VOL. 6, NO. 10, OCTOBER 2011 ISSN 1990-6145
ARPN Journal of Agricultural and Biological Science
©2006-2011 Asian Research Publishing Network (ARPN). All rights reserved.

www.arpnjournals.com

ASSESSMENT OF NILE CROCODILE UTILIZATION IN SELECTED COMMUNITIES OF RIVERS STATE, NIGERIA

Ijeomah H. M. and Efenakpo O. D.
Department of Forestry and Wildlife Management, University of Port Harcourt, Port Harcourt, Nigeria
E-Mail: henryijeomah@yahoo.com

ABSTRACT

Nile crocodile, a species endemic to Africa is threatened and the rate of its utilization in Nigeria, particularly in coastal areas is unknown. Assessment of crocodile utilization was therefore conducted in Choba, Aluu, Abonema and Emohua, being communities located around the fresh water/saltwater transitional river, with the aim of determining its rate of utilization in the study area. Structured questionnaires, field observations and in-depth interviews were used for the study. Two sets of questionnaire were purposely administered to three categories of respondents in the study area. The first set was administered to all crocodile consumers and all the fishermen/hunters in the study area while the second set was administered to the only crocodile farmer found in Abonema. In all, a total of 167, 70 and 1 consumers, fishermen/hunters and farmer respondents were respectively sampled. Data obtained were analyzed using descriptive statistics. Results revealed that 77.0% of respondents utilized crocodile for consumption alone. A cumulative of 1239 individuals of crocodile were consumed as at 2010 in the study area by consumers. About 57.0% consumers are willing to buy crocodile meat and the preferred sizes for consumption are sub adults (60.0%) and adults (30.5%). Most respondents (81.0%) do not hunt but know crocodile hunters (69.0%). Majority of the consumers (60.0%) are not willing to engage in crocodile farming. The willing respondents are interested in crocodile farming for money making (64.2%), food (19.4%) and hobby and money (16.4%). Approximately 77.0% of crocodile hunters and consumers perceived that the population of the species was decreasing in the study area. All respondents did not want crocodile to finish as its meat is desirable to consumers in the study area. About 63.0% had not recorded any form of injury from crocodile. In all only 37.0% of accident cases had been recorded with crocodile. This shows that many of the respondents can handle crocodiles without being hurt and that rearing of crocodiles in captivity could be effective in the study area if properly planned. However only 51.0% are interested in crocodile farming, Moreso, only one crocodile farm exists in the study area and is still at the rudimentary stage even though it has been in existence since 1967. Challenges to crocodile farming were high cost of feeding, space requirement and lack of expertise.

Keywords: Nile crocodile, Consumptive utilization, Wildlife conservation, Rivers state.

INTRODUCTION

The Nile crocodile (*Crocodylus niloticus* Laurenti) is one of the most commercially utilized and highly valued species of crocodilians producing a 'classic' hide due to the absence of osteoderms or bony plates under its skin. Historically, Nile crocodiles were heavily hunted for their valuable hides and their numbers were severely reduced almost worldwide (Gans *et al*., 1976; Fergusson, 2010). World Trade Organization reported in 1993 that 80,000 skins were produced from crocodile annually with the majority coming from Zimbabwe (54%) and South Africa (15%) from ranching and captive breeding (Collins, 1995; IUCN SSC, 2008).

Through the combination of trade controls and innovative applied conservation measures, crocodiles were reported to be thriving and numbers have returned to carrying capacity throughout most of their range (Brown *et. al*., 2005), however increase in population of crocodile is yet to be noticed in Nigeria.

Harcourt (2009) has implicated the high international demand for crocodile skin for the endangering status of Nile crocodile in Nigeria and therefore recommended thorough investigation and evaluation of the species and also the adoption of farming Nile crocodile species as a sustainable utilization program in Nigeria. Nile crocodile (*Crocodylus niloticus* Laurenti) which was once found in the Nigerian coastal waters right up to Lake Chad is fast disappearing due to loss of habitat and hunting (Nathaniel *et al*., 2010).

Based on international demand for investigations in the field of wildlife conservation, several investigations have been conducted on different areas of Nile crocodile including its social behaviour, Feeding (diet), population dynamics, reproduction, habitat preference, thermoregulation and captive management in other countries. None of such research has been carried out to determine the rate at which crocodiles are depleting due to human consumption in Rivers State, Nigeria.

Since man cannot be denied the use of natural resources there is need for sustainable utilization programmes to ensure perpetuity of the resources from one generation to another.

Hutton (1990) outlined priority areas that need to be addressed for the development of sustainable use programmmes in this country as:

a. Pre-feasibility studies (e.g. harvest potential).
b. Policy and legislation to provide the management framework.
c. Feasibility studies (identification of potential production sites, evaluation and quantification of factors inherent in sustainable use programs).

