



NDF WORKSHOP CASE STUDIES  
WG 7 – Reptiles and Amphibians  
CASE STUDY 1

*Crocodylus niloticus*

Country – KENYA

Original language – English

## **NON-DETRIMENT FINDING STUDIES ON NILE CROCODILE (*CROCODYLUS NILOTICUS*): THE STATUS OF AND TRADE IN THE NILE CROCODILE IN KENYA,**

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### **I. BACKGROUND INFORMATION ON THE TAXA**

#### **1. BIOLOGICAL DATA**

##### **1.1 Scientific and common names:**

Class:	Reptilia
Order:	Crocodylia
Family:	Crocodylidae
Scientific name:	<i>Crocodylus niloticus</i> (Laurenti, 1768)
Common names:	English: Nile crocodile Swahili: Mamba

##### **1.2 Distribution**

Several sub-populations of Nile crocodile exist in Kenya. Generally all the fresh water systems both fresh water lakes and rivers in the country have crocodiles. Some of the major ones include Lake Turkana, Lake Baringo, Lake Victoria, Mara River, Ewaso Nyiro River and Lorian Swamp, Tana River and Athi/Galana/Sabaki River and Ramisi River. (See map with distribution of fresh water masses being habitats for major populations of Nile crocodile in Kenya) These populations are considered healthy and are inferred to be increasing in numbers based on reports from the communities in these areas. The species habitat range has however shrunk as a result of encroachment by human activities resulting from increased human population.



sizes of between 20 -60 eggs. The eggs weigh between 70-110 Grams and length between 65-80 cm and width between 40-45 cm. The Nile crocodile is sexually dimorphic with growing upto 30% larger than the females. Males regularly grow to 5m and can weigh more than 500 kg.

### 1.3.2 *Habitat types*

The species occurs in fresh water wetlands, in lakes, rivers, marshes and dams. The dry stream beds, river banks and sandy shores of the wetlands provide preferred nesting sites where eggs are deposited during laying season usually between September and January.

### 1.3.3 *Role of the species in its ecosystem*

Nile crocodile is a predator species whose diet is very broad and includes aquatic invertebrates, fish, amphibians, birds and other reptiles. Hatchlings eat insects and small aquatic invertebrates. Adults can take a wide range of large vertebrates. The species plays a significant role in the ecosystem and is responsible for checking populations of other aquatic species such as the barbell catfish.

The species is a problem animal, killing people and their livestock more than any other wild animal in many areas where they co-habit. It probably causes more human deaths than any other wild animal in Africa (Hirschhoff *et al* 1996).

## 1.4 **Population:**

### 1.4.1 *Global population size*

Global population of Nile crocodile in the wild is estimated between 250,000-500,000. This population is distributed throughout Africa and Madagascar in suitable habitats. Its distribution extends from Senegal river, Lake Chad, Wadai and Sudan to the Kunene and the Okavango delta. In Madagascar, the species occurs in the Western and Southern parts from Sembrirano to Port Dauphin

### 1.4.2. *Current Global population trends*

increasing     decreasing     stable     unknown

The general trend for the global population of Nile crocodile is increasing although in most cases its range is shrinking as a result of increasing human population hence pressure demand for land in the species habitats

## 1.5 Conservation status

### 1.5.1 *Global conservation status* (according to IUCN Red List):

<input type="checkbox"/> Critically endangered	<input type="checkbox"/> Near Threatened
<input type="checkbox"/> Endangered	<input checked="" type="checkbox"/> Least concern
<input type="checkbox"/> Vulnerable	<input type="checkbox"/> Data deficient

The species was listed under IUCN as Vulnerable in 1990 (Baillie & Groombridge, 1990) and later in 1996 as species of Lower Risk but was not subsequently listed in 2000, and 2003.

