Communication N°15

KPERA G.N., SINSIN B., MENSAH G.A., 2009. Endogenous conservation of wildlife faced to the trade of crocodile organs in traditional medicine purposes in Benin. In: IUCN (Ed.), Proceeding of 1st Workshop of the West African Countries on Crocodilian farming and conservation 13-15 November 2007, La Tapoa Regional Parc W, Niger, 40-53.
http://cmsdata.iucn.org/downloads/proceeding_congres_crocodile_tapoa.pdf

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Actes du 1er Congrès d'Afrique de l'Ouest sur les Crocodiles « Elevage et Conservation des crocodiles » 13 au 15 novembre 2007 à la Tapoa, Parc Régional W du Niger

Proceeding of 1st Workshop of the West African Countries on on Crocodilian farming and conservation 13-15 November 2007, La Tapoa Regional Parc W, Niger

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SOMMAIRE

Endogenous Conservation of Wildlife Faced to the Trade of Crocodile Organs in Traditional Medicine Purposes (Bénin)

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Abstract:

The study was carried out in subhumid soudanian zone in northern Bénin during 18 months (July 2002 to December 2003). It permitted to determine the current distribution of crocodile species, the endogenous methods of their conservation and the trade of crocodile organs used in traditional medicine. A total of 108 locations where the presence of crocodiles was established was visited. Three habitat types invaded by crocodiles were distinguished: dams (57%), ponds (25%) and rivers (18%). The three crocodilian species found in Africa are present in Bénin. They are: Nile crocodile (*Crocodylus niloticus*), slender-snouted crocodile or African gavial (*Crocodylus cataphractus*) and dwarf crocodile (*Osteolaemus tetraspis*). *Crocodylus niloticus* was widely distributed in the study area (98% of the sites investigated).

Depending on the localities, crocodiles were protected because they represent a divinity for certain local people and a totem for others. Such beliefs or customs are the grassroots of «endogenous conservation» and represent the most important method of crocodile protection in Bénin.

This pact creates a relationship between crocodiles and people based on reciprocity and mutual respect.

Our investigations on 31 local markets in Bénin, on 2 markets in Nigeria Republic (Banana and Samia) and on Gaya market in Niger Republic permitted to inventory 17 organs of crocodile that were sold. It's composed of: skin, muzzle, legs, bone, fat, eggs, egg's shell, anus, dropping, teeth, bile, liver, lungs, heart, penis, stones contained in crocodile stomach and alive animal. Crocodile organs cost twice more expensive in Nigeria and Niger, which are the large pole of commercialization of wildlife products and accordingly localities bordering these big markets in Nigeria and Niger lack of conservation measures. This study shows that when wildlife become marketable without control local customs and beliefs could be weakened and endogenous conservation jeopardized.

Keywords: Crocodile, endogenous conservation, trade, traditional medicine, Bénin.

Conservation endogène de la faune face au commerce des organes de crocodiles à des fins médicinales au Bénin

Résumé:

L'étude s'est déroulée durant 18 mois (juillet 2002 à décembre 2003) dans la soudanienne humide au nord du Bénin. Elle a permis de déterminer la distribution actuelle des espèces de crocodiles, les méthodes de conservation des crocodiles et le circuit de commercialisation des produits et sous-produits de crocodiles utilisés en médecine traditionnelle. Au total, 108 localités où la présence des crocodiles a été établie ont été visitées. Les crocodiles occupent 3 types d'habitat, les barrages (57 %), les mares (25 %) et rivières (18 %). Les trois espèces africaines de crocodiles existent au Bénin : *Crocodylus niloticus, Mecistops cataphractus et Osteolaemus tetraspis*. *Crocodylus niloticus* est de loin l'espèce la plus répandue (98 %). Les crocodiles jouent d'importants rôles socioculturels et réligieux. En fonction des localités, ils sont vénérés parce qu'ils représentent soit une divinité soit un totem. De telles croyances ou coutumes constituent le socle "de la conservation endogène" qui représente la plus importante méthode de conservation des crocodiles au Bénin. Ce pacte crée une relation entre les crocodiles et les populations rurales basée sur la réciprocité et le respect mutuel.