©2006-2011 Asian Research Publishing Network (ARPN). All rights reserved.

d. International requirements for trade (CITES submissions, documentation and tagging of hides).
e. Population census and monitoring (technical support and training).
f. Technical support for developing ranching/farming programs.
g. Marketing.

This paper, therefore, seeks to investigate the utilization pattern of Nile crocodiles in selected areas of Rivers State and a feasibility survey of consumption. It also addresses the challenges faced in captive management of Nile crocodiles.

Objectives of the study

The objectives of this study are to:

a) Ascertain the consumption rate of the species by households in selected areas;
b) Determine the numbers of people engaged in Nile crocodile farming as a conservational tool;
c) Find out respondents perception on the population of crocodile status in the study area; and
d) Ascertain the ability and willingness of fishermen/hunters to participate in crocodile farming.

Scope of the study

This research study was limited within the scope of three categories of people engage in crocodile utilization around the freshwater/salt water transitional river of Choba, Aluu, Emohua, and Abonema of Rivers State namely; consumers, fishermen/hunters and farmers due to ecological demand, time and financial constraints.

Nile crocodile sizes

The work of Hutton (1989) and Wikipedia (2007) reveals the various sizes of Nile crocodile as juvenile (Figure-1) ≤ 1.2 m (< 3 years), sub-adult (Figure-2) > 1.2 m but < 4m (<10 years) and adult (Figure-3) >4 and ≥ 8m (11 -100).

Figure-1. Juvenile size of crocodile.

Figure-2. Sub-Adult size of crocodile

Figure-3. Adult size of crocodile: Adapted from Kay *et al*. (2006).

MATERIALS AND METHODS

Study area

The areas selected for the study are all in Rivers State, Nigeria. Choba is a town located in Obio/Akpor Local Government Area which lies between latitude 04^0 03^1 and 05^0 00^1N and longitude 06^0 45^1 to 07^0 00^1E (Nwankwo *et al*., 2010). Emohua is the headquarters of Emohua Local Government Area and lies on latitude 04^0 to 75^1 N and longitude 07^0 11^1 E (GPS). Aluu is a community in Ikwerre Local Government Area and lies on latitude 04^0 to 65^1 N and longitude 05^0 to 07^0 $12^{''}$ E (GPS). Abonema is a community in Akuku Toru Local Government Area and lies on Latitude 04° 44' 0" North and longitude 06° 46' 18" East (GPS). Farming is the major occupation in Choba, Aluu and Emohua unlike Abonema were fishing is the major occupation of households.

©2006-2011 Asian Research Publishing Network (ARPN). All rights reserved.

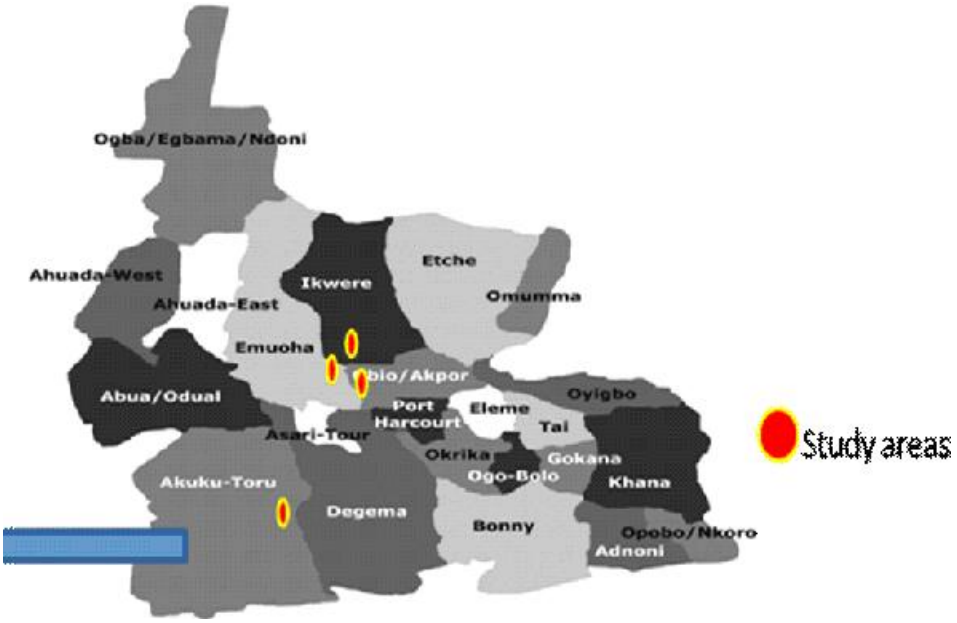

Figure-4. Map of rivers state showing the study areas in different local government areas, adapted from Baan (2009).