The species is listed in Appendix I of CITES (threatened with extinction) in most of its range except populations of Botswana, Ethiopia, Kenya, Madagascar, Malawi, Mozambique, Namibia, South Africa, Uganda, The United Republic of Tanzania (subject to an annual export quota of no more than 1600 wild specimens including hunting quotas, in addition to ranched specimens), Zambia and Zimbabwe that are in Appendix II (not threatened but trade must be controlled) for purposes of ranching in accordance with Resolution Conf. 11.16.

### 1.5.2 *National conservation status for the case study country*

The Tana River has the biggest living population of Nile crocodile (*Crocodylus niloticus*) in Kenya. The Tana River is the longest river in Kenya stretching over a total length of 1,000 km and has the largest catchments area of about 95,000 km square ; an approximately 17% of the Kenya land mass. It flows for most of its course across semi-arid and arid regions meandering through alluvial floodplain of varying width from 2km in the middle to 40km in the lower delta region. It enters the Indian Ocean through the Ozi River being the main channel near Kipini. The river has been the source of crocodile eggs for breeding operations registered with KWS and CITES in accordance with the provisions of CITES Resolution Conf. 11.16 on Ranching and Trade in Ranched specimens of species transferred from Appendix I to II for ranching purposes. Kenya population of *Crocodylus niloticus* is listed in CITES Appendix II following its transfer from Appendix I in 1995 for ranching purposes. CITES ranching requirements stipulate the need for frequent assessment of crocodile numbers within areas of their exploitation to ensure sustainability.

Several crocodile population surveys and assessments have been done in Kenya however only populations of the lower reaches of Tana River have been significantly studied. The objectives of the surveys are fourfold:

- Conduct a crocodile count to determine the species population size within designated section of the water system delineated for the species utilization program;

- Determine the suitability and viability of the crocodile population for ranching purposes,
- Recommend conservation and management strategies for this crocodile population,
- Recommend possible utilization quotas that are sustainable

Crocodile census is an exercise that requires specialized herpetological training skills and resources. There are no up-to date comparative studies done to estimate the population of the Nile crocodile in the country. The latest census conducted in Kenya was in 1995 and involved Kenya Wildlife Service, the CITES Management Authority and National Museums of Kenya (NMK), the Scientific Authority for Kenya. The surveys covered the lower reaches of Tana River system. There are few recent data based on the species monitoring through egg collection for ranching operations but it is evident that Kenya has a large population of the Nile crocodile not under any immediate threat. Planning for a survey of the Nile crocodile in its major distribution areas is underway and data to be generated will be used to update the national conservation of the species.

### 1.5.3 *Main threats within the case study country*

- No Threats
- Habitat Loss/Degradation (human induced)
- Invasive alien species (directly affecting the species)
- Harvesting [hunting/gathering]
- Accidental mortality (e.g. Bycatch)
- Persecution (e.g. Pest control)
- Pollution (affecting habitat and/or species)
- Other \_\_\_\_\_

Threat to Nile crocodile in Kenya include loss of its habitat as a result of human population encroachment, erosion and loss of nesting areas and riparian habitats as rivers change their courses due to land degradation upstream, persecution as a result of human-wildlife conflict and in a limited way egg collection for ranching operations for commercial trade. During drought in some of the arid and semi-arid land, people and crocodiles increasingly come into contact within the rivers/lakes that are sources of water and fish thus causing resource use conflicts. Results of such conflicts are normally human and livestock deaths caused by the crocodiles and or persecution of the crocodiles by human beings. As a result of such conflicts, Nile crocodile populations have been reduced in specific areas of high human population in Kenya. However, due to the species resilience, Nile crocodiles are able to co-exist successfully in areas with human disturbances.

## **2. SPECIES MANAGEMENT WITHIN THE COUNTRY FOR WHICH CASE STUDY IS BEING PRESENTED**

### **2.1 Management Measures**

#### **2.1.1 Management history**

The Nile crocodile (*Crocodylus niloticus*) was listed in CITES Appendix I at the plenipotentiary conference (Washington D.C, 1973) where CITES was adopted and signed. It is still included in Appendix I as a species while a number of national populations have been transferred to Appendix II including the Kenya population. All populations of *Crocodylus niloticus* are therefore in Appendix I except the populations of Botswana, Ethiopia, Kenya, Madagascar, Namibia, South Africa, Uganda, the United Republic of Tanzania (subject to an annual export quota of no more than 1,600 wild specimens including hunting trophies in addition to ranched specimens), Zambia and Zimbabwe.