Les investigations sur 31 marchés au Bénin, 2 marchés au Nigeria (Banana et Samia) et un marché à Gaya au Niger ont permis de recenser 17 produits et sous-produits. Il s'agit de : la peau (dorsale et ventrale), du museau, des pattes, des os, de la graisse, de l'œuf entier, des coquilles d'œuf, de l'anus, des crottes, des dents, de la bile, du foie, des poumons, du cœur, du pénis, des gastrolithes (pierres contenues dans l'estomac du crocodile) et de l'animal vivant. Ces produits sont issus du braconnage de crocodiles sauvages et coûtent 2 fois moins chers au Bénin que sur les marchés nigérians et nigériens qui sont les grands pôles de commercialisation d'organes d'animaux sauvages et caractérisés par l'absence de mesures de conservations des crocodiles.

Cette étude conclue que lorsque la faune devient commercialisable sans aucune réglementation, des croyances et coutumes pourraient être affaiblies et la conservation endogène est mise en danger.

Mots clés : Crocodiles, conservation endogène, commerce médecine traditionnelle, Bénin

1. Introduction

Crocodiles are the largest surviving vertebrate species of the Reptilia class and one of the last living links with the age of the dinosaur, which have remained virtually unchanged. Until the early 1950s, they were numerous in tropics of Africa, America, Asia and Australia (Dember, 1990). In recent years, crocodile's habitat destruction has taken many forms. The most obvious destruction of wetlands is by drainage, infilling, deforestation, conversion to agricultural use and pollution. This, combined with unregulated commercial over exploitation and indiscriminate killing of crocodiles for their valuable skins, which support an international trade worth over US$ 500 millions annually (Ross, 1998) and meat has resulted in many species suffering drastic declines in numbers and reduction in distribution. On the other land, crocodiles have often been killed simply because people do not like them, the

result of an exaggerated mythology, which blames them for attacks on people, domestic animals, and fish stocks (Santiapillai and de Silva, 2001).

Under the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), measures were introduced to control international trade of all species of crocodile. This aided conservation efforts by regulating the marketing of skins for export. However, the crocodile trade provided a vital source of income for rural population living in or near crocodile habitats (Kpéra, 2002).

In Bénin, crocodiles are hunted not only for their skins and meat but also for their organs such as heart, lungs, bone, penis, teeth, fat, eggs, stones contained in their stomach, etc., which were traded in local markets and border countries' markets (e.g. Nigeria and Niger) and used in traditional medicine as remedies to cure diseases and to obtain spiritual welfare (Kpéra *et al*., 2003; Kpéra, 2003). Then, crocodile is regarded as providential animal for rural populations as all its organs are used to cure diseases and also superstitions feeling. But these organs provided of poached wild crocodiles and this over-hunting has brought crocodiles populations to brink of extinction.

Fortunately certain religious and cultural taboos have endured (but attached to small isolated areas) and contributed to the reconstitution of crocodile populations in dams and water pounds in northern Bénin. But organ trade of crocodiles provided from wild animals makes endanger the endogenous conservation, the best method of protection of crocodiles at local scale.

This paper reviews current knowledge about crocodile species distribution in Bénin, traditional method of their conservation and the trade of crocodile organs for traditional medicine purposes. It also aims at preventing the extinction of crocodile species and encouraging the management and endogenous conservation of crocodiles with their habitats in order to ensure their ecological integrity.

2. Study area

This study was carried out in Soudanian zone of northern Bénin, between 10°32' and 12° North and between 2° and 3°45' East.

The climate of northern Bénin is of the Soudanian type with one rainy season going from May to October and one dry season from November to April. It's subjected to two types of winds being established chronologically in time with variable speeds: the maritime trade wind and the harmattan. The maritime trade wind blows from April to November in the southwestern direction. The harmattan is a dry wind blowing from the Sahara desert on all the north of Bénin from November to March with a mean velocity of 2 m/s and a maximum between 12 and 14 m/s. It is a factor increasing the dryness in the region. The average annual rainfall streches from 900 to 1150 mm. The average temperature is 27 °C with the minimun in the period December to February.

The vegetation consists of forest, savannah, riparian forests, etc.

3. Methods

This study was carried out in non-protected areas from July 2002 to December 2003 and was based on the present distribution of crocodile species, the endogenous methods of their conservation and the trade of crocodile's organs used in traditional medicine.

We visited a total of 108 villages situated in the administrative districts of Nikki, Kalalé and Sinendé (Borgou department), Gogounou, Ségbana, Kandi, Banikoara, Karimama and Malanville (Alibori department) and Toucountouna, Tanguiéta, Matéri, Kobli, Boukoumbé, Natitingou, Kouandé, Ouassa-Péhunco and Kérou (Atacora department) (Fig 1).

