching from about 39.5°W to 35°E. It occupies an area of about 241,030 km^2 of which about 36,328 km^2 is open water and about 7,707 km^2 is permanent swamp. Protected areas, namely national parks, wildlife and forest reserves account for about 30,870 km^2, which is approximately 12.8% of the total area of the country.

The Nile crocodile is one of the best studied crocodilians in the world. There is considerable information on its general biology, ecology, population and conservation status. Available literature includes Cott (1961), Graham (1968) and Hutton (1984).

21. Distribution: The Nile crocodile is widely distributed in suitable habitats in most parts of Uganda except in lakes George and Edward (Baker 1966, Churchill 1908, Cott 1954, 1961, Hippel 1946). However, there have been recent, sightings in these lakes.

The population below Murchison Falls was always noted for its high density (Cott 1961, Parker and Watson 1970). Crocodile numbers and geographical range in Uganda were reduced during the 1950s and 1960s because of heavy hunting.

In 1974, the Government of Uganda promulgated Statutory Instrument No. 75 of 1974 by which the sale of crocodile skins was banned. Since that ban, there has been a gradual recovery of crocodile populations, although their numbers are still very low in many of the habitats in which the species is present. Crocodiles have been sited in parts of the Nile River outside Murchison Falls National Park: in Semliki River, in lakes Kioga, Victoria and Albert.They are reported to occur in several other places such as Wenyenye in Kidepo Valley, Wansolo on Lake Kwaniya, lake Mburo e.t.c. Murchison Falls National Park, which is about 3840 km^2, remains the stronghold of the Nile crocodile in Uganda although their numbers are lower than in the 1960s.

22. In November 1996 a baselinne survey was carried out and the results are given in annex III.

Prior to this survey, the responsibility for regular counts of Nile crocodiles rested with the Fisheries Department. The newly enacted Uganda Wildlife Statute 1996 now gives responsibility to the Uganda Wildlife Authority to manage the populations of Nile crocodile in Uganda.

Murchison Falls population: The crocodile population of Victoria Nile, between Murchison Falls and Lake Albert, is almost entirely within the Murchison Falls National Park. This population has always enjoyed a full protection status, although poaching is reported to have taken place during the 1950s (Cott 1961).

23. Habitat: Uganda is a relatively small country, with a rich diversity of habitats that support equally a large diversity of species. It is an important watershed with several open waters and permanent swamps, which account for about 19.3% of the total area. Some swamps, especially those dominated by papyrus, are not suitable habitats for the Nile crocodile. They prefer more open water bodies with sand banks because they provide for basking and nesting places. Brief description of major habitats is given as annex IV.

3. Trade Data

31. National utilization: All forms of utilization of Nile crocodile in Uganda were prohibited under the Statutory Instrument No. 75 of 1974. The prohibition is still in force with respect to the hunting and trade in skins of wild-taken crocodiles.

As an effort towards the implementation of Nile crocodile management programme, in February 1991 the Board of Trustees of Uganda National Parks, in agreement with the Department of Fisheries, authorized Uganda Crocs Ltd. to collect eggs from Murchison Falls National Park to start a crocodile ranch at Katebo on the shores of Lake Victoria. Uganda Crocs Ltd. was given authority to collect 4000 eggs annually for a period of 10 years. The progress made by the ranching operation and its contribution to restocking the park were to be reviewed every five years. That review was carried out in 1996, following which the Board stopped Uganda Crocs Ltd. from collecting eggs mainly because the company had failed to comply with the agreed schedule of returning juveniles to the park.

32. Legal international trade: As already indicated above, Uganda does not allow trade in wild-taken skins of the Nile crocodile.
In 1992, Uganda successfully submitted a proposal to the eighth meeting of the Conference of the Parties for the transfer of its population of the Nile crocodile to Appendix II under ranching, but subject to an annual export quota of 2500 skins. Uganda was not able to submit a proposal at the ninth meeting of the Conference of the Parties, to maintain its population in Appendix II. However, Uganda requested the Conference to grant it an extension under the quota system for another period, in accordance with Resolution Conf. 7.14. Accordingly Uganda was granted an annual export quota of 2500 skins for the years 1995, 1996, and 1997. Record of skins exported until 1995 is shown below:

Year	Belly skin	Horn back
1993	2078	1941
1994	798	-
1995	624	-
Total	3500	1941

33. Illegal trade: There has been no evidence of any illegal taking and export of crocodile skins since the 1974 ban. Any illegal exports that may have taken place will have been very limited and may have been encouraged by a lack of control in some of the neighbouring countries. However, except for Kenya and the United Republic of Tanzania, the populations of the other neighbouring countries are included in Appendix I of CITES and these countries do not allow any exports of crocodile skins or other products.

34. Potential Trade Threats

341. Live specimens: The Government of Uganda does not authorize trade in live specimens of crocodiles either within the country or for export.

342. Parts and derivatives: There is at present no domestic industry for processing crocodile parts and derivatives, be it from skin or meat. Internal market for such products is almost non-existent at present and therefore illegally acquired skins are unlikely to find a market.

4. Protection Status

41. National: A new Wildlife Statute was enacted by Parliament in June 1996 and it came into effect on (1 August 1996). The Statute provides for the protection of crocodiles throughout the country and places this responsibility under the Uganda Wildlife Authority, also established under the provisions of the same Statute. The Statute establishes a number of wildlife use rights, including wildlife ranching. The Executive Director of the Authority controls the issuance of permits and licences.

42. International: While the Nile crocodile is included in Appendix I of CITES, populations of eleven range States, including that of Uganda, are included in Appendix II under the provisions of Resolution Conf. 3.15. That of Uganda was transferred to Appendix II in 1992, with a specified export quota. Any exports of skins from Uganda have been from ranched specimens and subject to full

compliance with CITES provisions, and agreed procedures for international controls on exports and imports of crocodilian skins and other products.

Besides internal controls, Uganda needs the co-operation of its neighbours in controlling exports. Uganda, the United Republic of Tanzania, Zambia, Ethiopia e.t.c have already ratified the Lusaka Agreement on Co-operative Enforcement Operations Directed at Illegal Trade in Wild Fauna and Flora (Lusaka, September 1994). The Agreement provides for co-operation between contracting States in curbing illegal crossborder trafficking and trade in wild fauna and flora and their products.

43. Additional protection needs: Uganda is in the process of identifying additional prime wildlife conservation areas, including suitable crocodile habitats, with a view to bringing these under protection. These areas include important wetlands, many of which are not yet included in the network of protected areas. IUCN is assisting with the identification of these areas.

The 1996 Statute provides for the development of community-based wildlife conservation programmes and projects. Under this option, it is expected to popularize the Nile crocodile, especially within the fishermen communities, wherefore they may be expected to co-operate in protecting the species while deriving some direct benefit from it.

5. Information on Similar Species

Crocodylus cataphractus is reported as being present in some rivers of western Uganda but this has not been reliably confirmed. The proposed management programme of *Crocodylus niloticus* does not affect *Crocodylus cataphractus*.

6. Comments From Countries of Origin

The proposal concerns the Nile crocodile population of Uganda only, which has been in Appendix II of CITES under ranching since 1992. It is very unlikely that the maintenance of this population in that Appendix II, under ranching, will affect in any way populations of other range States.

7. Ranching Proposal

71. Background:

711. Institutional framework: As mentioned in some of the previous sections, in June 1996 the Parliament of Uganda enacted the Uganda Wildlife Statute of 1996. Crocodiles, which were previously covered by Fisheries Act, are now covered by this Statute. The Statute recognizes the importance of the sustainable use of fauna and flora, including the involvement of communities that cohabit with them, and the need to develop programmes to this end.

The Statute also created the Uganda Wildlife Authority, replacing the Game Department and Uganda National Parks as a parastatal institution responsible for protected areas and the wildlife outside these.

Furthermore, a wildlife conservation fund - Wildlife Fund - has been established under the Statute into which may be vested, among other sources, revenue earned from the sale of confiscated wildlife specimens, fees and charges receivable under the Statute and any other sums received by the Authority in the performance of its functions under the Statute.

712. Crocodile management policy: In 1991, Uganda initiated a crocodile ranching project, as an experiment. Based on the experience gained from that project, the Uganda Wildlife Authority has formulated a crocodile management policy. The text is included with this proposal as Annex I. Essentially, the accent is on the establishment of ranching operations based on collection of eggs from specified sites within and outside protected areas and returning a percentage, 5% under the present ranching programme, of the hatchlings to these and other sites for restocking purposes.

713. Experience gained from previous ranching operation: In 1991, Uganda National Parks and Fisheries Department licensed Uganda Crocs Ltd. to start an experimental crocodile ranching operation at Katebo on the shores of Lake Victoria, in Mpigi District. The annual egg collection quota that was granted was 4000 eggs from 76 nests, which represented 70% of the nests counted. Clutch size averaged 50 eggs (Kaija personal communication). Thirty percent of (the nests were deliberately left undisturbed in order to allow the monitoring of natural recruitment.

In February and March 1991, Uganda Crocs Ltd. collected 4050 eggs from 76 nests in Murchison Falls National Park. Of these, 30 eggs were rejected as inviable.

Of the 4020 eggs incubated, 3483 eggs (80%) hatched of which 90% survived. It is on the basis of this in 1992 Uganda successfully presented a proposal at the eighth meeting of the Conference of the Parties agreed to the transfer of the Nile crocodile population to Appendix II.

The first batch of 182 juvenile crocodiles, of which 52% were below 1.2 m, were released in Murchison Falls on 23 and 24 October 1993. In the crocodile management plan, the recommended length for the release was between 1.3 m and 1.5 m.

Until 1995, the company continued to collect about 4000 eggs annually. The nesting sites where egg collection occured marked on a 1:50,000 map of the river banks. They reported on eggs collected, hatching rates and mortalities, as under:

	1991	1992	1993	1994	1995
Eggs collected	4.050	4.025	3.244	3.914	3.887
Hatchedos	3.483	3.381	2.337	3.405	3.565
Infertile	567	644	907	509	322
Hatching rate (%)	86	84	72	87	88
Mortalities	288	560	1.232	636	1.357
Mortality rate (%)	8,3	17	52	18	38

Uganda Crocs Ltd. lost its experienced veterinary surgeon in 1992 and this loss severely affected the monitoring of the captive crocodiles and, as a result mortality shot up in 1993 and 1995.

