

Illegal wildlife Trade and *Osteolaemus tetraspis*; A Case Study of activities in Bushmeat Markets (Uwa and Edumanom) in Niger Delta, Nigeria

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Abstract

There is a widespread decline in the biodiversity of the Crocodylian Species particularly, *Osteolaemus tetraspis*, due to illegal wildlife trade in Niger Delta. This study investigated the effects of activities of illegal Bushmeat trade from two (2) Bushmeat Markets in Niger Delta (Uwa Market in Edo state and Edumanon Market in Bayelsa State) on the numbers of *Osteolaemus tetraspis*. Extensive Survey and counting of the number of Crocodile distributed in each Market from 2021 to 2023 was carried out using observation and key informant Interview (KII). A total of 96 *Osteolaemus tetraspis* was counted in Uwa Bushmeat Markets while 53 were counted at Edumanon Bush meat market. The Crocodile were being bought either for food, medicine or to resell. More Crocodile in Uwa Bushmeat Market compared to Edumanon.. The observation made from this study were: decrease in the number of Crocodile shaded at both market for sale compared to previous researches made some decades ago, the use of Crocodile and its products through Bushmeat Markets for food, medicine and revenue generation have greatly increased not minding the attendant diseases. Furthermore, the population and biodiversity of this *Osteolaemus tetraspis* is gradually being reduced and may lead to extinction. The need for conservation/sustainability awareness is therefore a must do by conservation agents and government parastatal

Keywords

Illegal Bushmeat trade, *Osteolaemus tetraspis*, Uwa Market, Edumanon Reserve,

L Introduction

Wildlife a major component of animal protein and a source of income to rural dwellers is in high demand by a wide range of individuals in tropical Africa, America and Asia [(33,) (7)]. This has resulted in illegal wildlife trade which is ranked as the world's fourth most valuable illicit commerce by [(35) (20)]. The cravings for these meats cut across all species of vertebrates from fishes to mammal (8), (9) and (45), (47), (23).

The dwarf crocodile, being a providential bush meat is highly hunted for because of its skin, protein source, useful organs of the body as well as medicinal, spiritual and traditional purposes. (28, 29). People tend to hunt for this species of crocodile for different reason but primarily to generate income, the tanned skin of a 14-footer crocodile can worth up to 10,000 dollars (34, 41).and the demand for other wildlife products for food and pets worth up to 23 billion US dollars (36., 21) On a subsistence scale, wildlife hunting for food is good for livelihood security and supply of dietary protein for poor people. It can only be sustainable when carried out by traditional hunter gatherers in large landscapes for their own consumption. Due to the extent of bush meat hunting for trade in markets, the survival of those species that are large-bodied and reproduce slow particularly, *Osteolaemus tetraspis* is threatened (44, 26), (52) (47). The term 'bush meat crisis' was first used in 2007 and refers to the dual threat of depleting food resources and wildlife extinctions which are all component of the bush meat trade (7)



Illegal wildlife trade is a challenge because it has the potential to damage a whole biodiversity. The population of species on earth have declined by an average of 40% between 100 and 2000; and the second biggest direct threat to species survival, after habitat destruction (20). The Population of dwarf crocodiles was estimated to be between (25,000 - 100,000). (www.a-z animals.com) and the Conservation Status was tagged Vulnerable is listed on Appendix 1 of CITES, (53) (11). The Dwarf crocodile (*Osteolaemustetraspis*) has a distinctive feature of short broad snout and tough armored scales that covered the entire body which has led to a number of names used by individuals such as Black Crocodile, Alligator (Pidgin English especially Nigeria bush meat market), Bony Crocodile (18), (57). The works of (51), revealed the perceived suitability and specific interest in dwarf crocodiles as bush meat trade species. 10,000 and above dwarf crocodiles are exported on annual basis from rural areas to urban centres where the demand is higher [(24), (4), (5), (15)]. A research was carried out on Dwarf crocodiles and it was discovered that they are hunted extensively for local consumption and their skin. The meat is often available at the local bush meat markets in the south of the country with 263 crocodiles shaded for sale in Benin City during a typical 8-week survey period. The wild population of dwarf crocodiles is estimated to be over 50,000 individuals (10). The dwarf crocodiles are primarily threatened by the growing human incursion into their natural habitats such as habitat destruction, hunting, poaching, climate change, poisoning by cane toads (13), (57).