Crocodile distribution was acknowledged through interviews and observations.

The first approach was to interview local people, especially hunters, fishermen, cattle breeders, women who habitually visit dams and people living near swamps, ponds, dams and rivers. A poster featuring good-quality images of the three African crocodile species was used to ensure that the local people were positive about the identification of species. Authors being shown skins or body parts of crocodile's species that had been preserved by local hunters and traditional healers later augmented these interviews. As a result of these interviews, we obtained information concerning crocodiles' habitats and the wetlands where it could presently be encountered. The effective occupation area refers to the area actually occupied by crocodiles, as confirmed by direct observations of crocodiles in wetlands.

Direct observations of crocodiles were made by foot and from small fishing boat, using binoculars, from 0700 to 1900 hours (Santiapillai and de Silva, 2001), when they can easily be observed. It's also the time when many crocodiles lay down on riverbank basking in the sun. At every sighting of crocodiles, their number, location, habitat and behaviour were noted. Wherever possible, the species was identified based on field criteria such as, the maximum size, the color, etc. as defined by Waitkuwait (1985) (Table 1).

Also a Global Positioning System (GPS) permits us to record the coordinates of each site. These coordinates were fed into a Geographical Information System (GIS), which permits to map the current distribution patterns.

Data on endogenous knowledge of crocodile conservation and traditional medicine use were obtained by interviewing local people, especially old persons, religious chiefs, healers, by visiting the sacred water pounds of crocodile and participating to the cultural ceremonies of veneration.

Investigations on 31 local markets in the study area, 2 markets in Nigeria (Babana and Samia) and 1 market in Niger permitted to assess those organs of crocodile that were sold and their prices. We investigated Nigeria and Niger markets to know the commercial circuit of crocodile organs.

Table 1. Characteristics of African crocodilian species (Waitkuwait, 1985)

Species / Characteristics	*Crocodylus niloticus*	*Crocodylus cataphractus*	*Osteolaemus tetraspis*
Common names	Nile crocodile	Slender-snouted crocodile or African gavial	Broad-nosed crocodile or Dwarf crocodile
Maximum size	5 m	4 m	1.8 m
Coloration	On top: brassy olive to dark bronze-green Underneath: brassy yellowish	On top: dark olive-greenish Underneath: brassy yellowish with blackish marks	On top: black with small yellowish marks on tail Underneath: brassy yellow with blackish marks
Spatches of the neck	2 transversal series: - 4 spatches at 1st - 2 spatches at 2nd	2 transversal series: - 2 spatches at 1st - 2 spatches at 2nd	3 transversal series: - 2 spatches at 1st - 2 spatches at 2nd - 2 spatches small at 3rd
Dentition per upper and lower jaw	18 or 19 15	17 or 18 15	16 or 17 14 or 15
Muzzle	Three times as longer than wide in the base	Twice as longer than wide at the base	As long as wide in the base
Temperament	Aggressive	Aggressive	Less aggressive

4. Results

4.1. Current distribution of crocodile species in northern Bénin

Old persons and old hunters claimed that crocodiles existed in the past in all wetlands in Bénin. Commercial overexploitations for skin and indiscriminate killing have resulted in many crocodiles suffering drastic declines in number and reduction in distribution. However overhunting combined with severe habitat loss by deforestation, agricultural use, abusive use of pesticide for cotton and pollution have brought species to the brink of extinction.

Table 2 provides data on the present distribution of crocodile species in the study area, the seasonally (habitat behaviour) and the habitat types their frequent. A total of 108 locations where the presence of crocodiles was established today were visited. Three habitat types were invading by crocodiles: dams (57%), ponds (25%) and rivers (18%). So crocodiles have

preferred dams to ponds and rivers. In addition, they preferably colonize permanent water. The three crocodilian species found in Africa are present in Bénin. They are: Nile crocodile (*Crocodylus niloticus*), slender-snouted crocodile or African gavial (*Crocodylus cataphractus*) and dwarf crocodile (*Osteolaemus tetraspis*). *Crocodylus niloticus* is widely distributed in the study area (98% of the sites investigated). The distribution of the two others is reduced and their presence is uncertain in many locations investigated. Figure 2 present the map showing the 108 localities from where crocodiles where recorded.

Local people know and differentiate species from the color, the size, the muzzle and their degree of aggressiveness.