714. Monitoring: Counts of the number of nests between Murchison Falls and the delta at Lake Albert were made in 1968, 1969 and in 1991 at the start

of the ranching operation project, and from 1993 through to 1996. The results are summarized below.

Number of Nests between Murchison Falls and Delta to Lake Albert

Date	Count by	Total	Source
April 1968	Cott	176	Cott 1969
April 1969	Cott	181	Cott 1969
Feb 1991	UNP	108	UNP Report
Feb 1994	Kaija	102	UIE Reports
Feb 1995	Kaija	112	UIE Reports
Feb 1996	Kaija	120	UIE Reports

715. The future: Ecological monitoring to determine the survival and dispersal of released crocodiles has been established, including the review of the general ecology of the entire Nile crocodile population of Uganda. The review has included studies of habitat preference, population structure of the wild populations and nesting behaviour.

Uganda Wildlife Authority has established a wildlife research and monitoring unit, which will be responsible for monitoring the ranching programme, especially the release of juveniles and the recovery of beneficiary wild populations.

Because of the failure of Uganda Crocs Ltd. to comply with the terms agreed for the collection of eggs and subsequent raising of crocodiles on the ranch, the company will only be allowed to care for the stock it had in 1996.

One company has already proposed to continue ranching of crocodiles at Entebbe, only 40 km from Kampala where the Uganda Wildlife Authority Headquarters is located. This will make it easy to supervise the ranching operation.

716. Problem animals: There has been increasing complaints by fishermen and by a few agricultural communities about the destruction of life and property by crocodiles. Previously such animals have been killed and their skins, which are State property, have been recovered but not exported. The Uganda Wildlife Authority intends to move such animals to protected areas whenever possible. Where this is not feasible, the animals concerned will have to be killed. Therefore the Government of Uganda would like to include in its Nile crocodile management programme a small discretionary annual export quota of wild-taken skins, not exceeding 25 skins, for nuisance animals only. This quota may not be used at all in any one year. Revenue recovered from the sale of the skins will be paid into the Wildlife Fund to be used for the conservation of crocodiles in the country. The Uganda Wildlife Authority will be the only determining body on whether or not the problem animal should be short and, if so, only its field staff will carry out the task of eliminating the animal for as long as sport hunting is closed in Uganda. Should the ban on sport hunting be lifted, then the

Uganda Wildlife Authority may seek maximum possible financial gains,by offering such nuisance animals to safari hunters a proportion of which will be given to local communities effected for community development projects and the other for the conservation of crocodiles in the country.

72. Establishment of experimental egg collection quotas

The annual quota for the collection of eggs will remain similar to that established in 1991, that is 4000 eggs.

73. Additional data collection and population monitoring

Regular monitoring of the performance of the status of re-stocked population in Murchison Falls area was started in 1993. The result of a population status survey conducted in February 1996 in this area is shown below. It includes observations on the survival of juvenile crocodiles that were released by Uganda Crocs Ltd.

Population Density and age ratio of crocodiles between Murchison Falls and Lake Albert (February 1996 census) includes observation on survival of juvenile crocodiles that were released by Uganda Crocs Ltd.

Section	Age class	Number of crocodiles	Distance in Km	Density per Km	Ratio TJ.SA.A
Falls Sambye	A	76		12.76	
A	SA	12	6	2	0.01:0.012:1
	TJ	2		0.33	
Sambye	A	32	5.5	5.83	
Nyamusika	SA	15		2.72	0.25:0.46:1
B	TJ	8		1.45	
Nyamusika	A	19		4.47	
Paraa	SA	14	4.0	3.55	0.39:0.73:1
C	TJ	7		1.75	
Paraa	A	18		1.5	
	SA	14	12.0	1.16	0.39:0.78:1
D	TJ	7		0.58	
Delta to	A	9		0.69	
Lake Albert	SA	8	13	0.61	1.33:0.89:1
	TJ	12		0.92	
Totals		253	40.5		

A = Adult SA = Sub-adult TJ = Tagged juveniles

In addition to the figures given in the table above, 38 hatchlings of about 75 cm

were observed and 25 untagged juveniles were also seen, which brings the total count to 316 young crocodiles.

74. Expansion of Egg Collection

See section 72 above. Any increase in this quota will be in consultation with the Secretariat and will be determined largely by the success of the restocking programme, the recovery of re-stocked populations and the result of surveys on the population status of crocodiles within and outside protected areas.

The collection of eggs will be conducted under the strict supervision of a monitoring officer. This officer will also oversee the release of juveniles resulting from ranching operations.

75. Return of Hatchlings into the Wild

By the end of 1996, Uganda Crocs Ltd. had returned only 407 juvenile crocodiles to Murchison Falls, of which 61 died en route to the release site. On 8 March 1996, some 159 juveniles were released into the first batch of wild in Murchison Falls and another 700 juveniles are (expected to be) released in the same area early in 1997.

As already stated in section 74 above, the monitoring officer based at Murchison Falls National Park will also supervise the release programme in order to ensure that releases are on suitable sites along the river and to minimise loses.

76. Housing Requirements

The CITES Management Authority and the Executive Director of the Uganda Wildlife Authority have approved a management plan submitted by Imperial Botanical Beach Hotel Ltd., which has financial capability and expertise, to continue with the crocodile ranching programme.

The housing requirements provided by Uganda Crocs Ltd. were adequate. The company may therefore be authorized to resume ranching of crocodiles on the condition that it has adequate financial backing and expertise, the latter being the most crucial.

77. Harvest and Tagging

771. Harvest: At the time of making this proposal, Uganda Crocs Ltd. had 4740 juvenile and adult crocodiles on the ranch, of which 5% are to be released into the wild during 1997.

Any new company engaging in ranching of crocodiles is unlikely to export skins before 1998/99. The maximum annual production that may be expected is likely not to exceed 3600 skins if the annual egg collection quota remains at 4000 eggs.

From experience gained from crocodile farmers in Zimbabwe, it may be expected that on the average about 10% of eggs that are collected are infertile. A 10% of the hatchlings die within one year after successfully hatching and another 2% are lost thereafter through natural death and other causes (J. Hutton, pers. communication). It follows from this that, during the period 1996 to 2000 and based on current stock and 4000 eggs that are to be collected during 1996, exports of crocodile skins by Uganda may

be expect to be as in the table below.

Year	Eggs Hatchlings		Juveniles	5% release	Max. no. of skins
1996/97	-	-	4.740	237	4.500
1996	4.000	3.240	0	0	0
1998	4.000	3.240	3.175	159	0 + 25 w
1999	4.000	3.240	xxxx	xxxx	3.016 + 25 w
2000	4.000	3.240	xxxx	xxxx	+3.016 + 25 w

772. Tagging: As in the past, any skins to be exported by any crocodile ranching operation in Uganda will be in compliance with the provisions of Resolution Conf. 9.22 on universal tagging system. Tags will be ordered through the CITES Secretariat or direct by the CITES Management Authority of Uganda, in which case the Secretariat will be informed.

78. Products: The products that have been exported have included belly skins and horn backs.

Attempts have been made to sell crocodile meat locally but there has been little success. Potential for external markets is being investigated.

79. Monitoring and Reporting Procedures: Monitoring and reporting procedure will be as outlined in annexes I and II to this proposal.

8. References

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ANNEX I

POLICY AND MANAGEMENT PLAN FOR THE NILE CROCODILE IN UGANDA

Introduction

The Nile crocodile Crocodylus niloticus grows up to 5 m in length and is the dominant predator of the water's edge throughout much of sub-Saharan Africa.

The presence of this animal can conflict severely with human interests such as fishing and livestock production. At the same time, the hide of the crocodile is of considerable value in commercial trade. For these reasons, crocodiles were hunted and their numbers much reduced in Africa in the 1940's, and 60's.

In Uganda, the removal of formerly ubiquitous and common crocodiles allowed the widespread introduction of gill net fishing and this, probably more than any other factor, has prevented the animal from re-establishing itself as it has elsewhere in Africa.

The issue of crocodile management in uganda is, therefore, complex, requiring both conservation and control measures and including sustainable use.

Policy For Crocodiles

1. The Government of Uganda will ensure that crocodiles do not become extinct in Uganda, and to this end will conserve and encourage the species to survive wherever this does not conflict with legitimate human interests.

2. Conservation measures may include sustainable use where this can be shown to be beneficial to wild populations.

3. Wherever they adversely affect human populations, crocodiles will be discouraged and may be subject to control methods.

4. Crocodiles in uganda will be managed according to a management plan for the species drawn-up by Uganda Wildlife Authority in consultation with CITES Management Authority.

5. Management activities will be undertaken by Uganda Wildlife Authority.

Management Plan For Crocodiles

1. Management within different areas of Uganda

   (i) Within National Parks and Wildlife Reserves crocodiles will be managed to remain above minimum viable levels, at least, and will be encouraged to increase to levels corresponding to those attained in recent history.

   (ii) Elsewhere, crocodiles may be managed for a sustainable off-take, or controlled as necessary. Until regular censuses confirm increasing populations, for the moment fixed quota egg collection will be the best means of developing sustainable use of the resource.

   (iii) Uganda Wildlife Authority will monitor the status of wild crocodiles in all areas and

report to CITES annually as required.

2. Management Authorities

(i) The management of wild crocodile will be the responsibility of the Uganda Wildlife Authority.

(ii) Crocodile utilization in any form, anywhere in Uganda will be subject to the scrutiny, approval and co-ordination of the CITES Scientific Authority for Uganda.

(iii) All crocodile utilization, including crocodile ranches, will be licensed by the Executive Director Uganda Wildlife Authority.

3. Sustainable Use

(i) Sustainable use will normally be restricted to crocodile ranching, according to the CITES definition, involving the collection of eggs.

(ii) As noted in Section 2 (iii) above, all crocodile ranches will be subject to:

(a) Approval from the CITES Scientific Authority
(b) Permit from Executive Director Uganda Wildlife Authority (UWA)
(c) Approval and licence from the department responsible for the land on which the ranching occurs.

(iii) Applicants wishing to undertake crocodile ranching will submit a written proposal to the CITES Scientific Authority indicating , at least:

(a) Expertise in the field of crocodile farming;
(b) Finances sufficient for three years of operation without an income;
(c) Adequate land and water resources for the size of ranch outlined;
(d) Access to sufficient food to feed the number of crocodiles requested;
(e) Specific information on the source of crocodile eggs and written approval from the appropriate authority.