Kenya did make a successful proposal to transfer its population of Nile crocodile (*Crocodylus niloticus*) from Appendix I to Appendix II for ranching purpose at the Eighth Meeting of the Conference of the Parties (CoP8) in 1992. Trade in the species is only with ranching operation specimens. Eggs for the ranching operations are collected in areas outside protected areas and therefore all populations inside protected areas are fully protected from harvesting.

#### **2.1.2 Purpose of the management plan in place**

A management plan for Kenya population of Nile crocodile was developed in 1990 to provide for a code of ranching practice and guidelines. In accordance with CITES Resolution Conf. 11.16 on *ranching and trade in ranched specimens of species transferred from Appendix I to Appendix II*, each Party that has made successful proposal to transfer a population of a species in Appendix I to Appendix II for ranching purposes should submit to the CITES Secretariat annual reports on all relevant aspects of each approved ranching operation to include the following:

- a) Status of the wild population of the species concerned
- b) Number of specimens (eggs, young or adults) taken annually from the wild
- c) An estimate percentage of the production of the wild population that is taken for the ranching operation
- d) Number of animals released back to the wild and their survival rates estimated on the basis of survey and tagging program if any
- e) Mortality rates in captivity and causes of such mortality

- f) Production sales and exports of the products and
- g) Conservation programs and scientific experiments carried out in relation to the ranching operation or the wild population concerned

There is currently a strong focus by the MA towards ensuring there is improved compliance and enforcement of the code of practice and production standards.

### 2.1.3 *General elements of the management plan*

The following procedures are being required of all potential and registered operations:

- a) The potential rancher submits a short feasibility study with a management plan of proposed ranching operation to the MA.
- b) Upon acceptance/approval by the MA, the applicant submits a detailed project proposal detailing the following:
  - Location of the proposed ranching operation
  - Water supply
  - Food supply – evidence of secure food supply to feed a stated and projected number of crocodiles and a detailed plan of the operation.
  - Financial capital – the applicant will have to show proof of sufficient financial resources to cover at least four years of operation without expected income from the ranching operations.
  - Expertise on crocodile handling and husbandry
  - Ranch/Farm business plan with projected expansion and production
  - Full Environmental Impact Assessment Report
- c) The MA reviews and responds to the feasibility studies and the completed project proposals upon which a competent team from the MA and the SA does physical inspection of the facilities
- d) A letter of authority to ranch/farm is issued and can be revoked on failing to maintain standards required. The letter of authority stipulates conditions and standards to be met which include:
  - Procedures, formats and frequency of submitting farm returns
  - Standards of the facilities

#### 2.1.4 *Restoration or alleviation measures (see 2.1.2)*

### 2.2 **Monitoring system**

This case study presents the status of the crocodile population in Kenya as guided by a Management Plan for the species' ranching operations based on scientific information generated from population assessments, regular returns by the ranchers and routine inspections of the operations as a monitoring system for the species population.

The information presented in this case study is an analysis of population surveys, returns of the ranching operations and data collected through physical inspections of the same by a team from the CITES Management and Scientific Authorities. Valuable information is received through the Crocodile Producers Association of Kenya (CPAK) and directly from individual ranchers/producers.