Table 2. Present distribution of crocodile species in northern Bénin

No.	Localities where crocodiles occurs	District/ Department	Habitat types	Habitat behaviour	*Crocodylus niloticus*	*Crocodylus cataphractus*	*Osteolaemus tetraspis*
1	Nikki	Nikki/Borgou	Dam	Permanent	+		+
2	Gnanhoun	Nikki/Borgou	Dam	Permanent	+		
3	Ganrou	Nikki/Borgou	Dam	Permanent	+		
4	Gouréyako	Nikki/Borgou	Dam	Permanent	+		
5	Sakabansi	Nikki/Borgou	Dam	Permanent	+		
6	Gbabiré	Nikki/Borgou	Dam	Permanent	+		
7	Fombawi	Nikki/Borgou	Dam	Permanent	+		
8	Gnonkourou-Kali	Nikki/Borgou	Dam	Permanent	+		
9	Ouénou	Nikki/Borgou	Dam	Temporary	+		
10	Ourmonsi	Nikki/Borgou	Dam	Permanent	+		
11	Déma	Nikki/Borgou	Pond	Permanent	-	-	+
12	Kidarou-Kpérou	Kalalé/Borgou	Dam	Permanent	+		
13	Néganzi	Kalalé/Borgou	Dam	Permanent	+	+	
14	Djegga 1	Kalalé/Borgou	Dam	Permanent	+		
15	Bouka	Kalalé/Borgou	Dam	Permanent	+		
16	Gawézi	Kalalé/Borgou	Pond	Permanent	+		
17	Néganzi	Kalalé/Borgou	Pond	Temporary	+	+	
18	Bessassi	Kalalé/Borgou	Pond	Permanent	+		
19	Danganzi	Kalalé/Borgou	Pond	Permanent	+		+
20	Péonga	Kalalé/Borgou	Pond	Permanent	+		
21	Sèkèrè	Sinendé/Borgou	Dam	Permanent	+		+
22	Guessou-Bani	Sinendé/Borgou	Dam	Permanent	+		
23	Gah-Guessou	Sinendé/Borgou	Dam	Permanent	+		

No.	Localities where crocodiles occurs	District/ Department	Habitat types	Habitat behaviour	*Crocodylus niloticus*	*Crocodylus cataphractus*	*Osteolaemus tetraspis*
24	Gnanro	Sinendé/Borgou	Dam	Permanent	+		
25	Narérou	Sinendé/Borgou	Dam	Permanent	+		
26	Sikki-Bariba	Sinendé/Borgou	Dam	Permanent	+		
27	Diadia	Sinendé/Borgou	Dam	Permanent	+	+	+
28	Sankarou	Sinendé/Borgou	Dam	Permanent	+		
29	Yarra	Sinendé/Borgou	Dam	Permanent	+		
30	Sikki-Gando	Sinendé/Borgou	Dam	Permanent	+		
31	Pénati	Sinendé/Borgou	Pond	Permanent	+		
32	Fô-Bouko	Sinendé/Borgou	Pond	Permanent	+		
33	Yarra	Sinendé/Borgou	Pond	Permanent	+		+
34	Koné	Sinendé/Borgou	Pond	Permanent	+		
35	Sori	Gogounou/Alibori	Dam	Permanent	+		
36	Bouli	Gogounou/Alibori	River	Permanent	+		+
37	Folia	Gogounou/Alibori	River	Permanent	+		
38	Gakoufo	Gogounou/Alibori	River	Permanent	+		
39	Sabotou	Gogounou/Alibori	River	Permanent	+		
40	Yacoubou-Boula	Gogounou/Alibori	River	Permanent	+		
41	Liboussou	Ségbana/Alibori	Dam	Permanent	+		
42	Bobéna	Ségbana/Alibori	Dam	Temporary	+		
43	Gbintin	Ségbana/Alibori	Dam	Permanent	+		
44	Ségbana	Ségbana/Alibori	Dam	Permanent	+		
45	Bobéna	Ségbana/Alibori	Pond	Permanent	+		+
46	Libantè	Ségbana/Alibori	Pond	Permanent	+		
47	Saonzi	Ségbana/Alibori	Pond	Permanent	+		
48	Lètè	Ségbana/Alibori	Pond	Permanent	+		
49	Piami	Ségbana/Alibori	Pond	Permanent	+		
50	Zaio	Ségbana/Alibori	River	Temporary	+		
51	Monrou	Ségbana/Alibori	River	Permanent	+	+	
52	Tissarou	Kandi/Alibori	Dam	Permanent	+		
53	Gambanè	Kandi/Alibori	Dam	Permanent	+		
54	Sassabaka	Kandi/Alibori	Dam	Permanent	+		
55	Tchoka	Kandi/Alibori	Pond	Permanent	+		
56	Angaradébou	Kandi/Alibori	Pond	Permanent	+		