(iv) In all ranching situations, a number of crocodiles equivalent to 5% of the number of eggs collected will be made available to UWA for restocking depleted habitats. These will be transported at the expense of the rancher to the point of release.

(v) The animals made available for re-stocking will be:
(a) In the ratio of 4 females to 1 male;
(b) 1.3-1.5 total length;
(c) In good health and acclimatized to a natural environment after spending at least 6 months in a semi-natural enclosure at the licensed ranchers' expense.

(vi) If the return of a cohort of animals is not requested within three years of the collection of the eggs producing those animals, the requirement for the return of that cohort will fall away.

(vii) No rancher will reintroduce any crocodile stock to the wild except under the supervision of the relevant authorities.

(viii) Egg quotas will be decided by the Scientific Authority and will normally be renewable for a minimum of five years, as will all permits from the Executive Director, Uganda Wildlife Authority.

(ix) Egg collection will be supervised by officers of the Authority.

(x) Licensed ranchers will be required to make the following written reports each year to the CITES Scientific Authority, and Executive Director Uganda Wildlife Authority.

(a) By 30 June a report giving:

- the number of nests opened;
- the locality of each nest marked on a 1.50 000 map;
- the total number of eggs in each nest;
- the number of eggs rejected from each nest;
- the number of eggs incubated and the number hatched.

(b) by 31 December a report giving:

- the mortality rate of animals in each year class over the last 12 months and the causes of such mortality, and
- production, sales and export of products in the last 12 months.

4. Export of crocodiles, their parts and derivatives

(i) The export of live crocodiles of any status or origin will be discouraged.

(ii) All hide exports will enquire a CITES permit and will bear a tag complying with the CITES Uniform Marking System. These will be paid for by the appropriate licensed rancher.

(iii) A CITES export permit will only be granted where the rancher supplies:

(a) A completed application form;
(b) A detailed packing list with a skin size for each numbered tag;
(c) A proforma invoice.

ANNEX II

OUTLINE CROCODILE MANAGEMENT PLAN FOR MURCHISON FALLS NATIONAL PARK

Objectives

The objectives of crocodile management in Murchison Falls National Park are to maintain the breeding population of crocodiles between Murchison Falls and Lake Albert above minimum viable levels, at least and to increase this and other sub-populations wherever possible.

Methods

1. Crocodiles will be conserved through a system of "headstarting" in which crocodile eggs are removed from the Park and hatched, and young crocodiles raised in captivity until they can be released into the wild with a high probability of survival.

2. This system of conservation will be implemented for a further period of 10 years from 1977 and will rely on private sector involvement in which a portion of the eggs removed are reared in a crocodile "ranch" for commercial skin production, the farmer carrying all expenses and responsibilities related to there turn of juvenile animals to the Park.

3. This return of juvenile crocodiles will include a number of animals equivalent to 5% of the eggs removed from the Park.

4. The initial egg quota will be 4,000 p.a and will include infertile eggs, or those inviable for other reasons.

5. After five years this quota will be reassessed and may encompass all eggs laid provided the survival of released animals is satisfactory.

6. No individual crocodile "rancher" will receive a quota in excess of 4,000 eggs p.a, nor will a quota normally be given for a period exceeding 10 years.

7. The Uganda Wildlife Authority will monitor the survival of the first three cohorts of juveniles released into the park.

8. The juveniles to be released will be:

   (a) Acclimatized to living in the wild by their maintenance in semi-natural conditions for at least six months before release.

   (b) 1.5 m total length
   (c) In the ratio 4 females to 1 male.

9. Juveniles will not be released in any locality in numbers exceeding 25 individuals. Every attempt will be made to effect the release in "Juvenile" habitat.

10. To prevent further depletion of the crocodile population between Murchison Falls and Lake Albert fishing in this stretch of the Victoria Nile is prohibited.

11. For purposes of egg collection, the Victoria Nile will be divided into four egg collecting zones:

    Zone A: From Murchison Falls - Paraa crossing. North Bank
    Zone B: From Murchison Falls - Paraa crossing. South Bank
    Zone C: From Paraa - North Bank
    Zone D: From Paraa - South Bank

from the Executive Director of Uganda Wildlife Authority. The first

12. Licensed "ranchers" will be given a priority rating based on the date of approval of their permission to collect eggs from the Executive Director of Uganda Wildlife Authority. The first licensed ranch will commence egg collection in Zone A. If the Executive Director is satisfied that after every reasonable effort, the license holder has been unable to collect his full quota in Zone A, he may be allowed to transfer his activities to Zone B, and so on.

13. Each collector will be given one week to collect his quota, the first being required to finalize all egg collecting activities by 10 February at the latest.

14. Any subsequent collector will be required to commence collection in Zone A, moving to subsequent zones only when all reasonable efforts to locate eggs are no longer successful.

15. Licensed egg collectors will be required to:

    (a) Employ crocodile "wardens" between 1 January and 1 April each year to locate and guard crocodile nests from predation.

    (b) Record the precise location of each nest opened for collection with a cross reference to a data card giving the number of eggs in that nest and their fate.

    (c) Record the precise location of any nests of the season which were found predated during the course of collection activities.

16. The crocodile population of the Victoria Nile between Murchison Falls and Lake Albert will be subject to annual monitoring. This will comprise a series of aerial surveys during February of each year.

ANNEX III

A REPORT OF BASELINE SURVEY OF SUSPECTED CROCODILE POPULATIONS

SUMMARY

This survey was initiated by the Commissioner of Wildlife for Uganda and forms the basis of Uganda's submission to the 1997 CITES meeting. Uganda's Nile crocodile (*Crocodylus niloticus*) population was moved to Appendix II under the ranching criteria in 1992 and an annual export quota of 2 500 ranch produced skins is permitted until the end of 1997. Uganda will be applying for the maintenance of its' Nile crocodile population on Appendix II at the 10th COP.

This short study had three main aims. These were:

1 To collate as much information on the population status of the Nile crocodile in Uganda as possible using existing information and aerial and spotlight counts.

2 To train members of the Ugandan Wildlife Authority (UWA) in crocodile census techniques.

3 To produce a survey and monitoring plan to guide future survey work on the Nile crocodile in Uganda.

Uganda is 236 580 km^2 in area and almost 20% of this is lake or permanent swamp. The population is in excess of 16.5 million or an overall density of 70 people per km^2. However, this is not evenly distributed and some areas, especially those near the lakes and major rivers, probably have far higher densities.

The majority of Ugandans live off the land - as farmers or fishermen. The high densities of people and the active promotion of the fishing industry since the early part of the century has had a detrimental effect on the crocodile population.

The climate of Uganda is determined by the SE Trade Winds, the NE Trade Winds and the SW Monsoon. Rainfall is highest between March and May and again in October/November. Most of central Uganda receives 1000 to 1500 mm per annum with the north being more humid than the south. Lake Victoria has its own micro-climate and there is no harsh dry season. The Lake Victoria lakeshore region receives in excess of 1200 mm per annum. The Ruwenzori mountains on the Zaire border receive in excess of 2000 mm per annum on the drier eastern slopes and more than 3000 mm on the wetter western slopes (in Zaire). The driest part of the country is the Karamojo District on the Kenyan border and precipitation there is approximately 600 mm per annum.

The hydrology of Uganda is dominated by the Nile river and its system of feeder lakes and swamps. Over 15% of Uganda is open water. For the purposes of this report the country has been divided into the following zones.

1 Lake Victoria
2 Lakes Kyoga and Kwania (including the southern Victoria Nile)
3 Lakes George and Edward and associated rivers (eg Katonga)
4 Kafu/Nkusi system
5 Semliki Valley and southern Lake Albert
6 Victoria Nile and northern Lake Albert (including Murchison Falls)
7 Albert Nile (from Pakwach to Nimule in the Sudan)
8 Achwa, Pager and Agago system
9 Lake Mburo system

Historically the Ugandan crocodile population has been systematically exterminated since the 1930's as an official management policy by the Colonial Government. In many parts of the country local populations of crocodiles near human settlement are extinct.

Current utilisation of the Nile crocodile is limited to the Murchison Falls population where collection of eggs is permitted. The management plan requires that 5% of these are returned to the river. To date almost 20 000 eggs have been collected.

During this study both aerial and night counts were possible over and on selected rivers and lakes in Uganda.

Rivers and lakes surveyed in Uganda in 1996

River or Lake	Aerial Survey	Night Survey
Lake Victoria		51 km shoreline
Lake Albert	Familiarisation survey	
Lake Kyoga	10 km shoreline	36 km shoreline
Lake Edward	20 km shoreline	10 km shoreline
Lake George	5 km shoreline	
Victoria Nile	120 km shoreline	25 km shoreline
Albert Nile/Lake Albert	44 km shoreline	
Semliki	Familiarisation survey	
Kafu	Approx 200 km	

The results of these surveys are briefly summarised below.

Summary of surveys for crocodiles in Uganda -1996

Aerial Surveys	Density (Crocs/km)	Night Counts	Density (Crocs/km)
Victoria Nile	0.35	Victoria Nile	18.3 to 1.6
Victoria Nile	8.80	Lake Mburo	0.29
Lake Albert	0.20	Lake Victoria	0.00 to 1.00
		Lake Nawampasa	2.01
		Lake Kyoga	0.00
		Kazinga Channel	0.38
		Lake Edward	1.25

These surveys indicate that, although the crocodiles in Uganda have been systematically slaughtered since the 1930's - partly as a result of opening up areas for fishing and partly as a result of the skin trade - it appears that there are signs that the population is recovering in some areas.

As a general conclusion it is probably fair to say that crocodiles occur in low densities in most Ugandan waterways but have also been completely exterminated in parts of them, especially close to settlement. However, more work needs to be carried to ascertain the validity of this statement. A brief outline of the work proposed is part of this document.

1. INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

This study was initiated by the Commissioner of Wildlife for Uganda and forms the basis of Uganda's submission to the 1997 CITES meeting. Uganda's Nile crocodile (*Crocodylus niloticus*) population was moved to Appendix II under the ranching criteria in 1992. An annual export quota of 2 500 ranch produced skins is permitted. This quota was extended at the ninth meeting in 1994 until the end of 1997. Uganda will be applying for the maintenance of its' Nile crocodile population on Appendix II at the 10th meeting in Harare.