The illegal bush meat trade is not evil in itself but considering the insatiable craving for bush meat among Africans and Nigerians and the rarity of such delicacy in local markets (41), (55), the demand and transporting these species of animals from one place to another, carries a lot of diseases along with them (41), (6). Therefore, the consumption of wild animals is an uncompromised health risk. (16), (22), in his research, listed some deadly diseases that may be transmitted from the bushmeat of Crocodilian Species such as Crocodile Pox, Caiman Pox, Adenoviral Hepatitis Mycoplasmosis, Chlamydiosis, Dermatophilosis, Mycobacteriosis, Coccidiosis, Trichinellosis, Salmonellosis, Many recent researches have supported the outbreak of various diseases from illegal bush meat trade such as Zoonosis, Ebola, HIV/AIDS and so on. (32), (56), (50),.

The illegal bush meat trade has become a cog in the wheel of conservation as many actions as been taken to curb it but end in futility (58), (43), (17),. This makes it difficult for CITES and other conservation agents to combat this cankerworm alone hence the need for this paper. The objective of this research is to investigate how the activities of wildlife trade in these bush meat markets affect the abundance of dwarf crocodiles, x-ray the exploitation of the species and its effect on the entire biodiversity.

II. *Materials and Methods*

1. *Study Area.*

The Uwa a well known Bushmeat traders located at the hub of Benin City, Edo State. There are two bushmeat markets. It has a geographical area of 1204km² and a coordinate of 6.3642472°N 5.6089668° E. the markets are saturated with wildlife of different forms: dead, roasted, near dead animals, or live animals.

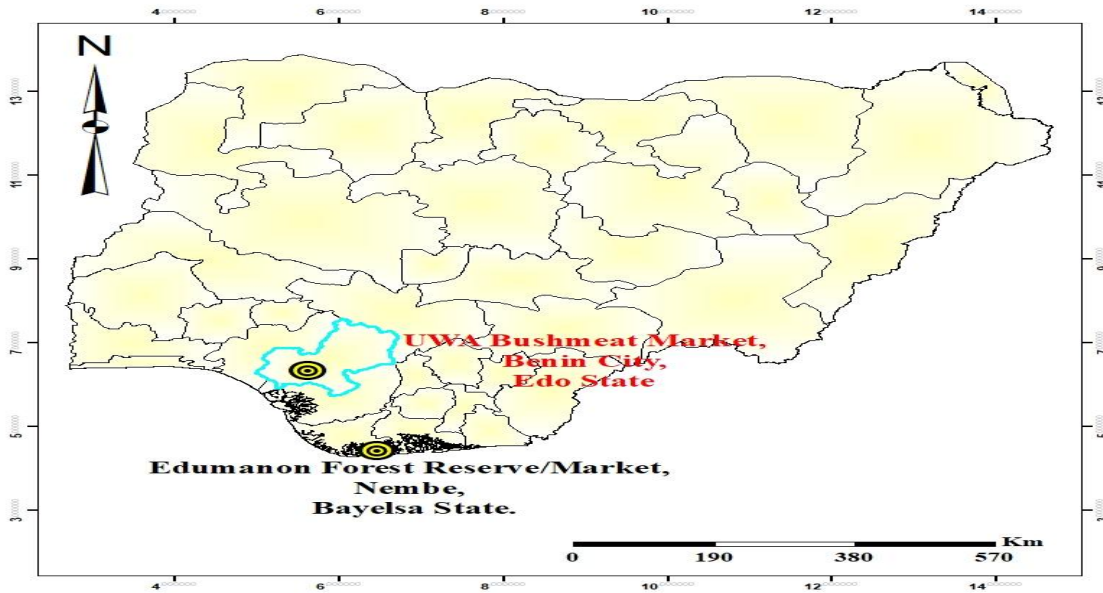


Figure 1: Map of Nigeria showing the coordinate of the study area.