No.	Localities where crocodiles occurs	District/ Department	Habitat types	Habitat behaviour	*Crocodylus niloticus*	*Crocodylus cataphractus*	*Osteolaemus tetraspis*
57	Padé	Kandi/Alibori	River	Permanent	+		
58	Sota	Kandi/Alibori	River	Permanent	+		
59	Atabénou	Banikoara/Alibori	Dam	Permanent	+		
60	Goumori	Banikoara/Alibori	Dam	Permanent	+		
61	Kokiborou Bariba	Banikoara/Alibori	Dam	Permanent	+		
62	Tintinmou	Banikoara/Alibori	Dam	Permanent	+		
63	Kakourokou	Banikoara/Alibori	Dam	Permanent	+		
64	Kérémou	Banikoara/Alibori	Pond	Permanent	+		
65	Boniki	Banikoara/Alibori	Pond	Permanent	+		
66	Goumori	Banikoara/Alibori	Pond	Permanent	+		
67	Gazéré-Tounga	Karimama/Alibori	River	Permanent	+		
68	Boumi-Tounga	Karimama/Alibori	River	Permanent	+		
69	Maguaï-Tounga	Karimama/Alibori	River	Permanent	+		
70	Bello-Tounga	Karimama/Alibori	River	Permanent	+		
71	Kossoukpè-Tounga	Karimama/Alibori	River	Permanent	+		
72	Kènè-Tounga	Karimama/Alibori	River	Permanent	+		
73	Monsey	Karimama/Alibori	River	Permanent	+		
74	Birnilafia	Karimama/Alibori	River	Permanent	+		
75	Malanville	Malanville/Alibori	River	Permanent	+		
76	Mékrou	Malanville/Alibori	River	Permanent	+		
77	Fètèkou	Kérou/Atacora	Dam	Permanent	+		
78	Ouoré	Kérou/Atacora	Dam	Permanent	+		
79	Batitinnin	Kérou/Atacora	Dam	Permanent	+		
80	Briagnamarou	Kérou/Atacora	Dam	Permanent	+		
81	Kérou-Centre	Kérou/Atacora	Dam	Permanent	+		
82	Kérou-Mission	Kérou/Atacora	Dam	Permanent	+		
83	Yakimotoko	Kérou/Atacora	Dam	Permanent	+		+
84	Pikiré	Kérou/Alibori	Dam	Permanent	+		
85	Bèket	Péhunco/Atacora	Dam	Permanent	+	+	
86	Tobré	Péhunco/Atacora	Dam	Permanent	+	+	
87	Nassou	Péhunco/Atacora	Dam	Permanent	+		
88	Samparérou	Péhunco/Atacora	Dam	Permanent	+		
89		Péhunco/Atacora	Dam	Permanent	+		

No.	Localities where crocodiles occurs	District/ Department	Habitat types	Habitat behaviour	*Crocodylus niloticus*	*Crocodylus cataphractus*	*Osteolaemus tetraspis*
90	Maressararou	Péhunco/Atacora	Dam	Permanent	+	+	
91	Kika	Kouandé/Atacora	Dam	Permanent	+		
92	Kpessourou	Kouandé/Atacora	Dam	Permanent	+		
93	Goutéré	Natitingou/Atacora	Dam	Permanent	+		
94	Perma	Toucountouna/Atacora	Dam	Permanent	+		
95	Tchakalakou	Tanguiéta/Atacora	Pond	Permanent	+		+
96	Biacou	Cobly/Atacora	Dam	Permanent	+		
97	Nouagou	Cobly/Atacora	Dam	Temporary	+		
98	Namoutchaga	Cobly/Atacora	Pond	Temporary	+		
99	Cobly1	Cobly/Atacora	Pond	Temporary	+		
100	Cobly 2	Cobly/Atacora	Pond	Permanent	+		
101	Kayanbouské	Cobly/Atacora	Dam	Permanent	+		
102	Somou	Matéri/Atacora	Dam	Permanent	+		+
103	Matéri	Matéri/Atacora	Pond	Permanent	+		
104	Tiellé	Matéri/Atacora	Pond	Permanent	+		
105	Dassari	Matéri/Atacora	Pond	Temporary	+		
106	Gouandé	Matéri/Atacora	Dam	Permanent	+	+	
107	Koukouangou	Boukoumbé/Atacora	Dam	Permanent	+		
108	Tatchadiéta	Boukoumbé/Atacora	Dam	Permanent	-	+	-
	Kouwonantougou	Boukoumbé/Atacora					