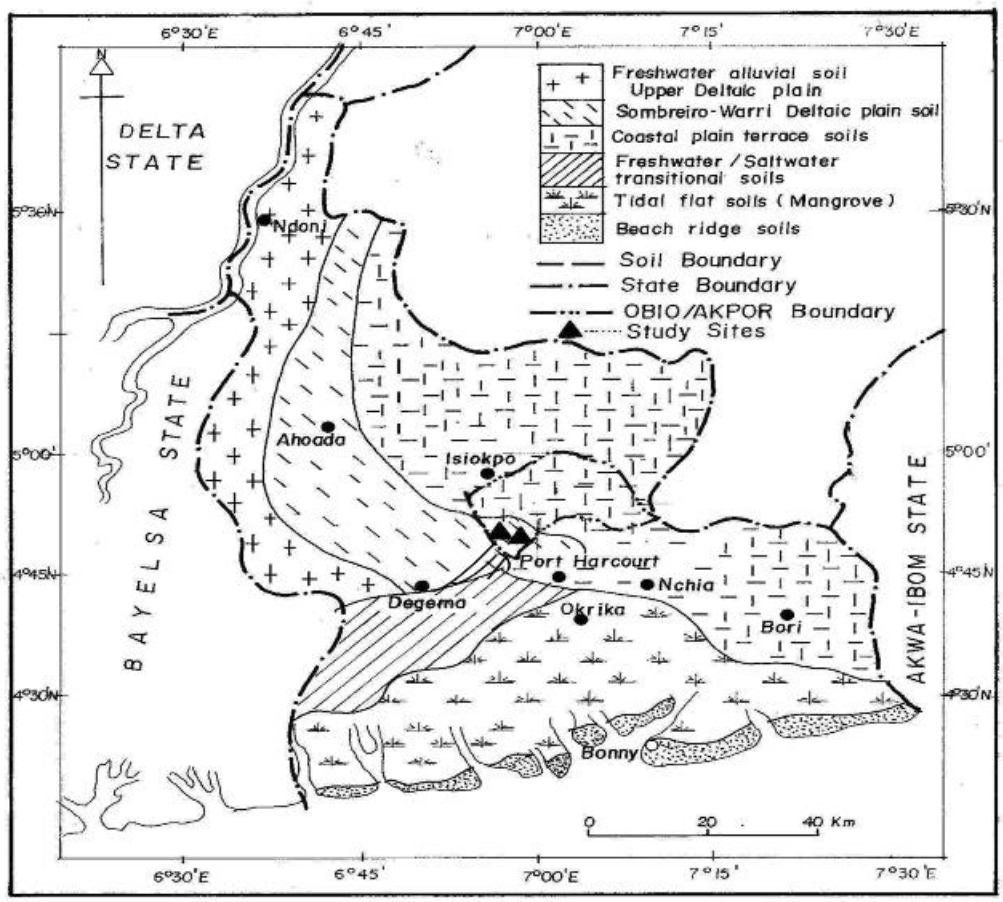

Figure-5. Map of study areas indicating the fresh water/salt water transitional areas, adapted from Nwankwo and Ehirim (2010).

©2006-2011 Asian Research Publishing Network (ARPN). All rights reserved.

Sampling techniques

The study locations where selected based on their closeness to the freshwater/salt water transitional river as shown in Figure-4. The selected communities are: Choba, Aluu, Emohua and Abonema of Rivers State. Data for the study were obtained through pre-tested structured questionnaires, in-depth interviews and field observations. Two sets of pre-tested structured questionnaires were administered purposively to three categories of respondents. The first set of questionnaire was administered to all crocodile consumers in the four selected communities, and also to all fishermen/hunters who had ever caught a crocodile (to get information on hunters/fishermens' perceived assessment of crocodile population and the willingness and ability to participate in crocodile conservation/farming). The second set of questionnaire was administered to owners (management) of crocodile farms. In all, 167 crocodile consumers and 70 fishermen/hunters were interviewed in the study area while only one crocodile farm manager was interviewed with the second set of questionnaire. The numbers of questionnaires distributed for different categories of respondents in each selected site is shown below in Table 1.

Table-1. Numbers of respondents in selected communities.

Respondents	Abonema	Aluu	Choba	Emohua	Total
Consumers	51	39	33	44	167
Fishermen/ hunters	23	12	12	23	70
Farmers	1	0	0	0	1

Method of data collection

The methods used for the collection of data for the research work were basically in three ways; pre- tested structured questionnaires, field observation, and personal interviews depending on the objective to be achieved.

Methods of data analysis

Data obtained from the study were analyzed using descriptive statistic in form of counts of frequency, Bar chart and Pie chart. Total numbers of catches for each year was gotten from the addition of all catches made by fishermen/hunters in each year. Rate of hunting in selected communities on monthly basis where arrived at by dividing total numbers of catches in a year (annual) by 12 months. The average numbers of crocodile caught by fishermen/hunters in each community were calculated by dividing the numbers of total catches with the numbers of fishermen/hunters in that community. The average numbers of crocodile consumed per - consumers were calculated by dividing the total numbers of crocodile consumed by numbers of consumers' respondent in the community.