Figure 2. : Uwa Market

Source: (37)

The Edumanom bushmeat market is located near the Edumanom forest reserve a few kilometers away from Okoroba in Ogbia axis located between Nembe and Brass Local Government of Bayelsa State (3). It has a total area of 93.24km^2 (36.00sq mi) and a coordinate of $4^{\circ}24'54''\text{N } 6^{\circ}27'1''\text{E}$



Plate 1: Incapacitated Dwarf Crocodile shaded for Sale at Uwa Bushmeat Market

2. Survey Method

The methods adopted for this study were; Observation, counting the number of dwarf Crocodile sighted at the bushmeat market. The number of crocodile counted were recorded. The crocodile sighted were measured with sticks compared side by side with tape rule. This was possible as many of the crocodiles were incapacitated tied with rope and some were near to death (18). Small dwarf crocodile measured 60 cm (approximately 2ft), medium sized crocodile measured 90 cm (approximately 3ft) while the large sized crocodile measured 120 cm (approximately 4ft) (46)

A key informant Interview, which involved recorded oral interview, was carried out to inquire how the marketers preserve these species for a period of time dead or alive until they are sold (18). The questions for the oral interview includes

1. How many crocodiles do you sell daily/weekly?
2. What do the people use the crocodiles for?
3. How do you get the crocodile meat to sell?
4. How do you preserve the dead crocodile bushmeat from getting spoilt or prevent death of live ones before they are sold?

III. Results And Discussion

Table 1: Visit to Uwa Bushmeat Market with records of Crocodiles Obtained.

Dates (Uwa Bushmeat Market)	Numbers of Small sized Dwarf Crocodile	Numbers of medium sized Dwarf Crocodile	Numbers of large sized Dwarf Crocodile	Total Number of Dwarf Crocodile
1st October, 2021	5	8	12	25
7 th December, 2021	4	7	5	16
25th February, 2022	2	6	7	15
7th November, 2022	2	5	3	10
25th January, 2023	3	7	5	15
7 th March, 2023	6	5	4	15
Total	22	38	36	96

Table 2. : Visit to Edumanon Bushmeat Market with records of Crocodiles Obtained

Dates (Edumanon Bushmeat Market)	Numbers of Small sized Dwarf Crocodile	Numbers of medium sized Dwarf Crocodile	Numbers of large sized Dwarf Crocodile	Total Number of Dwarf Crocodile
15 th October, 2022	2	4	4	10
17 th December, 2022	0	2	3	5
11th February, 2023	4	6	5	15
11 th March, 2023	2	4	4	10
1 st April, 2023	2	0	3	5
15 th April, 2023	1	2	5	8
Total	17	19	24	53

From the table 1 and 2 above, the abundance of dwarf crocodile in Uwa market (Table 1) is higher though the time and dates of visit not consistent as that of Edumanom (Table 2). We observed that the species are scanty in Edumanom market maybe because their market is every Saturday (weekly)

Table 3: Record of Oral Interview at Uwa Bushmeat Market, Benin City

S/N	Questions raised Orally	Number of Respondents (2)	Answers given	Percentage recorded
1	How many crocodiles do you sell weekly?	1 answered 1 (NIL)	>10	50%
2	What do the people use the crocodiles for?	2 answered	Food (2), Medicinal (2), some sell again (1)	100% 100% 50%
3	How do you get the crocodile meat to sell?	2 answered	Fishermen (2), Community Fishing	100% 50%

			(1)and Reserve Market(2)	100%
4	How do you preserve the crocodile bush meat from getting rot/dying before they are sold?	2 answered.	Smoke and fire dry(2), ensure they are kept in open area(2).	100% 100%

One of the respondents (bushmeat traders) interviewed at Uwa Market was skeptical at first giving us the right answers. The number of crocodile sold per week were less than 10 making 50% of the whole of Question 1. 100% of buyers buy crocodile for food and medicinal purpose while only 50% buy and sell again to make money for Question 2. Same way 100% of the crocodile are gotten from fishermen and Reserve market while 50% of the crocodiles are gotten from Mass Community Fishing.

Table 4 : Record of Oral Interview at Edumanom Bushmeat Market, Ohorobia, Bayelsa State.

S/N	Questions raised Orally	Number of Respondents (1)	Answers given	Percentage recorded
1	How many crocodiles do you sell weekly?	1 answered	<10	100%
2	What do the people use the crocodiles for?	1 answered	Food (1), Medicinal (1), some sell again(NIL)	100% 100% 0%
3	How do you get the crocodile meat to sell?	1 answered	Fishermen(1), Community Mass Fishing (1) and Reserve Hunters (1)	100% 100% 100%
4	How do you preserve the crocodile bush meat from getting rot/dying before they are sold?	1 answered.	Smoke and fire dry (1), ensure they are kept in open area(1).	100% 100%

Only one respondent (bushmeat trader) was present at Edumanon Bush meat market and she was open to answer questions.. The answer to each question (number of Crocodile, purpose of buying Crocodile for food and medicine) showed 100% being the only respondent, only the purpose for income (buying and selling Crocodile again) that showed 0%. Questions 3and 4 also showed 100%



Plate 2: : Large Sized Dwarf Crocodile shaded for Sale at Uwa Market.