(+) Present; (-) Absent; (no mark) presence or absence uncertain; Temporary = seasonal

4.2. Endogenous conservation of crocodile

In northern Bénin, crocodiles are protected because they represent a divinity for certain local people and a totem for others. This method of protection is a typical «endogenous conservation» and represents the most important method of their protection in Bénin.

In fact, the origin of the spiritual role of crocodiles goes up far in time. On the 108 sites listed, 22 are those where crocodiles are venerated, either a proportion of 20%. The great observations of numerous animals were done in these sacred sites. The table 3 gives the localities and the ethnic groups who consider crocodile as a god.

Table 3. Localities and ethnic groups venerating crocodiles

Departments	Localities	Ethnic groups
Borgou	Fombawi, Ouénou, Déma, Gawézi, Néganzi, Bessassi, Danganzi, Sèkèrè, Diadia, Yarra, Pénati, Fô-Bouko and Koné.	Baatonu, and Boo.
Alibori	Lètè, Piami, Zaio, Gambanè, Angaradébou, Goumori, Kakourokou, Kérémou and Boniki.	Baatonu, Boo and Mokolé

Table 3 shows that three ethnic groups attach importance to the religious role of crocodile. They are: Baatonu, Boo and Mokolé. Baatonu are the most representative ethnic group in Borgou department where crocodiles are sacred and are regarded as manifestations of ancestors. In Atacora department, ethnic groups consist of Natinba, Wama, Berba, Ditammari and M'bermè, do not venerate them, but there is a totem, which prohibits to kill and to consume crocodiles because a crocodile would have helped one of the ancestors to cross a river or would have led him through the river in dry season.

Because of their cultural importance and the anecdote, which says that "a pond with crocodiles never dry up", crocodiles are subject of certain assistance brought by local people. This assistance appears by:

- Regular dragging of ponds during the dry season.
- Cleaning of the riverbank.
- Protection of crocodiles: prohibition to kill them.
- Transportation of crocodile babies towards the pond after hatching.

The assistance on crocodiles is very remarkable at Sinendé district where local population participates to their conservation through a local code for natural resources protection. In this code, articles 66 and 67 was reserved to crocodiles:

- Article 66: The crocodile is a crowned animal. So it should not be killed.
- Article 67: Any person who kills a crocodile will carry out the ceremonies of burial like those of human. He will buy white sheep, a shroud and will pay a 20 000 franc fine.

This assistance to crocodiles creates a peaceful collaboration between local people and crocodile populations. Collaboration is narrower that animals are venerated and as ponds are closed to the dwellings. This pact creates a relationship between crocodiles and people based on reciprocity and mutual respect. Them, it's common to see children having fun with young crocodiles' tail and going up the back of the adults and plunge with them. The women also lead their activities around the water points without being worried (case of Fombawi, Bessassi and Yarra localities). As for the livestock, they learned how to be accustomed with the presence of the crocodile.

This endogenous method of conservation of crocodile is very important because it's actively participating to animal protection then to maintain biodiversity in Bénin.

4.3. Trade of crocodile organs used in traditional medicine

In Bénin, the demand for wildlife products is satisfied through direct poaching or buying in markets. There are used to cure diseases or for superstitions feeling.

Our investigations on 31 local markets in the study area, on 2 markets in Nigeria Republic (Banana and Samia) and on Gaya market in Niger Republic permitted to inventory 17 organs of crocodile that were sold. It's composed of: skin, muzzle, legs, bone, fat, eggs, egg's shell, anus, dropping, teeth, bile, liver, lungs, heart, penis, stones contained in crocodile stomach and alive animal. Figure 3 presents the proportions of different organs traded.