Consumption rate quota on community basis was gotten from the percentage representation of community by diving each community total numbers of crocodile consumed by the overall total numbers of consumption multiply by 100

RESULTS

Consumption rate of crocodile by households

Results on consumption rate of crocodile by households are presented in Table-2 and Figure-6. Table-2 shows the average numbers of crocodile consumed by one consumer as at 2010. In each community number of crocodile consumed in 2010 per respondent was highest (8) in both Emohua and Aluu communities.

Table-2. Average numbers of crocodile consumed per respondent in 2010.

Year	Abonema 51(335)	Aluu 44(338)	Choba 33(191)	Emohua 59(325)
2010	7	8	6	8

* Numbers in brackets represent total numbers of crocodile consumed.

Source: Field Survey 2010.

Figure-6 shows that the highest consumption of crocodile in 2010 was experienced in Abonema (33.0 %), which was followed by Aluu (27.0 %).

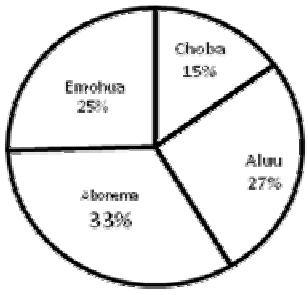

Figure-6. Consumption rate of crocodiles as at 2010 on community basis.

Desirability of crocodile meat

Results on desirability of crocodile meat by consumers are presented in Tables 3 and 4. The results show that most respondents (96.0%) considered crocodile meat desirable, about 77.0% of respondents do not make other use of crocodile but utilized it for consumption and

©2006-2011 Asian Research Publishing Network (ARPN). All rights reserved.

the sub-adults (34.0%) are the mostly preferred size. About 69.0% of respondents were aware of where crocodiles are sold though only 41.0% know the sellers. Table-3 reveals that only 40.0% of the consumer respondents are willing to engage in crocodile farming.

Table-3. Desirability of crocodile meat in study area by consumers.

Parameters	**Variables**	**Frequency**	**Percentage** (%)
If consumers like crocodile meat	Yes	160	96.0
	No	7	7.0
If respondents make other uses of crocodile apart from consumption	Yes	39	23.0
	No	128	77.0
Willingness to buy crocodile meat for consumption	Willing	95	57.0
	Not willing	72	43.0
Size preferred	Juvenile	9	9.5
	Sub-adult	57	60.0
	Adult	29	30.5
If consumers hunt	Yes	32	19.0
	No	135	81.0
Respondents knowledge of people who hunts crocodile	Yes	115	69.0
	No	52	31.0
Awareness of where crocodiles are sold	Aware	65	94.0
	Not aware	4	6.0
Awareness of crocodile sellers	Aware	69	41.0
	Not aware	98	59.0
How many consumers are ready to engage in crocodile farming?	Yes	67	40.0
	No	100	60.0
Reasons why consumers want to engage in farming	Fun and money	11	16.4
	Money	43	64.2
	Food and like	13	19.4
How many consumers want crocodile to finish?	Yes	6	4.0
	No	161	96.0

Source: Field Survey 2010.

Awareness of crocodile consumption

Results on consumer's consumption awareness pattern in selected communities are presented in Tables 4. Most of the respondents (80.8%) who consumed crocodiles do not hunt and most respondents (52.6%) have consumed 1-5 crocodiles. Respondents hardly consume crocodile in drinking parlour even though majority (50.8%) buys what they consumed. Table-4 shows that most respondents (59.2%) do not know many crocodile hunters.

©2006-2011 Asian Research Publishing Network (ARPN). All rights reserved.

Table-4. Awareness of crocodile consumption and source of supply.

Parameter	Frequency	Percentage (%)
Source of crocodile		
Bought and killed	28	16.7
Killed	8	4.7
Bought	85	50.8
Family/friends killed	16	27.5
If consumers hunt crocodiles for consumption?		
Yes	32	19.2
No	135	80.8
If consumers know others hunters of the species?		
Yes	68	40.7
No	99	59.3
If respondent consumes the species in drinking parlour?		
Yes	14	8.4
No	153	91.6
Numbers of crocodile consumed		
1-5	88	52.6
6-10	49	29.4s
11-15	13	7.8
16-20	17	10.2

Source: Field Survey 2010.

Respondent's perception on the population of crocodile status

Tables 5 and 6 show that majority of the respondents (77.0%) perceived that the population of crocodile is decreasing.

Table-5. Perception of respondents on population status of crocodile in selected communities.

Respondents	Abonema	Aluu	Choba	Emohua	Total
Fishermen/Hunters					
Decreasing	21	12	10	16	59(84.3)*
Increasing	2	0	2	7	11(15.7)*
Static	0	0	0	0	0(0)
Consumers					
Decreasing	45	26	22	30	123(73.6)*
Increasing	6	13	11	14	44(26.4)*
Static	0	0	0	0	0(0)

Source: Field Survey 2010.
* Represent percentage values.