This short study had three main aims. These were:

1 To collate as much information on the population status of the Nile crocodile in Uganda as possible using existing information and aerial and spotlight counts.

2 To train members of the Ugandan Wildlife Authority (UWA) in crocodile census techniques.

3 To produce a survey and monitoring plan to guide future survey work on the Nile crocodile in Uganda.

1.2 BACKGROUND

This section is a brief summary of the background to Uganda as far as it pertains to crocodiles. Special attention is given to descriptions of the lakes and rivers.

1.2.1 General

Uganda is 236 580 km^2 in area and almost 20% of this is lake or permanent swamp. The population is in excess of 16.5 million or an overall density of 70 people per km^2. However, this is not evenly distributed and some areas, especially those near the lakes and major rivers, probably have far higher densities.

The majority of Ugandans live off the land - as farmers or fishermen. The high densities of people and the active promotion of the fishing industry since the early part of the century has had a detrimental effect on the crocodile population.

1.2.2 Climate

The climate of Uganda is determined by the SE Trade Winds, the NE Trade Winds and the SW Monsoon. Rainfall is highest between March and May and again in October/November. Most of central Uganda receives 1000 to 1500 mm per annum with the north being more humid than the south. Lake Victoria has its own micro-climate and there is no harsh dry season. The Lake Victoria lakeshore region receives in excess of 1200 mm per annum. The Ruwenzori mountains on the Zaire border receive in excess of 2000 mm per annum on the drier eastern slopes and more than 3000 mm on the wetter western slopes (in Zaire). The driest part of the country is the Karamojo District on the Kenyan border and precipitation there is approximately 600 mm per annum.

The climate has been described in a little more detail than one would expect in a report about crocodiles. This is because the high rainfall is an important determinant of the hydrology and subsequently the available crocodile habitat. It is also important for the timing of any future surveys.

1.2.3 Hydrology and Drainage

The hydrology of Uganda is dominated by the Nile river and its system of feeder lakes and swamps. Over 15% of Uganda is open water. For the purposes of this report the country has been divided into the following zones (Figure 1).

1 Lake Victoria
2 Lakes Kyoga and Kwania (including the southern Victoria Nile)
3 Lakes George and Edward and associated rivers (eg Katonga)
4 Kafu/Nkusi system
5 Semliki Valley and southern Lake Albert
6 Victoria Nile and northern Lake Albert (including Murchison Falls)
7 Albert Nile (from Pakwach to Nimule in the Sudan)
8 Achwa, Pager and Agago system
9 Lake Mburo system

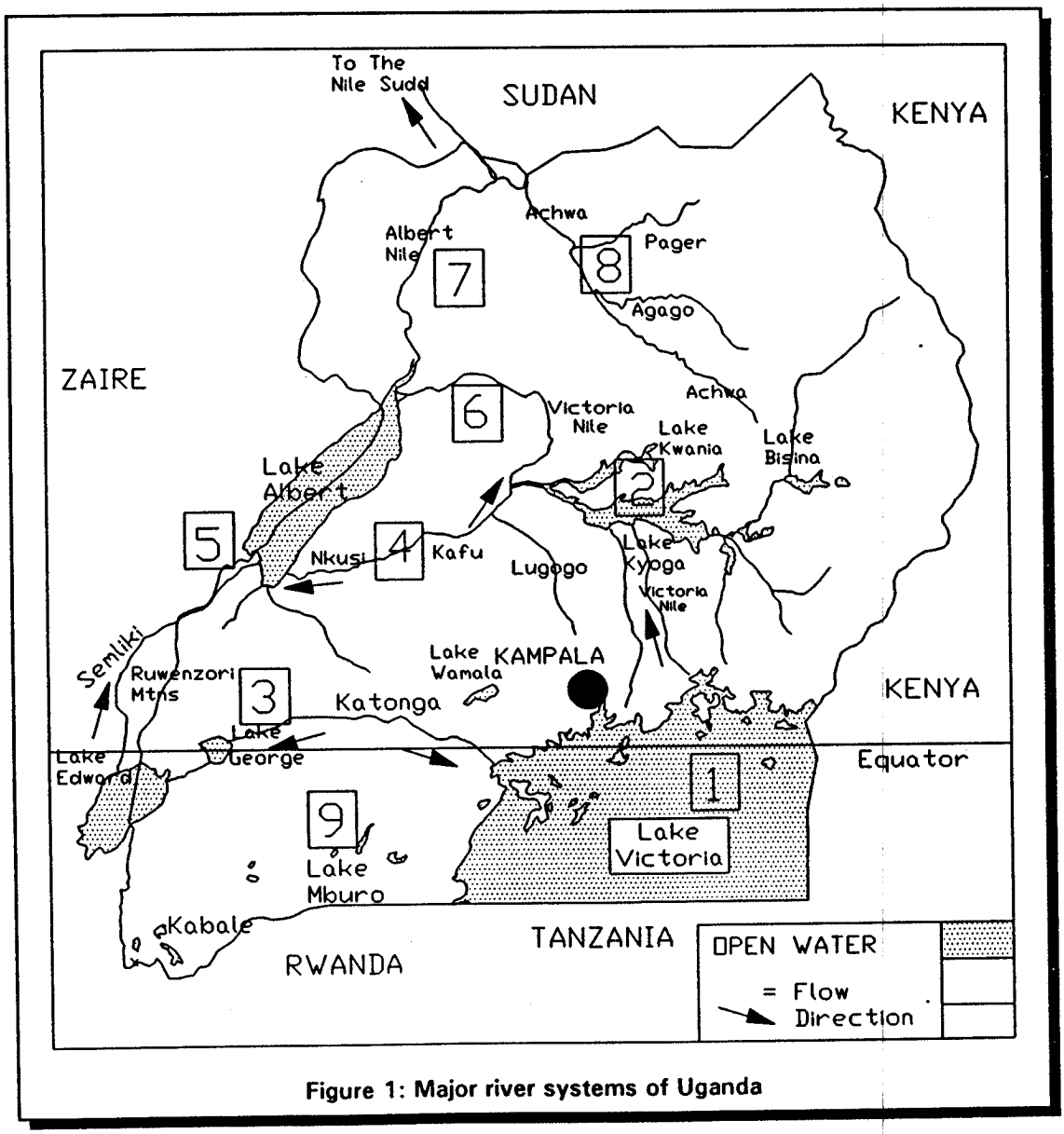

Figure 1: Major river systems of Uganda

2. METHODS

2.1 DATA COLLECTION

It was possible to carry out both aerial and ground counts on selected rivers (Plates 15 and 16). These are dealt with separately in this report.

2.1.1 Aerial Survey

Aerial survey was conducted from two different aircraft - a Cessna 206 with Robertson STOL conversion(5X-RSM) and a Piper Super-Cub (5X-UNM). The 206 was used for a single flight from Entebbe airport to Lake Kyoga, the Kafu river, Lake Albert, part of the Semliki river, the Kazinga channel and Lake George (Figure 3). Time and bureaucratic problems precluded further flights. On this flight two observers sat directly behind the pilot in anticipation of using the "tandem" counting technique while a single observer was seated on the right hand side.

The Super-Cub was stationed at Murchison Falls National Park and is used as part of their management strategy. We were allowed access to the aircraft for approximately five hours of flying. The configuration of the Super-Cub means that there can only be a single observer behind the pilot. This meant that banks had to be counted singly in separate passes.

Three flights (at different times of day) were carried out over the Victoria Nile between the Murchison Falls and either Lake Albert or Buligi post, counting both banks in separate passes. A single count was also possible between the Murchison and the Karuma Falls. Both banks were counted in single passes. A single count was also possible between the Pakwach bridge and the Wanseko village.

2.1.2 Spotlight Counts

Spotlight counts were possible on the Victoria Nile between the Murchison Falls and the Buligi ranger post. In addition counts were carried out on selected sections of Lake Victoria, Lake Mburo, Lake Kyoga and Lake Edward (Kazinga channel).

Counts were carried out from a "banana boat" on the Victoria Nile and from fishing boats in the other areas. During these counts an attempt was made to assign each sighting into a size/age class.

2.2 DATA ANALYSIS

2.2.1 Sample Counts

"Traditional" sample counts require that the river is stratified prior to survey and that selected representative samples are surveyed from each of the strata (Graham, 1988). In this way an overall estimate of the river is obtained and the coefficient of variation calculated.

Analysis of the sample counts followed the method outlined by Graham (1988) which was based on that of Jolly (1969). The coefficient of variance or CV (the standard error as a percentage of the estimate) is a measure of the precision of a count. It was estimated by first calculating S_d^2 with:

$$S_d^2 = \frac{(\sum d^2 - (\sum d)^2) \ / \ (n)}{(n - 1)}$$

where:
d = density of the samples
n = number of samples

The variance of the count (V) was then calculated by:

$$Var\ N = \left[\frac{Z^2}{n}\right] S_d 2$$

where:
Z = total length surveyed
n = number of samples

and the CV calculated by

$$CV = \left[\frac{\sqrt{V}}{N}\right] 100$$

where:
V = variance of the count
N = number of crocodiles

As these were not sample counts in the true sense (ie the whole length of the river was counted) a population estimate was not directly derived from them. Densities, and fluctuation thereof over the years was considered more important.

3. RESULTS

It was possible to carry out both aerial surveys and night counts for crocodiles in Uganda during November, 1996 (Figure 3).