#### 2.2.1 *Methods used to monitor harvest*

Currently there are six Nile crocodile ranching operations in Kenya most of them along the Kenyan coast and one in Kirinyaga district within the proximity of the five hydroelectric dams along the Tana River system. Currently, most of the eggs collected for the ranching operations are sourced from the Tana River system. Only a small percentage is currently being collected in Lake Turkana estimated to have a population of 12,000 crocodiles. To ensure continued sustainable exploitation of crocodile resources within the country, the species population in the Tana River especially the lower reaches has been regularly assessed and monitored using basic egg collection data and community reporting on incidences of community-crocodile interactions in the major species distribution areas. The areas of egg collections are zoned to allow for appropriate levels of monitoring the population, its protection and utilization. Data on the number of eggs per nest and the egg collection efforts (number of egg nests identified and collected within the open season for egg collection) is used to provide information on relative size of the crocodile population within a given segment of the egg collection zone. The sizes of the eggs collected are also used to provide general information on the relative age, sizes and structure of the reproductive female population of the crocodile in the egg collection zones. Based on data on egg sizes collected and analysed at the Nile crocodile ranching operation, it indicates the size of the eggs positively correlates with the size of the female crocodile laying the eggs. The data on the number of nests collected is used to estimate the population of female crocodiles that have reached reproductive age at each collection season. This data does not however aid to estimate the population of the males and also the

reproductive immature population of the crocodiles in the designated egg collection zones. However, better censuses of the various segments of the crocodile population and especially the adults are certainly necessary. A national survey of the Nile crocodile population was scheduled for early this year but due to budget constraints, it has been rescheduled to early 2009. Currently, the designation of specific zones in the lower reaches of Tana river and also the Lake Turkana for egg collection focuses on reducing the Nile crocodile population to mitigate against crocodile-human conflicts. Approvals on the number of eggs for collection by each ranching operation are based on projected farm capacity for production. Once the egg collection permit is issued for specified number of eggs in specified identified collection zone, the collection of the eggs is monitored followed by inspection of the facilities in the ranching operation to ensure the facility can manage the number collected and taking cognizant of the existing stock and the projected trade. These multiple factors are considered and used to determine quotas for crocodile egg collection allocated to each of the registered ranchers and breeders. The total quotas allocated to all the ranching operations therefore vary year –on-year as determined by the capacities of the operations to produce. The quota allocated to each operation is reviewed in the course of the collection season against the respective facility expansion. To effectively ensure this review, the egg collection is closely monitored through use of the collection permits and filing of returns. The annual egg collection is used to monitor relative crocodile population abundance in the designated zones and identify trend and problem areas.

Crocodile ranches and farms in Kenya (2008)

S No.	Ranch/farm Name	Location	Ranching/Captive breeding
1	Nile Crocodiles	Mombasa	R
2	Kenya Crocodile Farm (Mamba Village)	Mombasa	CB
3	Baobab Crocodile Farms <sup>1</sup>	Mombasa	R,CB
4	Larfarge Ecosystem <sup>2</sup>	Mombasa	R, CB
5	MarkEast Brook Crocodile Farm	Malindi	CB
6	Galaxy Crocodile Farm	Sagana	R, CB

<sup>1</sup> Stock for this farm was obtained from the former Baobab Farm Ltd. now relocated to a new site.

<sup>2</sup> This is the new name for the former Baobab Farm Ltd. with a shift from commercial operation to eco-tourism.

## Crocodile stocks on farms (2005/2006)

Age Class/category	Farm/Ranch Name						Totals
	Nile Crocodiles	Kenya Crocodile (Mamba Village)	Baobab Croc. Farms	MarkEast Brook Crocodile Farm	Larfarge Ecosystems	Galaxy Crocodile Ltd.	
Less 1 year	7,835	2,777	3,229	194	—	823	14,858
1 yr. 9 months	5,110	1,881	—	165	—	—	7,156
2 yr. 9 months	4,026	—	—	330	—	—	4,356
Mixed ages	311	1,204	1,335	34	189	—	3,073
On treatment	490	—	—	-	—	—	490
Breeders	—	238	94	40	28	—	400
<b>Totals</b>	<b>17, 772</b>	<b>6,100</b>	<b>4,658</b>	<b>763</b>	<b>217</b>	<b>823</b>	<b>30,333</b>