Plate 3: : Live Dwarf Crocodile in a cave at Edumanom Bushmeat Market

IV. Discussion



1. *Abundance of Crocodile*

The observation from our research from these two Bush meat market showed that there is a progressive and geometric reduction in the number of dwarf Crocodile even with inconsistent visits to these markets.. This claim tallies with that (10) where 263 crocodiles were shaded for sale in Benin City during a typical 8-week survey period. 100 dwarf Crocodile (commonly called alligator in pidgin english) were counted at the same market within a period of six months (40). This also agreed with the fact that The crocodile population have declined as human activities and land use changes have reduced their habitat. This reduction stem from over hunting for their valuable skin which provide leather for shoes ,belts, handbags and other articles (12)

2. *Usage/Exploitation of Crocodiles*

Our observation from the oral interview showed that the Crocodile bought from the bushmeat market are for three (3) purposes: Food and protein consumption, medicinal purpose and to regenerate income. The food and medicinal purpose scaled higher in Table 3 and 4.. For food and protein, the Crocodile meat taste like chicken and is a special delicacy (14). For medicinal purpose, the use of the dwarf Crocodile is inexhaustible. The Crocodile skin is used to cure respiratory disease like Asthma and others like Inguinal hernia, Jaundice, Measles, rheumatism, Otitis, Whitlow pain and for superstitious feeling. (29) (14).. In Nigeria, the use of animal species for medicine is predetermined by culture, religion, availability and locality. (2). In Ogun State for instance, Nigeria ,55 animal species have been discovered to be used In trado-medicine from which 21 species were on the CITES (Convention International Trade in Endangered Species of Wild Fauna and Flora) list (48) while 22 animal species were discovered to be used for treatment of different ailments ranging from rashes ,toothache, night blindness to mumps and gastro-intestinal disorders in Sokoto State (1). An extensive survey of animals was carried out In alternative medicine in Ibadan (South-west, Nigeria) , ranging from leopard, civet cat, gorillas to pangolin, aardvark, warthog including reptiles like crocodiles and the ailments treated ranged from convulsion, preparation of anti-poison drugs to stomach ache (39). From this incessant demand for faunal use trade In animals has continued to flourish as there is always a need for it. Some species are becoming rare as there Is no consideration for either the conservation status or sustainability of the species before hunting (27), (49).

The medicinal effect of crocodile meat in developed world(Southern China) have resulted in high demand for the crocodile bushmeat such that the current exporting rate of these species to China, Hong Kong, and Taiwan is over 85% from African countries particularly, Nigeria.(14)

3. *Effect on Biodiversity.*

With observation from the work of (10), (40)i in Uwa Bushmeat Market and (18) in the Niger Delta on Dwarf Crocodile vis a vis this research, one is tempted to x ray the effects of this geometric reduction on the biodiversity of Crocodylian Species in the Niger Delta region. It was stated in (18) that Out of 267 respondents, in an analysis, 94.4% responded that they saw crocodile alive, 2.6% dead and 3.0% as skin..The demand for wildlife product including crocodiles in Africa even Nigeria is by direct poaching or buying in the market as in the case of Uwa and Edumanom bushmeat market.(29).The direct effect of over hunting and illegal wildlife trade on this endangered and vulnerable species reduces the biodiversity of crocodiles in particular and that of reptiles in general. (29).Studies have shown that traditional veneration of Crocodile exist in Nigeria even the Niger Delta and may serve as a guide for future conservation programs as practiced in developed countries (like Philippines (54)

V. *Conclusion*

Wildlife trade, being an integral part and driver of extinction of biodiversity and its products have done more harm than good in that sustainability of wildlife product such as *Osteolaemus tetraspis* is affected in the Niger Delta region. We therefore recommend awareness campaign both local and media through conservation agencies to the society in order to curb this cankerworm.

VI. *Conflict Of Interest*

We hereby write to affirm that there is no conflict of interest in this research work as all other authors only made their contribution through Correction and Review. Also, there is no funding from any organization..All research expenditure were solely carried out by the corresponding author.

VII. *Ethical Statement*

Due permission through traditional meetings with the bushmeat traders was requested before oral interview and extensive survey took place in the sampled Bushmeat Markets.