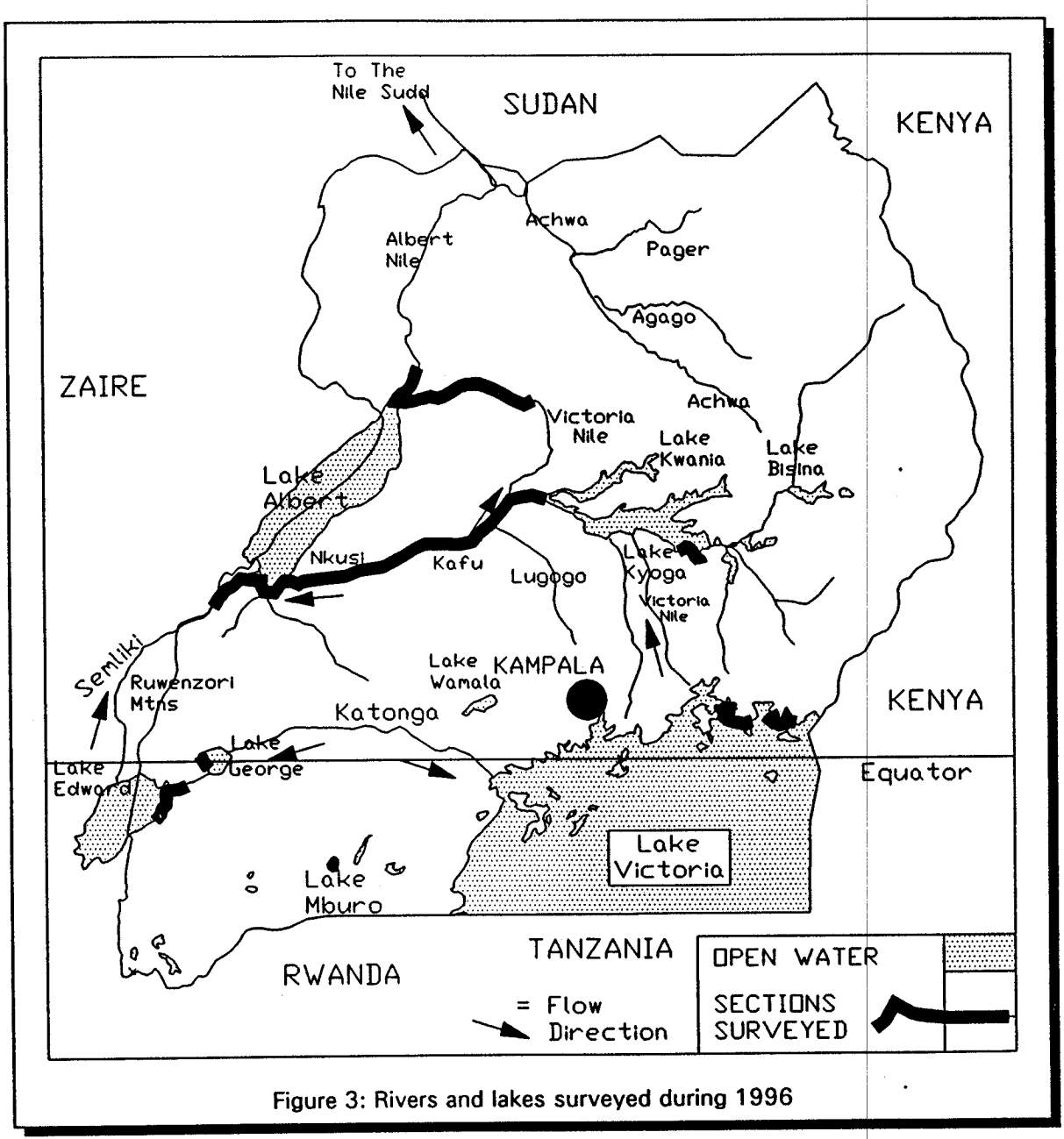

Figure 3: Rivers and lakes surveyed during 1996

3.1 AERIAL SURVEYS

3.1.1 Lake Kyoga, Kafu river, Lake Albert, Semliki river, Kazinga Channel, Lake Edward

This was a single flight which covered parts of all of these wetlands. A single crocodile was sighted on the Kafu river (Table 5).

Table 5: South-Western Uganda crocodile aerial survey

Wetland	Comments
Lake Kyoga	Approximately 10 km of shore surveyed east of the Kafu confluence. No crocodiles seen.
Kafu River	Almost the entire length of the river surveyed. One crocodile seen near the road bridge. River unsuitable for aerial survey.
Lake Albert	Parts of the eastern and southern shore surveyed. Problems with weather and the fact that there are no airstrips below the escarpment kept the survey very brief. No crocodiles seen but many fishermen around.
Semliki River	A "familiarisation" survey carried out. No formal survey due to the reasons outlined above. No crocodiles seen and the area is heavily settled.
Kazinga Channel	A military invasion of Uganda in this area on the previous day meant that the bridge over the channel had to be avoided. Consequently only a short section of the Kazinga Channel east of the Mweya Lodge was surveyed. No crocodiles seen.
Lake Edward	Surveyed from the Kazinga Channel to Kisenyi fishing village. No crocodiles seen.

3.1.2 Victoria and Albert Nile and the Murchison Falls National Park

The Victoria Nile in the Murchison Falls National Park was subdivided into three sections. These three sections had their own sub-units (Figure 4). They are dealt with separately as they are very different in terms of vegetation and hydrology.

1 Victoria Nile above the Murchison Falls

Between the Karuma and Murchison Falls the river falls 185 metres in 80 km. It is wide at first with many islands (Plate 11) but becomes narrower as it approaches the Murchison Falls. The river is essentially a series of rapids throughout this section (Plate 12).

2 Victoria Nile below the Murchison Falls

Here the river flows through a wide channel with sand-bars, mud-banks and vegetated areas (*Vossia* and water hyacinth; Plate 13) until it reaches its delta on Lake Albert. This delta is characterised by extensive papyrus swamps (Plate 14).

3 Lake Albert/Albert Nile

The section between the delta and the Pakwach bridge is probably more lacustrine than riverine. Fringing papyrus and *Vossia* is common as is the water hyacinth. The eastern bank is protected and forms part of the Murchison Falls National Park.

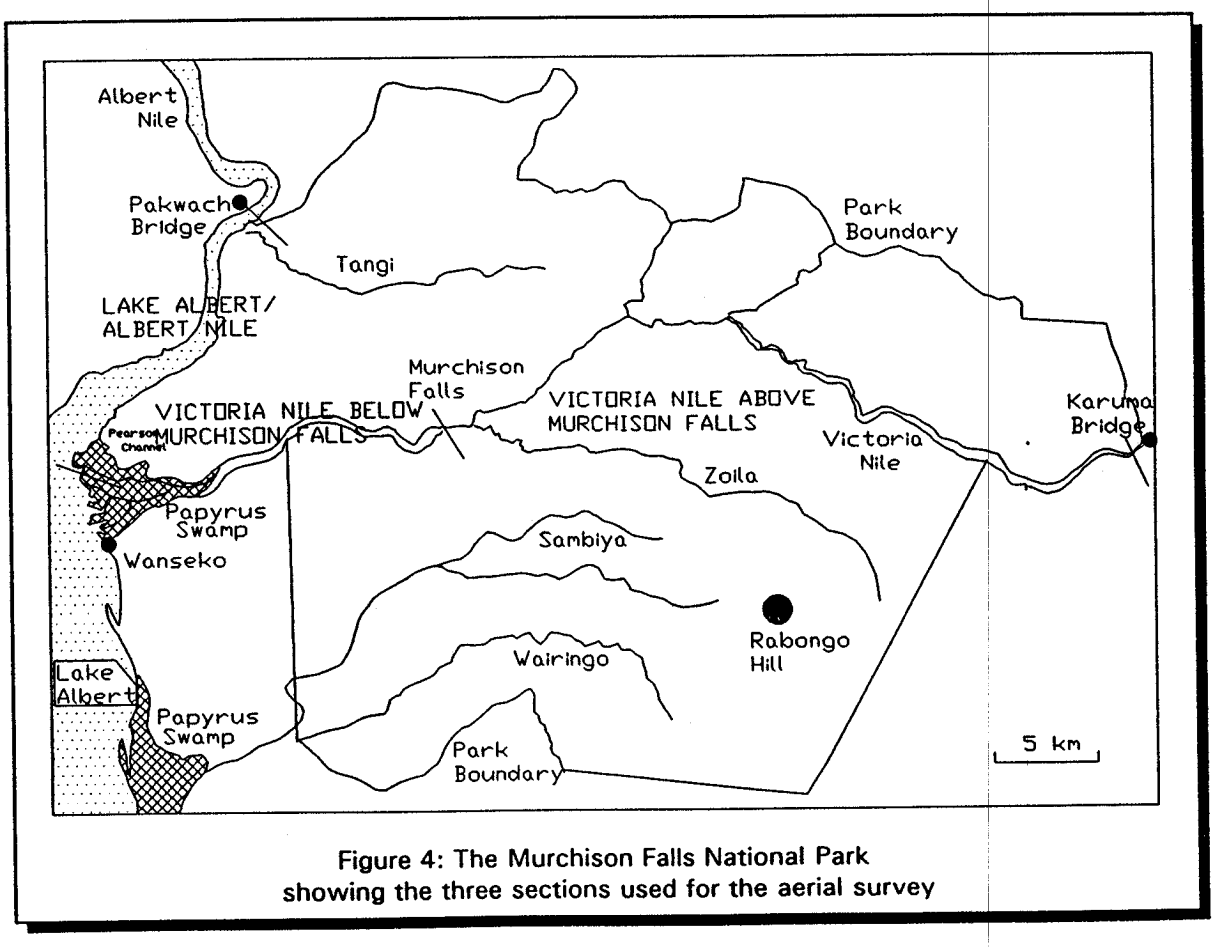

Figure 4: The Murchison Falls National Park showing the three sections used for the aerial survey

3.1.3 The Victoria Nile above the Murchison Falls

It was possible to survey the Victoria Nile between Karuma and the Murchison Falls. The Karuma bridge had to be avoided for security reasons. Twenty eight crocodiles were seen in 80 km giving an overall density of 0.35 crocodiles per kilometre (Table 6 and Figure 5). Densities varied between 0.08 and 0.5 crocodiles per kilometre.

Table 6: Aerial surveys between the Murchison Falls and the Karuma Falls

Section	Description	North Bank	South Bank	Totals	Distance	Density
1	Murchison Falls to Nile Bend	5	1	6	14	0.43
2	Nile Bend to Kibaa river	3	0	3	8	0.38
3	Kibaa river to Ayago river	1	0	1	12	0.08
4	Ayago river to Atlee Camp	1	2	3	10	0.30
5	Atlee Camp to Chobe Lodge	4	7	11	22	0.50
6	Chobe Lodge to Karuma Bridge	4	0	4	14	0.29
TOTAL		**18**	**10**	**28**	**80**	**0.35**

This river was not entirely suitable for aerial survey as it contains extensive sections of "white water" (rapids). The sections near the Karuma Falls were wide and contained numerous islands and coverage was consequently poor. However, it is probably impractical to conduct night surveys in most of this part of the river as the only feasible means of transport is a rubber raft. In 1995 a tour group travelled down this section and their raft was repeatedly attacked by large crocodiles which resulted in one crew member losing a finger.