## Egg collection Quotas allocated and numbers taken from the wild from 2002/2003 to 2007/2008 collection seasons

Name of Farm	Collection locality	2002-3 Quotas allocated	Eggs collected	2003-4 Quotas allocated	Eggs collected	2004-5 quotas allocated	Eggs Collected	2005-6 Quotas allocated	Eggs collected	2006-7 Quotas	Eggs collected	07/08 Quota	Eggs collected
Nile Crocodiles Ltd	Lower Tana	12,000	8,360	16,000	10,300	20,000	14,119	25,000	19,589	25,000	15,701	30,000	30,000
Galaxy Crocodile Farm**	Lower Tana	—	—	—	—	—	15,000	2, 096	15,000	2,300	20,000	2,000	—
Baobab Crocodile Frams	Lower Tana	12,000	6,243	12,000	6,292	5,000	—	5,000	—	—	—	—	—
Kenya Crocodiles	Lower Tana	—	—	—	4,000	—	4,000	—	—	—	—	—	—
Total Quota allocated /eggs collected		24,000	14,603	28,000	16,592	29,000	14,119	49,000	21,685	40,000	18,001	50,000	32,000

The lower Tana River is a long stretch divided into three- (3) distinct collection zones namely Mbalambala-Garissa, Baomo-Kipini and Garissa -Wenje and the community egg collection programmes do not overlap.  
\*\* Farm was established in late 2005.

## Estimate of the hatchability success rates of eggs collected for commercial production in the ranching operations

The following table summarizes the egg hatchability success for the various farms during the 2005/2006-egg collection season.

Name of Farm	Eggs collected from farm	Eggs collected from wild	Hatchlings realized	% Success hatching rate
Nile Crocodiles Ltd.		19,589	12,303	62.81
Galaxy Crocodile Farm		2, 096	823	39.27
Lafarge Ecosystem	1124		449	39.95
Baobab Crocodile Farms	503		287	57.06
Kenya Crocodile Farm	4979		3169	63.65
MarkEast Brook Crocodile Farm	366		183	50.00
Totals	6972	21685	17214	
Average %success on farm				52.67
Average %success from Wild				51.04
Overall Average %success				60.01

Lack of or inadequate experience in egg handling by newly recruited community egg collectors contributed to low levels of egg hatchability for eggs collected from the wild. Galaxy Crocodile Farm, which recorded the lowest hatchability success, suffered from this problem and also the fact that this was their first operation in the farm. Some of the eggs, however, were not fertile (Dan Haller, Manager Nile Crocodiles, Pers. Comm.) in the lower reaches of Tana River the following are the eggs collection areas: Ozi, Kau, Riketa, Chalaluma, Didewaride, Moa, Kibusu, Biliasa, Matomba, Mikameni, Bubesa, Mnazini and Baomo.

*The mortality rate in captivity and causes of such mortality*

Loss is more common at the egg collection and hatchling stage hatchlings and sometimes juveniles are susceptible to skin infections. Such cases are successfully reversed in treatment ponds at the ranching facilities.

**2.2.2 Confidence in the use of Monitoring**

The MA is responsible for issuance of all permits in accordance with the provisions of the Wildlife Act CAP 376 of Kenya. Permits for egg collection are issued to the ranching operations and the authority communicated to the local authorities and officers of the management Authority under which the egg collection areas fall to supervise the collection and file parallel reports. The resource is communally owned and harvesting is managed and controlled jointly with the community.

**2.3 Legal framework and law enforcement**

Hunting and dealership in wildlife and wildlife products have been outlawed in Kenya by an Act of Parliament since 1977 and 1978 res-

pectively. However, Section 67 of the Wildlife Act allows the Minister in charge of wildlife to make regulations for the better management of wildlife farming. Collection of crocodile eggs is treated as hunting. Crocodile eggs and or products are trophies in accordance with the National law and therefore requires prior permit to collect the eggs or deal in crocodile trophies such as meat and skins.

Nile Crocodiles are gazetted as prohibited exports unless authorized by the Minister in charge of wildlife. Exports of crocodiles and their products are therefore subject to approval by the minister responsible for wildlife.