©2006-2011 Asian Research Publishing Network (ARPN). All rights reserved.

Table-6. Perceived assessment of crocodile population status by fishermen/hunters and consumers on cumulative basis.

Status	Fishermen/Hunters	Consumers	Total	Percentage (%)
Decreasing	59	123	182	77.0
Increasing	11	44	55	23.0
Static	0	0	0	0

Source: Field Survey 2010.

Numbers of people involved in crocodile farming in the study area

The results on numbers of persons involved in crocodile farming are presented in Figures 7 and 9. One crocodile farm in Abonema is the only farm in the entire study areas (Figure-7).

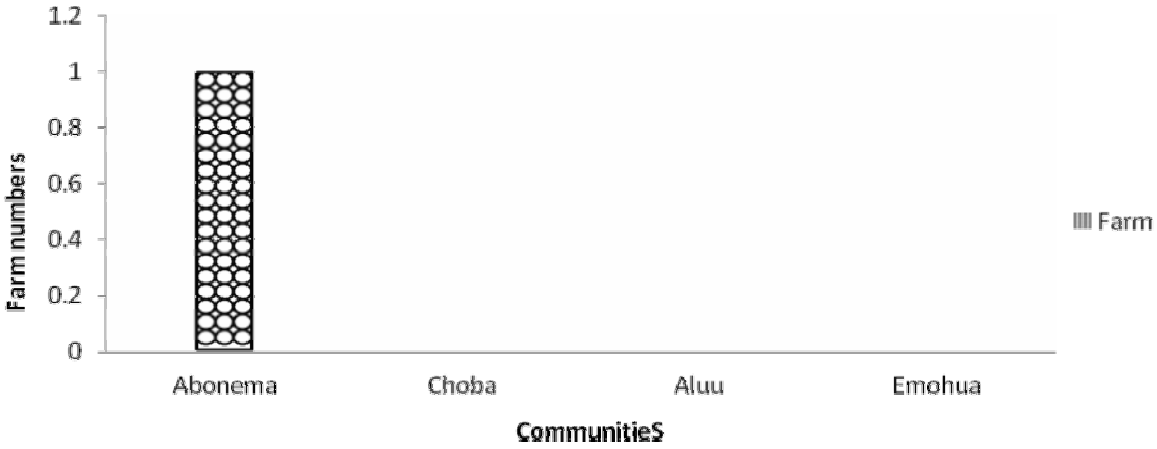

Figure-7. Areas where farm are located in the study areas.

Source: Field Survey 2010.

©2006-2011 Asian Research Publishing Network (ARPN). All rights reserved.

Figure-8. A Crocodile pen at Abonema.

Source: Field Survey 2010.

As presented in Figure-9, the challenges faced by the only crocodile farmer in the studied area are arranged in a descending order of feeding, space, expertise and lack of awareness by consumers.

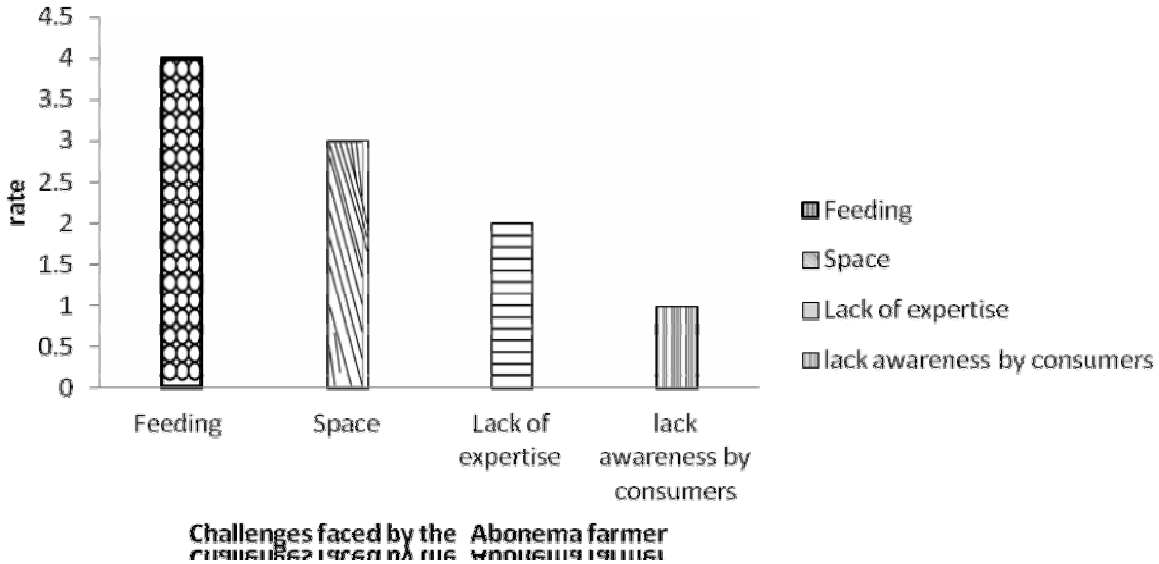

Figure-9. Challenges faced in crocodile farming.