3.1.4 Victoria Nile Below Murchison Falls

Three surveys were carried out between the Murchison Falls and Paraa (and below) at different times of day (Table 7). The best result was at 0800h and this is in accordance with Cott's observations (Cott, 1961).

The best count revealed 150 crocodiles on both sides of the river between the Murchison Falls and the Park Headquarters at Paraa. Less than 10% of these were seen on the south bank. In addition nearly 50% of the crocodiles seen on the north bank were in a backwater located immediately downstream of the gorge.

The midday count was believed to give a completely erroneous picture of the crocodile situation in this part of the river. One of the major attractions of the Murchison Falls National Park is a launch trip between Paraa and the Falls and going close to basking crocodiles is an integral part of the trip. This obviously means that the crocodiles vacate the banks. The launch was on its return journey when the midday survey was undertaken which added to the under-count. Future surveys should take this into account.

A comparison between this survey and the 1969 and 1991 surveys showed that there was a marked decrease in the last 27 years (Table 8). However, there was a considerable increase from the 1991 survey (as indicated by density). There are two factors that need to be considered before this can be regarded as real (and the authors believe that it is not). Firstly the 1991 survey started at 0900h and secondly it is difficult to tell if the aircraft circled the backwater adjacent to the gorge where nearly 50% of crocodiles were seen on this survey. What is apparent though is the decline from since the late 1960's.

Table 7: Aerial surveys of the Victoria Nile below the Murchison Falls (November, 1996)

			Start 17:30		Start 08:10		Start 11:50	
Section	Description	Distance	North Bank	South Bank	North Bank	South Bank	North Bank	South Bank
1	Murchison Falls to 1st Bend[1]	6	58	3	99	3	52	1
2	1st Bend to Nyamsika river[2]	5.5	20	2	33	7	7	0
3	Nyamsika river to Paraa crossing[3]	4	27	4	5	3	3	0
4	Paraa crossing to Buligi Post	10	7	2	5	NR	3	NR
5	Buligi Post to Lake Albert	15	9	NR	NR	NR	NR	NR
TOTALS	Murchison Falls to Paraa Crossing		105	9	137	13	62	1
TOTALS			121	11	142	13	65	1

[1] Includes a circuit of a pool immediately on the exit to the gorge on the north bank
[2] Includes "Parker Island". Numbers added to the north bank total.
[3] Most crocodiles are seen at the Nyamsika river mouth
NR No Records

Table 8: Density indices for the Victoria Nile between Murchison Falls and Lake Albert estimated from aerial surveys

Section		1969[1]	1991[2]		1996 16:30	1996 08:00	1996 11:50
Murchison Falls to 1st Bend	*North Bank*	34.0	1.5	1.7	9.7	16.5	8.7
	South Bank	14.5	0.2	0.5	0.5	0.5	0.2
1st Bend to Nyamsika	*North Bank*	23.6	0.5	1.0	3.6	6.0	1.3
	South Bank	9.8	0.5	0.0	0.4	1.3	0.0
Nyamsika to Paraa	*North Bank*	5.3	1.3	1.0	6.8	1.3	0.8
	South Bank	5.5	1.0	1.5	1.0	0.8	0.0
Paraa to Buligi	*North Bank*	5.7	0.7	NR	0.7	0.5	NR
	South Bank	0.6	0.5	NR	0.2	NR	NR
Buligi to Lake Albert	*North Bank*	0.9	0.9	NR	0.6	NR	NR
	South Bank	0.0	0.2	NR	NR	NR	NR
Murchison Falls to Paraa	*North Bank*	22.9	1.1	1.3	6.8	8.8	4.0
	South Bank	10.5	0.5	0.6	0.6	0.8	0.1

[1] = Parker and Watson, 1969
[2] = Hutton, 1991
NR = No Records

3.1.5 Lake Albert/Albert Nile

A single survey was possible on Lake Albert from Wanseko fishing village to Pakwach bridge. The lake is probably narrow enough to be the Albert Nile at Pakwach. Nine crocodiles were seen in 44 kilometres giving an overall density of 0.2 crocodiles per kilometre (Table 9).

Table 9: Aerial survey on the Lake Albert

Section	Description	Numbers	Distance	Density
1	Pakwach Bridge to Pakuba Lodge	0	18	0.0
2	Pakuba Lodge to Ranger Post	1	10	0.1
3	Ranger Post to Pearson's Channel	6	6	1.0
4	Pearson's Channel to Wanseko Village	2	10	0.2
TOTALS		**9**	**44**	**0.2**

3.1.6 Summary

The results of the surveys are summarised graphically in Figure 5.

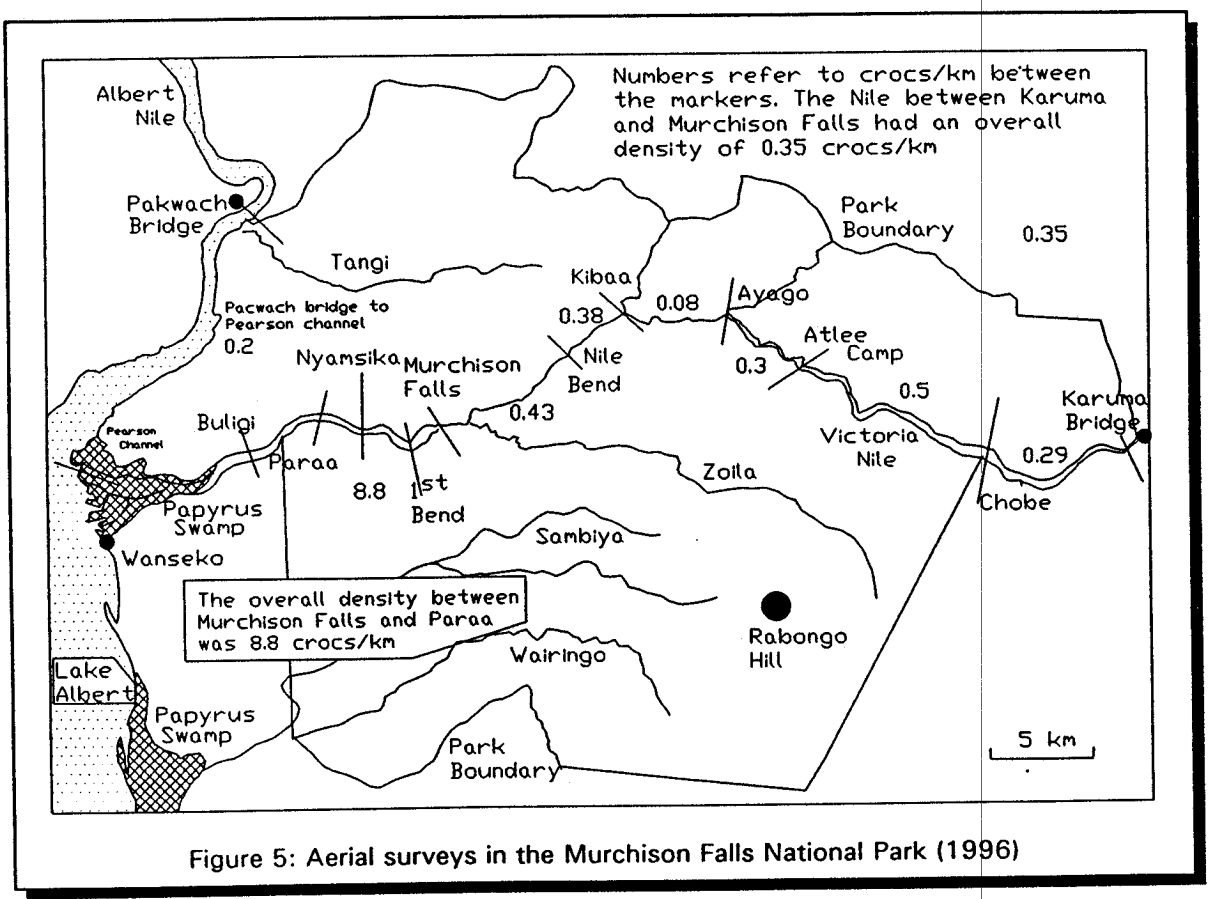

Figure 5: Aerial surveys in the Murchison Falls National Park (1996)

3.2 NIGHT COUNTS

Night counts were possible on the Victoria Nile below Murchison Falls and selected shorelines along Lake Victoria, Lake Mburo and Lake Kyoga. All of these areas are dealt with separately.

3.2.1 The Victoria Nile Below Murchison Falls

A total of 335 crocodiles were seen between Murchison Falls and Buligi ranger post over two nights (Table 10). Over 70% of these were seen on the north bank.

Table 10: Night surveys on the Victoria Nile below Murchison Falls

Section		Adults	Sub-Adults	Juvs	Unknown	Total
Murchison Falls to 1st Bend	*North Bank*	95	7	1	7	110
	South Bank	13	0	0	3	16
1st Bend to Nyamsika	*North Bank*	11	30	4	8	53
	South Bank	21	9	4	3	37
Nyamsika to Paraa	*North Bank*	25	6	12	16	59
	South Bank	2	4	4	2	12
Paraa to Buligi[1]	*North Bank*	7	4	1	4	16
	South Bank	6	7	9	10	36
Totals	*North Bank*	138	47	18	35	238
	South Bank	42	20	17	18	97

[1] The south bank section ended 2.5 km downstream of Buligi ranger post due to a navigational error. The section length was therefore 12.5 km.

Previous surveys have attempted a population structure by assigning individuals to one of three size classes (adults, sub-adults and juveniles) and this methodology was followed during this study. The overall ratio of adults:sub-adults:juveniles was 5:2:1. Most adults were found in section 1 - Murchison Falls to the first bend. This is very different to that found during the 1991 survey which was 1:1.1:1. This is hardly surprising given that nearly 70% of the eggs produced in the area have been collected as part of the ranching programme. This needs more detailed survey work and analysis and will form part of the study by Baguma (1996-A and B).

Density indices (measured from the night counts) in 1969, 1991 and 1996 also show that there has been a marked decrease since the late 1960's (Table 11). Again the 1991 density is lower than 1996 but not by much. The reasons for this are unclear.