Internationally, trade in Nile crocodile and its products is regulated under CITES. The MA reports annually numbers of export permits issued and quantities of products to the CITES secretariat. Producers make requests to the MA for tags annually and the MA assigns the tag numbers and advises the Secretariat. The Secretariat links up the tag supplier with the producer for the tag supplies and payments.

### **3. UTILIZATION AND TRADE FOR RANGE STATE FOR WHICH CASE STUDY IS BEING PRESENTED**

#### **3.1 Type of use (origin) and destinations (purposes)**

Utilization of Nile crocodile in Kenya is commercial based on ranched specimens in accordance with CITES Res. Conf. 11.16. The parts utilized include meat for food that is utilized locally and sold through outlets authorized and regulated by the Management authority and the skin that is solely for export markets for leather industry.

#### **3.2 Harvest:**

##### **3.2.1 *Harvesting regime***

Only eggs are collected from the wild under authority, incubated and reared in authorized ranches to reach commercial maturity size of approximately 1.2 meters at average age of 3 years. The egg collection is carried out under a community egg collection programme.

##### **3.2.2 *Harvest management/ control (quotas, seasons, permits, etc.)***

Egg collection from the wild by registered operations requires a separate collection permit and returns are filed with the Management Authority immediately at the close of the collection. Egg collection is regulated using open and closed collection seasons. Egg collection season is between September and March. In the course of the open season, the eggs collected for each ranching operation is reviewed based on filed returns and physical inspections at the facility and also assess-

ment of the capacity of the facility to accommodate and manage the projected production levels. In order to reduce probable mortalities as a result of disturbance in the nests if some eggs were left uncollected during egg collection, all eggs in the identified and selected nests are collected. At least 33% of identified nests are left undisturbed and uncollected for the population recruitment.

Egg collection involves local communities in the designated zones of collection currently in the lower reaches of Tana River and Lake Turkana. The MA recommends that the ranchers identify and train community members on methods of egg collection and handling for maximum production and minimal wastage/loss. Community members are paid on the number and viability upon hatching of collected eggs. Approximately 85% of the crocodile eggs collected are collected by grass root community members and communities benefit directly from the resource. Collectors are trained on egg handling as the eggs are sensitive. The integration of local communities in the egg collection programme has proved to be of positive value to conservation of wild populations.

In some instances, the ranchers have introduced extra incentives in the form of bonus payments dependable on percentage hatchability. Each collector is paid Ksh.10 per egg collected plus a bonus of up to a maximum Ksh.25 on hatching as an incentive. Overall, community crocodile egg collection programme has helped to turn the human crocodile conflict problem into a sustainable socio-ecological and economic opportunity, which supports conservation of the resource.

Selectively and based on area assessments, identified adult problematic animals are captured and used as breeding stock in selected authorized ranches. In return the operations support community development projects in the source of breeders as further incentives for in-situ conservation of the crocodile population. The capture of adult rogue crocodiles for ranching purposes is provided for in the crocodile management plan. The objective of this element is human-crocodile conflict management.

### **3.3 Legal and illegal trade levels**

The table below shows crocodile skin exports authorized by Kenya MA for the year 2001- 2005.

Export of Crocodile skins from Kenya 2001-2007

Farm/Ranch	2001	2002	2003	2004	2005	2006	2007
Kenya Crocodiles (Mamba village)	1,500	700	—	—	2,500	2,500	—
Nile Crocodiles	1,650	1050	1,050	1,200	4,700	6,210	10,645
Baobab Crocodile Farms (Ex-Baobab Ltd.)	1,500	650	1,300	1,700	2700	—	—
MarkeastBrook Croc. Farm	—	62	87	150	150	—	—
Totals as per permits	4,650	2,462	2,437	3,050	10, 050	7,000	10,645

Exports of Crocodile products other than Skins from Kenya 2001-2007

Year	Product exported	Quantities in permits issued	Farm Name exporting
2001	-		
2002	-		
2003	Live hatchlings	3,300	Kenya Crocodiles(Mamba village)
	Heads	144	Kenya Crocodiles (Mamba Village)
2004	-		
2005			
Total Animals		3,444	

The exports are mainly destined to Singapore.