Fishermen/hunters' ability and willingness to participate in crocodile farming

Results on assessment of respondent's ability and willingness to participate in crocodile farming are presented in Tables 7 and 8. Majority of the respondents in Abonema (78.0%) and Choba (75.0%) have never fallen victim of crocodile accident. All the respondents in the study areas do not want crocodile to finish. Respondent's interest in crocodile rearing was 61.0 % in Abonema, 58.0 % in Choba and 48.0 % in Emohua and 33.0 % in Aluu.

©2006-2011 Asian Research Publishing Network (ARPN). All rights reserved.

About 78.0%, 70.0 % and 67.0 % of the respondents from Abonema, Emohua and Choba, respectively have interest in crocodile conservation programme (Table-7). On cumulative bases majority of the respondents (66.0%) were interested in crocodile conservation.

Table 7: Assessment of fishermen/hunters ability and willingness to participate in crocodile conservation in selected communities

Parameters	**Variables**	**Frequency**	**Percentage** (%)
Choba			
Fishermen/hunters that are victim of crocodile accident	Yes No	3 9	25.0 75.0
Interest in rearing crocodile	Interested Not interested	7 5	58.0 42.0
Fishermen/hunters'interest in conservation programs	Interested Not interested	8 4	67.0 33.0
If Fishermen/ hunters want crocodile to finish	Yes No	0 12	0 100
Aluu			
Fishermen/hunters that are victim of crocodile accident	Yes No	6 6	50.0 50.0
Interest in rearing crocodile	Interested Not interested	4 8	33.0 67.0
Fishermen/hunters interest in conservation programs	Interested Not interested	7 5	58.0 42.0
If Fishermen/ hunters want crocodile to finish	Yes No	0 12	0 100
Abonema			
Fishermen/hunters that are victim Of crocodile accident	Yes No	5 18	22.0 78.0
Interest in rearing crocodile	Interested Not interested	14 9	61.0 39.0
Fishermen/hunters interest in conservation programs	Interested Not interested	15 8	78.0 22.0
If Fishermen/ hunters want crocodile to finish	Yes No	0 23	0 100
Emohua			
Fishermen/hunters that are victim Of crocodile accident	Yes No	12 11	52.0 48.0
Interest in rearing crocodile	Interested Not interested	11 12	48.0 52.0
Fishermen/hunters interest in conservation programs	Interested Not interested	16 7	70.0 30.0
If Fishermen/ hunters want crocodile to finish	Yes No	0 23	0 100

Source: Field Survey 2010.

©2006-2011 Asian Research Publishing Network (ARPN). All rights reserved.

Table 8: Assessment of fishermen/hunters respondent ability and willingness to participate in crocodile conservation on cumulative basis

Parameters	Variables	Frequency	Percentage (%)
Fishermen/Hunters that are victim of crocodile accident	Yes No	26 44	37.0 63.0
Interest in rearing crocodile	Interested Not interested	36 34	51.0 49.0
Fishermen/Hunters interest in conservation programs	Yes No	46 24	66.0 34.0
If Fishermen/ hunters want crocodile to finish?	Yes No	0 70	0 100

Source: Field Survey 2010.

DISCUSSIONS

Consumption rate of crocodiles

The results showed that a total of 1239 crocodiles have been consumed by respondents as at 2010 with more crocodile consumers in Abonema and Aluu. Apart from the fact that majority of crocodile hunters/fishermen were located in Abonema, the presence of a crocodile farm in the community could have made respondents more conscious of crocodile consumption and therefore contributed to the increase in number of crocodile consumers (Figure 2). On individual basis Aluu and Emohua had the highest number of crocodiles consumed per person as at 2010. This could be ascribed to the fact that a popular bush meat centre (where crocodile meat is always consumed and a bush meat market) are located in Omagwa, a nearby community to Aluu. This agrees with the work of Onu and Ijeomah (2010) on bushmeat consumption in Omagwa. The case of Emohua can be related to their low level of education, awareness and relatively high numbers of fishermen/hunters (23). Even though many researches (Gans *et al*., 1976; Revol, 1995; Harcourt, 2009; Fergusson, 2010) portrayed that the most valuable product from the crocodile is the hide used in the exotic leather trade, the species is mainly utilized in the study area for only consumptive purpose. Parts of crocodile's body such as the heads, feet, teeth, claws and back strips commonly processed and retailed as curios in many countries are hardly given any special attention in the study area. This implies that the respondents have little knowledge of the monetary values of Nile crocodile. It also shows that the respondents do not have ready market for such crocodile parts. As rural inhabitants of Niger Delta they are more interested in food to consume for survival due to high level of poverty.