Table 11: Density indices for the Victoria Nile between Murchison Falls and Lake Albert estimated from night surveys

Section		1969	1991	1996
Murchison Falls to 1st Bend	*North Bank*	29.7	9.2	18.3
	South Bank	NR	3.3	2.7
1st Bend to Nyamsika	*North Bank*	21.2	9.2	9.6
	South Bank	17.1	NR	6.7
Nyamsika to Paraa	*North Bank*	12.2	8.8	14.8
	South Bank	32.5	6.8	3.0
Paraa to Buligi	*North Bank*	14.1	2.9	1.6
	South Bank	3.8	2.8	2.9[1]
Buligi to Lake Albert	*North Bank*	NR	NR	NR
	South Bank	NR	NR	NR
Murchison Falls to Paraa	*North Bank*	22.2	9.4	14.3
	South Bank	NR	NR	4.2

[1] This section ended 2.5 km downstream of Buligi ranger post due to a navigational error. The section length was therefore 12.5 km.

NR = No Records

3.2.2 Lake Mburo

Lake Mburo is one of several lakes in and around the Lake Mburo National Park. The shoreline was distinctly divisible into eastern and western by the amount of *Cyperus papyrus* fringing the banks. Only one crocodile was sighted on the western bank which has extensive stands of *C. papyrus*.

Table 12: Night count for crocodiles on Lake Mburo

Adults	Sub-Adults	Juveniles	Unknown	Total	Distance (km)	Density
3	1	1	0	5	17	0.29

Lake Mburo has a similar density to the Albert Nile/Lake Albert section which is probably similar habitat.

3.3.3 Lake Victoria

Two areas on Lake Victoria were surveyed at night during this study (Figure 3; Table 13). These were:

1 **Lwanika Nakalanga and Kikonko**

The shoreline of the lake in this area is covered with *C. papyrus* and *Phragmites* spp. The water surface is infested with water hyacinth which can be as much as 200 m wide. Common along the shore are gentle rocky slopes with moist evergreen forests in the background.

2 Bugoto-Bwago

C. papyrus is common along this shoreline and only three sand beaches were recorded. It was reported that 20 eggs were removed from a nest just prior to the survey (late November, 1996).

Crocodile densities were as high as 1 per kilometre in a short section in the Nakalanga area (Table 13) but overall they were low (0.12 crocs/km). It is likely that there are more crocodiles but they were not seen owing the vegetational characteristics of the shoreline (water hyacinth etc).

Table 13: Night counts for crocodiles on Lake Victoria (see Figure 3)

	Section	Adult	Sub-Ad	Juv	Total	Km	Density
1	Nakalanga rock outcrop (eastwards)	0	2	0	2	10	0.20
	Nakalanga-1st Bend (westwards)	2	0	0	2	2	1.00
	Nakalanga-Nakayoga Bay	0	0	0	0	2.5	0.00
2	Bugoto-Bwago (westwards)	2	0	0	2	.37	0.05
	Totals	**4**	**2**	**0**	**6**	**51.5**	**0.12**

Other areas on Lake Victoria where crocodiles have been reported are Buluba, Bushi, Lugala and Waigala. It was not possible to visit these on this survey for a variety of reasons.

3.3.4 Lake Kyoga

Three areas were visited at the south-eastern end of the Lake Kyoga system but it was only possible to survey two of them (Table 14). There are briefly described below:

1 **Nawampasa**

This is a shallow lake to the east of the southern arm of Lake Kyoga. It is approximately five or six kilometres long by three wide (at the widest point). It must be stated, however, that this was measured from a 1:500 000 scale map as it was not possible to locate others during the study. The lake is not fished extensively partly because the local people believe that it is haunted. The lake supports numerous water lilies (*Nymphaea* spp), bullrush (*Typha* spp) and *C. papyrus*.

It was reported by a local fisherman that over 80 crocodiles were shot here in one week during 1993

2 **Budipa**

This small lake was not surveyed as the entire shoreline was covered by floating islands but the local people confirmed the presence of crocodiles in the lake. It was also reported that five people had been killed by crocodiles in Budipa between 1987 and 1996.

3 Nawampiti-Kisanga - Lake Kyoga "proper"

This part of the shoreline of Lake Kyoga has a shoreline of *C. papyrus* and *V. cuspidata*. There were also many floating islands.

Other areas reported to have crocodiles were Nkonw, Buyumba, Izinga, Tringa and Kiboyo but it was not possible to survey these areas.

The density of crocodiles in a small lake east of Lake Kyoga (Nawampasa) was relatively high with over 2 crocodiles per kilometre of shoreline (Table 14). No crocodiles were seen on a survey of 21 kilometres of the Lake Kyoga shore.

Table 14: Night counts for crocodiles on Lake Kyoga in Kamuli (see Figure 3)

Section	Adult	Sub-Ad	Juv	Unknown	Total	Km	Density
Lake Nawampasa	19	10	0	2	31	15	2.01
Nawampiti	0	0	0	0	0	21	0.00
Totals	**19**	**10**	**0**	**2**	**31**	**36**	**-**

3.3.5 Kazinga Channel and Lake Edward

A total of 16 crocodiles were seen in a little over 22 kilometres of shoreline (Table 15). Twelve of these were seen in Lake Edward. Crocodiles have never been formally recorded in this lake system (Edward, George and the Kazinga channel) and efforts should be made to determine the origin of these crocodiles and to ascertain if they are Nile crocodiles. If they were introduced by man this may have implications for their management.

Table 15: Night counts for crocodiles on Kazinga Channel and Lake Edward (see Figure 3)

Section	Adult	Sub-Ad	Juv	Unknown	Total	Km	Density
North Bank	1	0	0	0	1	4.6	0.22
South Bank	1	0	1	1	3	8	0.38
L. Edward	3	4	1	4	12	9.6	1.25
Totals	**5**	**4**	**2**	**5**	**16**	**22.2**	**0.72**

3.3.6 Kidepo National Park

Although not part of the current survey it was reported that there are approximately 20 crocodiles in the Narus river in the Kidepo National Park (Figure 3).

4. DISCUSSION AND RECOMMENDATIONS

4.1 GENERAL DISCUSSION

This was the first attempt at establishing base-line survey data for crocodiles in Uganda since the late 1960's. Some general comments are necessary before recommending future survey work. These are:

1 Habitat suitable for survey

Although Uganda has considerable expanses of habitat suitable for crocodiles it must be stated that much of this is not suitable for conventional survey work - both from the ground and from the air. Rivers such as the Karonga and Kafu are not suitable for aerial survey. Many of the lakes (Lake Kyoga and parts of Lake Victoria, for example) are probably not suitable for night counts owing to the nature of their shoreline - thick beds of *C. papyrus* and *V. cuspidata* and the invasive water hyacinth. These vegetation types make spotting crocodiles difficult and, in some areas, probably meaningless (except to record that they are there).

2 Security

Security was a problem during this project which cut down the amount of survey time. Groups opposed to the Government had recently attacked vehicles on the north bank of the Murchison Falls National Park and at the time of the survey this section of the park was closed. This meant that clearance from the Director of Civil Aviation (DCA) in Entebbe to fly this area was difficult to obtain. The survey crew eventually drove to the Park where the Park plane could fly us without needing Entebbe DCA clearance.

Western Uganda also became insecure during this survey with attacks on the border towns in the Kasese District (eg Kasese and Bushenyi). Again this exacerbated the clearance problems and meant that all bridges had to be avoided.

The Ugandan security problem seems to be perennial - although everyone hopes that this will not always be the case. This makes access to some areas difficult or dangerous. It is problematical to base a series of surveys on a particular stretch of river or lake which may become a "no-go" area.

3 The weather!

The weather in Uganda is also problematical for aerial surveys. During this current survey the time available for survey of Lake Albert and the Semliki was cut short by the weather and the fact that there were no airstrips below the escarpment where one could land an aeroplane in event of the clouds closing in. It is often difficult to schedule an aerial count for a particular day or time as one can never tell in advance what the weather will be like. This is probably especially true during the time that it was possible to conduct this survey.

4 Map availability

The Department of Surveys and Lands in Entebbe is running out of 1:50 000 maps and this could pose a problem for future surveys. On this survey we had to work from a variety of maps on different scales and this always increases the errors.

4.2 THE MURCHISON FALLS CROCODILE POPULATION

This section was to be a detailed analysis of the available data on the population below the Murchison Falls but the deadlines for the submission to the CITES secretariat meant that time was not available. Also during the course of this survey it was discovered that A. Graham and J. Hutton had been preparing a paper on the Murchison Falls crocodile population using data from a variety of sources. It was decided that this work should be expanded on using the data from these surveys and the paper submitted for publication in the East African Wildlife Journal (Graham, Hutton and Games, *In prep.*). It is hoped that the draft will be ready for the CITES meeting in 1997.

However, we present a map of the currently known nesting sites in the river for interest.

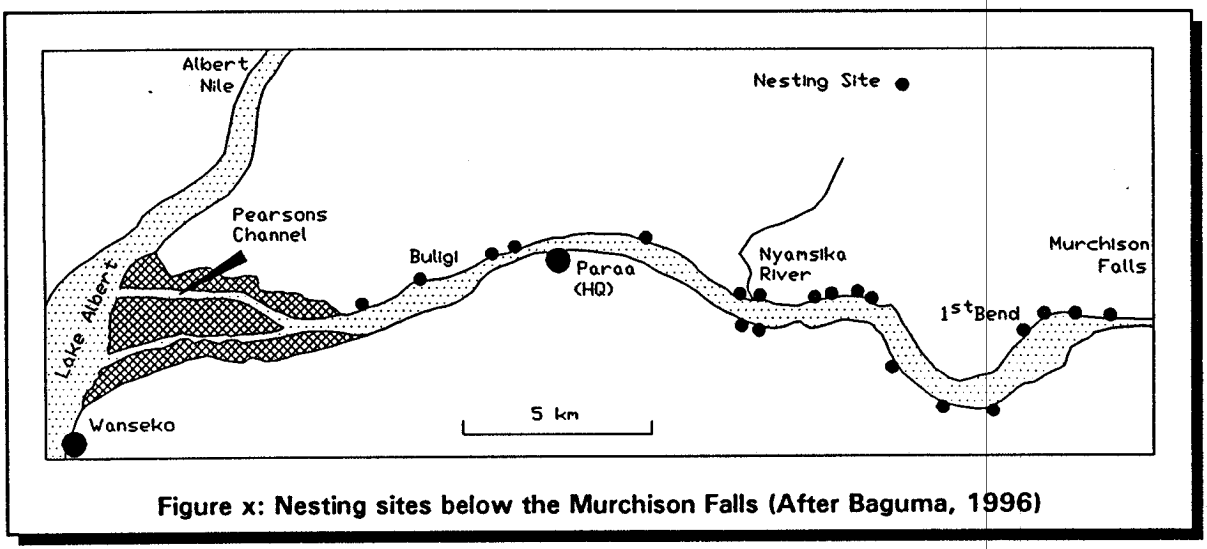

Figure x: Nesting sites below the Murchison Falls (After Baguma, 1996)

4.3 RECOMMENDATIONS FOR FUTURE SURVEY WORK

This section should be treated as a guide for future work. We believe, if funds are available, Uganda should monitor its crocodile populations even if it does not require a CITES approved export quota. Any increases in the crocodile populations will obviously affect the large rural population that lives by fishing in the lakes and rivers.