No cases of illegal trade in crocodiles and their products have been reported in the recent past.

## II. NON-DETRIMENT FINDING PROCEDURE (NDFs)

**1. IS THE METHODOLOGY USED BASED ON THE IUCN CHECKLIST FOR NDFs?**

yes no

Methodology used in doing NDF studies on Nile crocodile is systematically followed based on the IUCN checklist for NDFs. Details especially on quantitative information where possible is generated to back up the qualitative assessment. The checklist is extensively referred to during the process.

## **2. CRITERIA, PARAMETERS AND INDICATORS USED**

The concepts in the checklist are referred to when carrying out the NDF process and applied in combination with information on the following elements:

The species characteristics:

- Distribution
- Tolerance to human disturbance
- Mortality rate based on hatchability success rate of the collected eggs as determined by methods of the egg collection and handling

## **3. MAIN SOURCES OF DATA, INCLUDING FIELD EVALUATIONS OR SAMPLING METHODOLOGIES AND ANALYSIS USED**

The following are the sources of data for making NDF on Nile crocodile in Kenya

- Field assessment of population abundance. Regular assessments of the Nile crocodile population are conducted especially in the lower reaches of Tana River system and Lake Turkana which are the major two areas where egg collection is authorized to feed the six registered Nile crocodile ranching operations.
- Kenya Wildlife Service Stations daily Occurrence Book recording incidences of human-crocodile conflicts and returns on egg collection.
- Applications for egg collection quotas and collection sites from the ranching operations
- Egg collection permits and filed returns by local communities, Kenya Wildlife service Wardens and the ranching operations
- Export permits issued for export of skins to the ranching operations
- Reporting by the ranching operations on the performance of the facilities and physical inspections of the ranching facilities by the Wildlife Authorities to assess the production capacities in relation to applications for egg collection permits
- Routine inspection of the ranching operations by the Management and Scientific authorities.

## **4. EVALUATION OF DATA QUANTITY AND QUALITY FOR THE ASSESSMENT**

Data obtained from the sources in c above is analyzed to determine approvals for levels of harvesting from the wild, areas to be designated for harvesting and compare with applications for exports and levels of compliance with management plans for the management of the species. Data generated from detailed reporting by the ranching operations on number of eggs collected against the number of nests removed in the wild and those left to maintain the wild population is

evaluated and analysed to provide information on the species population dynamics the targeted crocodile utilization zones and guide in the review of the management of the species. The performances of the ranching operations especially on the egg hatchability success rates and the production capacity in terms of infrastructure are assessed to determine approval for egg collection quotas for the succeeding year and if need to increase the quotas, identify new areas for designation as egg collection zones.

**5. MAIN PROBLEMS, CHALLENGES OR DIFFICULTIES FOUND ON THE ELABORATION OF NDF**

Major challenge in the elaboration of NDF studies on the Nile crocodile has been to get the definite population size of the Nile crocodile especially in the areas zoned for egg collection in the Tana River system and lately Lake Turkana to be able to understand the population structure. Censusing Nile crocodile is a relative expensive affair and also requires highly skilled herpetologists. Limited resources both capital and human on this aspect pose a big challenge to the understanding of the Kenyan population structure of the Nile crocodile

**6. RECOMMENDATIONS**

The use of the IUCN Checklist for NDF is quite applicable to the Nile crocodile species. The checklist is therefore a practical tool for making NDF on the Nile crocodile (*Crocodylus niloticus*); however it is important that quantitative data on the species is generated to provide informed assessment of the status of the species especially where the checklist calls for qualitative information. Efforts must therefore be made to generate the quantitative information as much as possible. Such elements that need this quantitative data include the biological status to inform on the approximate population size, structure, sex ratio and nesting ecology.