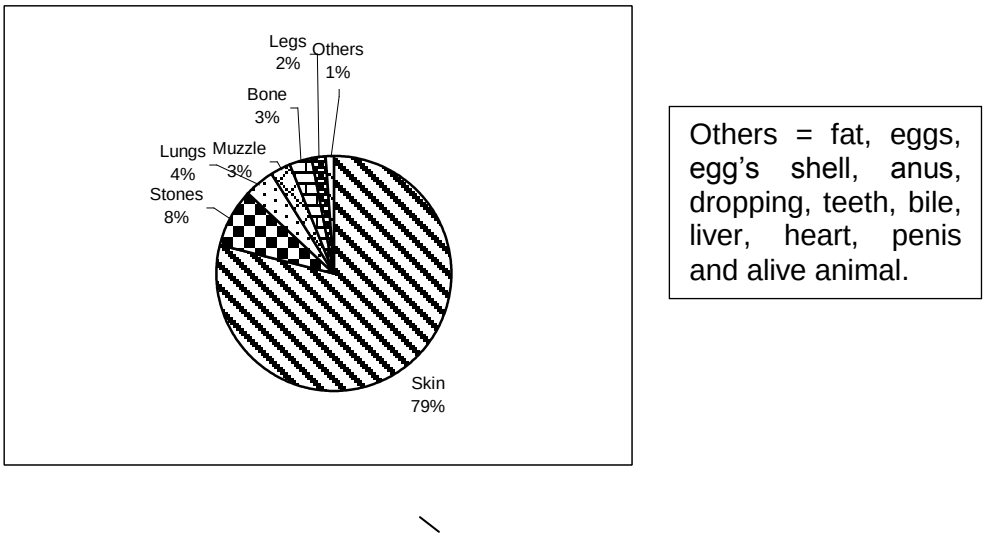

Figure 3. Proportions of organs available in investigated markets

Crocodile skin is the most representative in the markets. The organs were brought by healers and local people to cure disease such as asthma, inguinal hernia, jaundice, measles, rheumatism, otitis, whitlow, pain, etc. and for superstitions feeling. Then crocodile is regarded as a providential animal as all its organs are used to cure diseases and to obtain spiritual welfare. It's important to note that all organs are not useful and some are dangerous for human being. For example the bile is a dreadful poison.

Three groups involve in crocodile trade that were: large traders, middlemen and opportunistic traders and each group has its owns characteristics.

Large traders are generally haoussa from Niger and Nigeria. They represent the group of armed poachers who penetrate in Bénin territory to collect, hold and redistribute crocodile products to middlemen in big towns. Middlemen are characterized by having a fixed point (market in general) at which they can accumulate organs before selling. Opportunistic traders are village hunters, fishermen and farmer who seize opportunities to profit from wildlife trade if they kill them.

The study on the prices of organs in Bénin, Nigeria and Niger shows that there is a significant difference (P< 5%) between the prices. Crocodile organs cost twice expensive in Nigeria and Niger, which are the large pole of commercialization of wildlife products (Table 4).