References

- [1] Abubakar, MS, Emmanuel, HM, Kabiru, A and Abdullahi YM (2015) Ethno-zoological survey of animal and animal products used in traditional healing practices in Sokoto state, Nigeria. *Nigerian Journal of Natural Products and Medicine* 2015
- [2] Adeola, MO (1992): Importance of wild animals and their parts in the culture, religious festivals and traditional medicine of Nigeria. *Environmental Conservation* 19:125–134 1992
- [3] Akani, G.C, Pedro, E.E, Afesehi, Fabio, Petrozzi, and Luca Luiseli, (2014). Preliminary Survey of the Terrestrial vertebrate fauna (mammals, reptiles and amphibians) of the Edumanom Forest reserve, Nigeria. *Journal of Tropical Zoology*.
- [4] Behra, O. (1993a). Cameroon FAO crocodile management project. *Crocodile Specialist Group Newsletter* 12(1): 16.
- [5] Behra, O. (1993b). Togo. *Crocodile Specialist Group Newsletter* 12(1): 17.
- [6] Bell, D., S. Roberton & P.R. Hunter. (2004). Animal origins of SARS coronavirus: possible links with the international trade in small carnivores. *Phil. Tran. Roy. Soc. Lon. B.* 359: 1107– 1114
- [7] Bennett, E. L.; Blencowe, E.; Brandon, K.; Brown, D.; Burn, R. W.; Cowlshaw, G.; Davies, G.; Dublin, H.; Fa, J. E.; Milner- Gulland, E. J.; Robinson, J. G.; Rowcliffe, J. M.; Underwood, F. M. & Wilkie, D. S. (2007). "Hunting for consensus: reconciling bushmeat harvest, conservation, and development policy in West and Central Africa". *Conservation Biology*. 21 (3): 884–887. doi:10.1111/j.1523-1739.2006.00595.x. PMID 17531066. S2CID 38428707.
- [8] Bowen-Jones, E. & Pendry, S. (1999). "The threats to primates and other mammals from the bushmeat trade in Africa and how this could be diminished". *Oryx*. 33 (3): 233–247. doi:10.1046/j.1365-3008.1999.00066.x.
- [9] Cowlshaw, G.; Mendelson, S. & Rowcliffe, J. (2005). "Evidence for post-depletion sustainability in a mature bushmeat market". *Journal of Applied Ecology*. 42 (3): 460– 468. doi:10.1111/j.1365-2664.2005.01046.x.
- [10] Dore, M.P.O. (1996). Status of Crocodiles in Nigeria. *Crocodile Specialist Group Newsletter* 15(2): 11.
- [11] Dwarf Crocodile on The IUCN Red List site <http://www.iucnredlist.org/details/15635t>
- [12] Dwarf Crocodile Wikipedia article - https://en.wikipedia.org/wiki/Dwarf_crocodile
- [13] Eaton, M.J. (2010). Ecology, conservation and management of the Central African dwarf crocodile (*Osteolaemus tetraspis*), a progress report. Pp. 84-95 in *Crocodiles. Proceedings of the 18th Working Meeting of the IUCNSSC Crocodile Specialist Group*. IUCN: Gland.
- [14] Echo, H (2016). Why China loves Crocodile Meat. *Quart : Technology*. September 13, 2016. www.qz.com
- [15] Efoakondza, B. (1993). Mensurations, comptage, pesage et commercialization du crocodile nain dans le nord dupays (Congo) *Osteolaemus tetraspis*. WCS: Brazzaville, Congo.
- [16] EFSA (2007), Public Health Risk Involved in the Human Consumption of Reptile Meats. *European Food Safety Authority Journal* 2007, 578, 1-55
- [17] Ekkot I. (2022). In Nigeria, a decade of pay off boosted global wildlife trafficking hub. *Mongabay Series: Illegal wildlife Trade*
- [18] Eniang, A. Godfrey, C, Akani, , Danielle Dendi, John ,E. Fa, and Lucas Luiselli (2020). People's Perception of Crocodile In Nigeria. *Herpetological Journal*. Vol 30, Page 112-116
- [19] Fritz Geller_Grimm, 2021 in a-z animals.com
- [20] Gaworecki, M. (2019). Legal and illegal trade negatively impacting survival and wellbeing of Africa's wildlife: Report by Mongabay.com on 9 October 2019
- [21] Gilbert, M., Sokha, C., Joyner, P. H., Thomson, R. L. & Poole, C. (2012). Characterizing the trade of wild birds for merit release in Phnom Penh, Cambodia and associated risks to health and ecology. *Biological Conservation* 153, 10–16.
- [22] Huchzermeyer, F.W (2002). Diseases of Farmed Crocodile and Ostriches.