Consumers' desirability and consumption awareness/pattern

Crocodile is mainly utilized for consumption in the study area as respondents considered the meat desirable (96.0%). It is a good source of white meat low in cholesterol. The high desirability level could be attributed to the reason why respondents do not want crocodile to finish (Table-7)**.**

About 52.6% and 29.3% of the respondents have consumed 1-5 and 6-10 crocodiles, respectively. The size mostly preferred for consumption is the sub-adult as the juvenile were considered immature for consumption and the adults relatively expensive and more difficult to catch or handle. Most respondents (80.8%) do not hunt to get crocodiles for consumption and do not eat crocodile in drinking parlours. About 50.8% bought the crocodile they consumed while 27.5% consumed the ones killed by friends or family members. This showed that consumers buy and consume crocodile meat when available. Generally, meat from wild animals 'bushmeat' are considered a delicacy in most parts of Nigeria, Niger Delta inclusive. Bush meat, apart from being well cherished is the major source of dietary animal protein to rural inhabitants due to its availability and free procurement from the wild. Among the coastal inhabitants of the Niger Delta, fish, crabs, periwinkle, oyster, larvae of palm beetles and Nile crocodile constitute some of the few wildlife species available in the mangrove and therefore consumed as frequent as available.

Crocodile farming in selected areas

Even though hunting and consumption of crocodile is common in the study area and many respondents do not want crocodile to finish in the wild the study revealed that it is only one crocodile farm found in Abonema that exist in the four selected communities (Figures 6, 7 and 9). This indicates that all the crocodile consumed in the study area were from the wild. The fewness of respondents interested in keeping crocodile could be attributed to the fact that most respondents perceived it as a ferocious ''man eater'' species that cannot be domesticated. Besides, they are not aware of the potential benefits of crocodile farming and the large global market for crocodile products. Interaction with the only crocodile farmer in Abonema confirmed that despite the fear and belief of people on crocodile farming no accident had been recorded since the inception of the farm far back 1967. However the major challenges encountered in crocodile farming by the farmer is high cost of feeding as

©2006-2011 Asian Research Publishing Network (ARPN). All rights reserved.

the species is a carnivore. This confirms the finding of Ijeomah and Aiyeloja (2007). Many respondents lack isolated space in their residence to construct enclosures for crocodile farm. Others lack the expertise to design the crocodile enclosure, and effectively manage the species. The only farmer in Abonema has not received any form of support from conservation bodies.

Perceived population status of Nile crocodile by fishermen/hunters and consumers

When what is commonly seen frequently consumed or caught becomes difficult to sight, catch or bought people perceive that the population has decreased. Both consumers and fishermen/hunters of crocodiles have perceived that crocodile population in the study area has reduced overtime. The obvious decrease in crocodile population status in the study area could be attributed to anthropogenic activities such as hunting and habitat destruction which is similar to findings of Aust (2009). Though this decrease in population has been noticed, no attempt was made to guarantee future utilization by increasing the population through regulated hunting or farming. This is contrary to the findings of Macgregor (2002) which emphasized ranching (farming) as the preferred means of obtaining conservation benefits from crocodile utilization. It is also different from what is obtainable in Namibia (Fergusson, 2010) and Kenyan (Kenyan's report to CITES, 2006) where crocodile populations were increased and consequently moved from Appendix 1 to 11 in 2004 and 1992, respectively through ranching. Farming of Nile crocodile would have been an effective measure to raise the population of Nile crocodile since protective management or park resources conservation have failed over time due to increasing numbers of crimes around parks and reserved areas where crocodiles and fishes are found.

Ability and willingness of respondents to participate in crocodile conservation

The results of the study revealed high level of willingness of fishermen/hunters to participate in crocodile conservation as all respondents do not want crocodile to finish. Some fishermen/hunters were not interested in conservation programmes because of the fact that it would be handled by Government or Non- Governmental Organization who might hinder them from killing the crocodile at will. The fact that majority of fishermen/hunters have hunted crocodile without being victims of crocodile accident implies that the fishermen /hunters can handle crocodile effectively with little training. Even the few, who were victims if taught, could make reasonable progress in crocodile farming since they had the courage to handle it at the onset. On community basis, majority of the respondents who are willing to participate in crocodile rearing are from Abonema. This can be ascribed to the fact that someone have done it and recorded success in crocodile rearing. The fact that more cases of crocodile accidents were recorded in Emohua cannot be unconnected with the fact that the community has been taking the lead in numbers of crocodile catches.