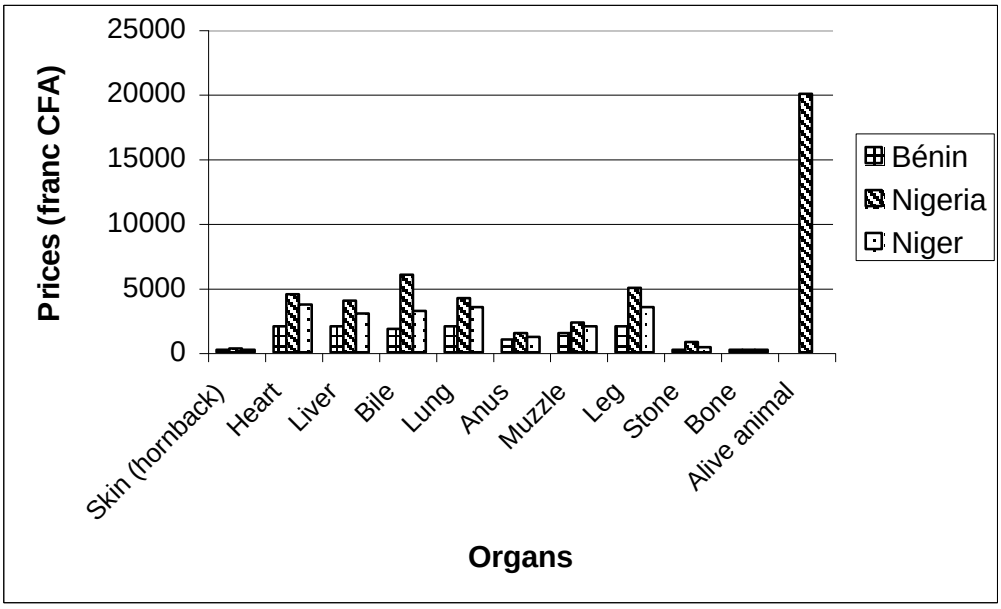

Figure 4. Comparative prices of crocodile's organs in Bénin, Nigeria and Niger

Markets

Organs prices depend of the level of trade. The prices used are the one of middlemen in markets. Alive animals were observed only in Samia market (Nigeria) and the price turns around18000-franc CFA. They were researching by healers to take fresh organs and urine. All crocodile organs come from hunting wild populations, which is non-selective and there is no legislation to assess wild products in the markets and control the prices.

5. Discussion

The distribution of crocodile in northern Bénin depends on their endogenous conservation. In Sinendé district for example where this conservation is strict, 100% of the wetlands are invading by crocodiles. Endogenous conservation is observed in Burkina Faso where near the village of Bazoulé a pound with 100 Nile crocodiles are protected because they are regarded as a manifestation of ancestors (Toonen, 2003).

But, we note that traditional ethnozoological knowledge is lost with the extinction of endogenous practices and modernization. Then, many people believe that endogenous societies are more knowledgeable about their natural surroundings and are less likely to abuse natural resources than non-endogenous societies (Clay, 1988, Mc Neeley *et al.*, 1990).

Endogenous conservation of crocodiles does not accept to take animal for medicine use or food. But conservation is not a freeze of resource and it must contribute to biodiversity and human welfare. This method as where practice in Bénin is an obstacle to the developing of traditional medicine using organs of crocodile. As traditional medicine cost less than modern medicine, this method of conservation blocks people welfare and the exploitation of crocodile for traditional medicine is adding to pressure on wild populations.

The use of wildlife in traditional medicine is not observed only in Bénin. In Laos for example, traditional medicine was estimated to be use by a least 60% of people (Nooren and Claridge, 2001). In Madagascar, oil extracted from crocodile meat has a traditional use that was restricted to rural people as a tonic and for treating open wounds. Now, hospitals are using and selling for treatments including burns, skin ulcer, cancer and melanomas. However, by far the lost important use is for asthma (FAO, 1993). Although Madagascar has crocodile ranches, the oil is from wild caught animals.

Direct effects of hunting consist of two main aspects: overhunting of target species and incidental hunting of non-targeted or rare species because hunting is largely non-selective. In addition, because hunting is often non-selective, it can have disproportionate effects on endangered species, thus reducing over all biodiversity. Given that there is a market for crocodile products which otherwise would be supplied by hunting wild populations, the availability of the same products from farmed stock may meet some of the demand and reduce the need for hunting.

If wildlife is permitted to contribute meaningfully to their welfare, people will not be able to afford to lose it in their battle for survival. If wildlife does not contribute significantly to afford to preserve it, except as a tourist curiosity in a few protected areas.

6. Conclusion

As in most tropical countries, wildlife species are less managed within conservation areas in Bénin. This is especially the case as far as crocodiles are concerned. Endogenous conservation, which is the most important method of their conservation doesn't permit the development of crocodile organs trade for traditional medicine. The cause of crocodile conservation may therefore best be served, not by a cessation of wild crocodile harvesting and a development of farming, but by the implementation of effective management plans for wild populations, involving ranching, direct harvest, or a combination of the two. But the high level of illegal trade in crocodile organs suggests that the current degree of control is far from adequate in Bénin Republic. Any conservation program in developing countries designed to enhance the long-term survival of a species, must be justifiable in terms of its value in tangible benefits to people at the local level.

Crocodiles are a valuable renewable natural resource, whose prudent utilization should be regarded as a form of land-use that can be compete effectively on economic terms with agriculture. In addition, increasing attention must be given to the development and implementation of programs such as ecotourism that would promote the non-consumptive use of crocodiles.

Whilst commercial hunting for food and medicine used should be controllable by measures such as price manipulation and taxation, much of the demand is driven by basic subsistence

needs, which are unlikely to be susceptible either to market manipulation or to more draconian measures of control, unless culturally acceptable alternatives are available.

7. Acknowledgements

This work could not have been complete without the scientific assistance of Applied Ecology Laboratory and the financial support generously provided by Centre Béninois pour le Développement Durable (CBDD) and the Netherlands IUCN committee. The authors also would like to express their gratitude to local populations of Borgou, Alibori and Atacora department for the perfect collaboration.

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