- [23] Hughes, A. C., Marshall, B. M. & Strine, C. T. (2021). Gaps in global wildlife trade monitoring leave amphibians vulnerable. *eLife* 10, 1–23
- [24] Hutton, J.M. (1991). Congo bushmeat survey. *Crocodile Specialist Group Newsletter* 10(3): 4.
- [25] IUCN Redlist(September,2014). <http://www.iucnredlist.org>
- [26] Johnson, P. J., Kansky, R., Loveridge, A. J. & Macdonald, D. W. (2010). Size, rarity and charisma: valuing African wildlife trophies. *PLoS One* 5, 1–7.
- [27] Kakati, LN, Bendang AO and Doulo, V: Indigenous Knowledge of zootherapeutic uses of vertebrate origin by the Ao tribe of Nagaland. *Journal of Human Ecology* 19(3):163-167 2006. Ogoanah, O. S and Omijie, F. 158
- [28] Kpéra G. N., 2003. Notes on crocodiles in Bénin.IUCN/SSC Crocodile Specialist Group Newsletter. IUCN, Gland, Switzerland, 22 (1), 3-4.
- [29] Kpéra G.N., Sinsin B. and Mensah G. A.,(2003). Endogenous conservation of wildlife as determinate factors for the survival of species: case of crocodiles in Bénin. Abstracts of the Proceeding of the First Regional Workshop on the Management of Protected Area in West Africa. Parakou, Bénin, pp.99-100.management programmers. In *Wildlife Management: Crocodiles*
- [30] Marshall, B. M., Strine, C. & Hughes, A. C. (2020). Thousands of reptile species threatened by under-regulated global trade. *Nature Communications* 11, 4738.
- [31] Marshall, B. M., Strine, C. T., Fukushima, C. S., Cardoso, P., Orr, M. C. & Hughes, A. C. (2022). Searching the web builds fuller picture of arachnid trade. *Communications Biology* 5, 448.
- [32] McMichael, A. J. (2002). "Population, environment, disease, and survival: past patterns, uncertain futures" . *The Lancet*. 359 (9312): 1145–1148. doi:10.1016/s0140-6736(02)08164-3. PMID 11943282. S2CID 9159650.
- [33] Nasi, R.; Brown, D.; Wilkie, D.; Bennett, E.; Tutin, C.; Van Tol, G. & Christophersen, T. (2008). Conservation and use of wildlife-based resources: the bushmeat crisis (PDF). CBD Technical Series no. 33. Montreal and Bogor: Secretariat of the Convention on Biological Diversity and Center for International Forestry Research (CIFOR). pp. 1–50.
- [34] NathaNatar (2014)Why Do People Hunt Crocodiles? www.hubpages.comNatural Products and Medicine 2015.
- [35] NCF, (2018) 16th Chief S.L Edu Memorial Lecture on Illegal Wildlife Trade. In Okere,A.(2023) .Illegal AnimalTrade,hunting threatens multimillion naira .Wildlife Tourism Industry. Captured Crocodile for Sale .Punch Newspaper .8th January, 2023. Edition@punch.ng.com.
- [36] Nelleman, C., Henricksen, R., Raxter, P., Ash, N. & Mrema, E. (2014). The Environmental Crime Crisis—Threats to Sustainable Development from Illegal Exploitation and Trade in Wildlife and Forest Resources. A UNEP Rapid Response Assessment. United Nations Environment Programme and GRID-Arendal, Nairobi and Arendal. www.grida.no. United Nations Environment Programme (UNEP), Nairobi.
- [37] NNP,(1990),Nigeria Nostalgia Project, Image of Bushmeat Market
- [38] NTG, 2016, in www.a-z animals.com
- [39] Oduntan OO, Abiodun, A, Ogunyode, OO and Adesina O (2012): Survey of wild animals used in zootherapy at Ibadan, Oyo State Nigeria. *International Journal of Molecular Zoology*.2(9): 70-73 2012.
- [40] Ogoanah O. S andOmijie, F.(2017). Animal Species used for traditional medicine in Benin City, Nigeria. *Society for Experimental Biology of Nigeria*. Vol (17(4)
- [41] Okere,A.(2023) .Illegal Animal Trade, hunting threatens multimillion naira .Wildlife Tourism Industry. Captured Crocodile for Sale .Punch Newspaper .8th January, 2023. Edition@punch.ng.com.
- [42] Oladipo K, (2023) Health implications for wildlife consumers In Okere,A.(2023) .Illegal Animal Trade, hunting threatens multimillion naira .Wildlife Tourism Industry. Captured Crocodile for Sale .Punch Newspaper .8th January, 2023. Edition@punch.ng.com.
- [43] Onoh I, (2016)..Nigeria ready to tackle illicit wildlife trade.Earth Journalism Network.Environs News, Nigeria, Lagos. 7th June,, 2016.(info.ejn@internews.org) pp. 157–175. Surrey Beatty and Sons, Sydney, Australia.