We stress that as much use should be made of local information as possible. This could take the form of a low key information gathering exercise in several areas in Uganda. This information will help to plan any future surveys. For example, if the survey crew had information on the hydrology, vegetation and drainage of the Kafu river it would not have been flown during this study thereby constituting a considerable cost and time saving.

A GPS should be made available for future ground-based surveys as changing survey crews may find descriptive waypoints difficult to locate exactly in future surveys (eg "hippo point").

This current survey was probably carried out at the wrong time of year. Crocodile surveys should be done when the water levels are lowest. The problem with Uganda is that it receives an extraordinary amount of rainfall compared to the other savannah countries of east, central and southern Africa it is difficult to specify the exact time of year without detailed local knowledge. A further problem is that there are local micro-climates (eg Lake Victoria and the Rwenzoris) that a general statement about the most suitable time of year may be meaningless. However, it would appear that August through September may be more suitable than the more "traditional" time (in east Africa) of October and November.

In the light of the above discussion and the general discussion (4.1) the following is recommended for future survey work in Uganda. This is a rough guide and the UWA should allocate some of their personnel to determine a more detailed plan - which should be adaptive in the light of a changing information base and funding available. The work could take place over several years and not every area needs to be surveyed an annual basis.

1 The areas surveyed on Lake Victoria should be increased. This, in conjunction with the surveys already carried out, will constitute a baseline for the lake. Once this has been established areas should be chosen to have surveys at two or three year intervals to monitor the situation.

2 Lakes Kyoga and Kwania - and the numerous associated waterbodies - appear to have recovering crocodile populations (as evidenced by this survey) and it suggested that as a first step, local information should be gathered. The lakes should then be prioritized and night surveys carried out. Much the system appears to be unsuitable for air survey but this statement could be re-assessed after the areas have been seen from the ground.

3 The Kazinga channel and Lake Edward crocodiles. As crocodiles are not known historically from this area attempts should be attempted to ascertain how they actually got there. Capture of a few individuals should also be made to ensure that they are, in fact, Nile crocodiles.

4 A night survey should be conducted along the Semliki river between Lake Albert and the Zairian border.

5 An aerial count and night survey should be carried out along the Albert Nile from Pearson's channel (Murchison Falls National Park) to the Sudanese border. The comments about security should be taken note of here.

6 The population of the Murchison Falls National Park should be monitored, especially if the Ugandan authorities wish to continue the current utilisation programme. The river between Karuma Falls and the Murchison Falls is not really suitable for aerial survey (Plates x and x) but this may be the only way in which it possible to survey this stretch. It is only accessible by rubber rafts and the only people that the authors are aware of who have done it were attacked repeatedly by large crocodiles.

7 Local information about the Achwa, Pager and Agago rivers in north-eastern Uganda should be obtained. The crocodile population in Kidepo National Park should be assessed formally.

8 The Kafu river should be surveyed from the ground. Again, as a first step someone should travel to all the villages along its banks to gather local knowledge of the situation before proceeding to a night count. A similar exercise count be carried out on the Katonga river.

9 The Victoria Nile between Jinja (Lake Victoria) and Lake Kyoga should be surveyed from the air as should the river between Lake Kyoga and the Karuma Falls (the security situation permitting).

The above could be considered still part of the establishment of the baseline. A meaningful monitoring plan can only be developed once the UWA has a clearer picture of the extent of the crocodile population.

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ANNEX IV

BRIEF DESCRIPTION OF SOME SELECTED RIVERS AND LAKES IN WHICH NILE CROCODILES OCCUR

River/Lake	Description
Lake Victoria	45% of Lake Victoria is inside Uganda which has an estimated shoreline of 1700 km. The lake has a mean depth of 40m and a maximum of depth of 85m and receives more water from rainfall than from the inflowing rivers. Extensive papyrus swamps are present in some bays with some patches of swamp forest. Water hyacinth (Eichonia crassipes) is also common. The lake supports an extensive fishery and a recent frame survey (Tumwebaze and Coenew, 1990) reported nearly 9000 active fishing boats on the Ugandan shoreline. Much of the shoreline is densely settled. Large islands are found in the Lake of which the most well known (outside Uganda) are the Ssese Islands. Crocodiles were very common along many parts of the shoreline as recently as the 1940's but today there are very few.
Lakes Kyoga+ Kwania	These lakes and their associated swamps (mostly papyrus) occupy a shallow dendritric valley system. The mean depth of Lake Kyoga is approximately 3m while that of Kwania is 4m. However, seasonal fluctuations of nearly 4m are on record. These fluctuations are thought to have become more extreme in recent times due to the deforestation in Mt. Elgon area. The system has nearly 3500km^2 of open and in excess of 2000km^2 of swamp. The major feeders are the Victoria Nile and the rivers descending from the Mt. Elgon area. The Kafu drains part of western Uganda into the western end of lake Kyoga. The lakes are an important fishery and Lake Kyoga produced nearly 50 000 tonnes of fish in 1969. During a study of the shoebill stork in Uganda Muller pers. comm. reported seeing no crocodiles in this lake system despite having spent a considerable amount of time in it. However, this survey reports a relatively high density of crocodiles in a small lake associated with this system.

Lake Albert

Lake Albert lies in the Western rift valley and is fed by the Semliki river and, at its northern end, by the Victoria Nile. Most of the lake near Uganda is shallow but the western part reaches 56 m in depth. Salinities in the lake are relatively high (away from the influence of the Victoria Nile) and are in the order of 6‰. The Nile and Semiliki deltas support extensive *Cyperus papyrus* beds. As with most other lakes in Uganda, Lake Albert supports an extensive fishery with nearly 1000 active fishing boats and canoes present in the late 1980's. Much of the lakeshore along the Ugandan rift valley wall is unsuitable habitat for crocodiles.

Lakes George+ Edward

Lake George has a mean depth of 2.4m and a maximum depth of 7m. One of its major feeders is the Katonga river which also flows into Lake Victoria. The Lake edges are dominated by papyrus which often has a *Vossia cuspidata* outer fringe. Lake Edward is connected to Lake George by the Kazinga Channel 36km long and 1.5km wide. The lake has a maximum depth of 112m close to the western shore but slopes gradually up into Ugandan waters. Almost 30‰ of the lake is inside Uganda. The northern bank of the Kazinga channel is dominated by *Vossia cuspidata* while the southern bank is more suitable crocodile habitat.

Historically crocodiles are not known from these lakes. This is thought to be due to recent crustal uplifting in the region which effectively isolated them from other waters (see Semiliki river section). This survey confirms the recent sightings of crocodiles in the Kazinga channel but it is not known how they got there.

Semiliki River

The Semiliki river drains from Lake Edward through Zaire into the southern end of Lake Albert. After flowing over the rapids in Zaire (thought to be a barrier to crocodile movement by some authors) and through the eastern parts of the Ituri forest the river enters a wide floodplain through which it meanders to Lake Albert. The area is heavily populated. The water is turbid and the river is wide (approx 100m) and is characterised by steep banks with few banks suitable for crocodiles to lie upon. There is a known crocodile nesting site in Zaire where the river leaves Lake Edward.

Kafu River

The Kafu river is typical of a number of rivers in Uganda (eg. The Katonga river linking lakes George and Victoria). They are probably more correctly described as swamps and are essentially channel-less water transport systems. Papyrus is common in the deeper parts while *sorgastrum* grassland is common on the drier sections. Prior to reaching the Victoria Nile the river has a Vossia lined channel. Swamp and riverine forest vegetation is found along some of the banks. There are reports of problem crocodiles in this river from the 1930's and 1940's.

Lake Mburo

Lake Mburo is the centrepiece of the Lake Mburo National Park which is situated in a relatively low rainfall area (700-800mm per annum). The eastern shore is generally steep with patches of ^*Cyperus papyrus* but there are several areas with gentle slopes. The banks are well vegetated. The western bank has extensive stands of *Cyperus papyrus* and is generally unsuitable for crocodile survey.
There is intensive fishing activity on the lake and over 50 canoes are reported by Park personnel but we believe this is to be under-estimate.

Nile River

The Nile flows from Lake Victoria into Lake Kyoga. After the confluence of the Kafu river it forms a channel to the Karuma falls on the boundary of the Murchison Falls National Park.

Between the Karuma and Murchison Falls the river flows for in 80km. It is wide at first with many islands but becomes narrower as it approaches the Murchison Falls. The river is essentially a series of rapids throughout this section.

After the Murchison Falls the river flows through a wide channel with sand -bars, mud-banks and vegetated areas of Vossia and water hyacinth until it reaches its delta on Lake Albert. This delta is characterised by extensive papyrus swamps. The entire section between the Karuma Falls and Lake Albert flows through protected areas and the area below the Murchison Falls contains one of Africa's most spectacular crocodile populations.

The section between the delta and the Pakwach bridge is probably more lacustrine than riverine. Fringing Papyrus and vossia is common as the water hyacinth. The eastern bank is protected and forms part of the Murchison Falls National Park. After the Pakwach bridge the river becomes known

as the Albert Nile until Nimule on the Sudan boarder. This section of the river is wide and meandering and has extensive papyrus beds. Both banks are heavily populated and reports indicate that very few crocodiles would be found in this part of the river.