CONCLUSIONS AND RECOMMENDATIONS

The utilization of natural resources such as the Nile crocodile for various purposes by man is not abysmal but when immense pressure is consistently mounted on resources they continue to decrease in number and may eventually become locally extinct. Most respondents perceived that crocodile population was decreasing due to decreases in catches. Even though most respondents did not want the species to become extinct and were willing and able to rear crocodile yet, concerted efforts are not being made to increase population of the species through captive breeding. The only crocodile farm in study area is very rudimentary even though it has been in existence in 1967.

Proper awareness on sustainable utilization of the species should be created in Choba, Abonema, Aluu, and Emohua communities. The Federal and State Government, Non Governmental Organization and Conservation bodies should encourage inhabitants of these selected communities through remuneration, training and awareness to embark on crocodile farming and captive breeding. Because of the high poverty level the respondents will be willing to participate in conservation programmes if they will benefit financially. However, the programme should be designed in such a way that with time the owners of the farms can manage the farms independently and profitably. Total enumeration of the species population in the wild should be periodically conducted in the study area to monitor the population dynamics. Efforts should also be made to protect Nile crocodiles in their natural habitats through community participation and conservation studies.

Further researches should be carried out in the following area:

a) To conduct periodic assessment of crocodile population; and
b) Impact of various land use system on Nile crocodile population recovery.

REFERENCES

Aust P.W. 2009. The ecology, conservation and management of Nile crocodiles *Crocodylus niloticus* in a human dominated landscape. Unpublished PhD Thesis. Department of Zoology, Imperial College London. p. 88.

BAAN. 2009. http: //www.livingstone.org/docs/baanpdf.

Brown C.J., Stander R., Meyer-Rust R. and Mayes S. 2005. Results of a Crocodile *Crocodylus niloticus* survey in the river systems of northeast Namibia. Crocodile Specialist Group Newsletter. 23(3): 18-21.

Fergusson R.A. 2010. Nile Crocodile *Crocodylus niloticus* Status Survey and Conservation Action Plan. Proceedings

©2006-2011 Asian Research Publishing Network (ARPN). All rights reserved.

of the 11th Working Meeting of the IUCN-SSC Crocodile Specialist Group. IUCN: Gland October 15th 2010 Switzerland. pp. 84-89.

Gans C. and Pooley A.C. 1976. Research on Crocodiles. Journal of Ecology. 57(5): 839-840.

Harcourt D. 2009. Solving Crocodile Shortage in Nigeria with Crocodile Farming. http://www.ecolocalizer.com 28/06/2010.

Hutton J. 1989. Movements, home range, dispersal and the separation of size classes in Nile Crocodiles. Journal of American Zoologist. 29(3): 1033-1049.

Ijeomah H. M. and Aiyeloja A. A. 2007. Tourism and Economic Challenges in Jos and Pandam Wildlife Parks of Plateau State, Nigeria. Nigerian Journal of Forestry. 37(1): 11-18.

IUCN SSC. 2008. IUCN CSG species accounts on Crocodylus niloticus. http://www.iucncsg.org 26/06/2010.

IUCN. 2009. IUCN Red List of Threatened Species. Ver. 2009.1 (www.iucnredlist.org).

Kay W.R., Shabata Y., Yoshikane M., Inoue M., Yanai T., Karmata R., Edmonds J.S. and Morita M. 2006. Very High Concentrations of DDE and Toxaphene residues in crocodiles from Ord River, Western Australia: An Investigation into possible endocrine disruption. Journal of EnvironmentalMonitoring. 8: 649-661. http://www.livingstone.org/docs/baan.pdf.

Kenya. 2006. The Status of Ranching and trade in the Nile crocodile (*Crocodylus niloticus*) in Kenya, a Report of Kenya to the CITES Secretariat in accordance with Res. Conf. 11.16 May 31.

Macgregor J. 2002. International trade in crocodilian skins: review and analysis of the trade and industry dynamics for market-based conservation. Proceedings of the 16th Working Meeting of the IUCNSSC Crocodile Specialist Group. IUCN: Gland. October 15th 2002 Switzerland. pp. 12-18.

Nathaniel A. and Imeh T. 2010. The effects of poverty in conservation of biodiversity: The Nigeria Experience. http://www.scienceinafrica,co.za 28/07/2010.

Nwankwo C. N. and Ehirim C. N. 2010. Evaluation of aquifer characteristics and groundwater quality using Geoelectric Method in Choba, Port Harcourt. Journal of Scholars Research Library 2(2): 396-403. http://scholarsresearchlibrary.com 28/07/2010.

Onu M.E. and Ijeomah H. M. 2010. Assessment of Bushmeat trade in Ikwerre Local Government Area of Rivers State: A case study of Omagwa Bushmeat market. International Journal of Agriculture and Rural Development. 13(2): 281-286

Revol, B.1995. Crocodile Farming and Conservation, the example of Zimbabwe. Journal of Biodiversity Conservation. 4(3): 299-305.