- [44] Ripple, W. J., Newsome, T. M., Wolf, C., Dirzo, R., Everatt, K. T., Galetti, M., Hayward, M. W., Kerley, G. I. H., Levi, T., Lindsey, P. A., Macdonald, D. W., Malhi, Y., Painter, L. E., Sandom, C. J., Terborgh, J., et. al. (2015). Collapse of the world's largest herbivores. *Science Advances* 1, 1400103.
- [45] Ripple, W. J.; Abernethy, K.; Betts, M. G.; Chapron, G.; Dirzo, R.; Galetti, M.; Levi, T.; Lindsey, P. A.; Macdonald, D. W.; Machovina, B.; Newsome, T. M.; Peres, C. A.; Wallach, A. D.; Wolf, C. & Young, H. (2016). "Bushmeat hunting and extinction risk to the world's mammals". *Royal Society Open Science*. 3 (10): 160498. Bibcode:2016RSOS...360498R. doi:10.1098/rsos.160498. PMC 5098989. PMID 27853564.
- [46] San Diego (2015) Dwarf Crocodile (*Osteolaemus tetraspis*) Fact Sheet. c2015, San Diego Zoo Wildlife Alliance. (Accessed August,2015) http://ielc.libguides.com/sdzg/factsheets/dwarf_crocodile.
- [47] Scheffers, B. R., Oliveira, B. F., Lamb, I. & Edwards, D. P. (2019). Global wildlife trade across the tree of life. *Science* 366, 71–76.
- [48] Soewu D.A(2008): Wild animals in ethnozoological practices among the Yorubas of southwestern Nigeria and the implications for biodiversity conservation. *African Journal of Agricultural Resources* 3:421–427. 2008
- [49] Soewu DA (2012): Zootherapy and Biodiversity Conservation in Nigeria. *Animals in Traditional Folk Medicine* 347-365 2012.
- [50] Subramanian,M (2012) .Zoonotic disease risk and the bushmeat trade: assessing awareness among hunters and traders in Sierra Leone. *Ecohealth*. 2012;9:471–482.doi:10.1007/s10393-012-0807-1.
- [51] Thorbjarnarson, J.B. and Eaton, M.J. (2004). Preliminary examination of crocodile bushmeat issues in the Republic of Congo and Gabon. Pp. 236-247 in *Crocodiles. Proceedings of the 17th Working Meeting of the IUCNSSC Crocodile Specialist Group*. IUCN: Gland.
- [52] Toomes, A., Garcí'a-Díaz, P., Stringham, O. C., Ross, J. v., Mitchell, L. & Cassey, P. (2022). Drivers of the Australian native pet trade: the role of species traits, socioeconomic attributes and regulatory systems. *Journal of Applied Ecology* 59, 1268–1278.
- [53] UNEP, (2022) CITES Appendices I, II, and III. June 2022 interpretation.
- [54] Vander Ploeg, J, Cauillan-Cureg,M. van Weerd,M. and Persoon,G. (2011) Why must we protect crocodiles? Explaining the value of the Philippine Crocodile to rural communities. *Journal of Integrative Environmental Sciences* 8, 287-298.
- [55] Wilkie, D. S., Bennett, E. L., Peres, C. A. & Cunningham, A. A. (2011). The empty forest revisited. *Annals of the New York Academy of Sciences* 1223, 120–129
- [56] Wolfe,N.D,Daszak,P.,KilpatrickA.M.,andBurke,D.S.(2005) Bushmeat hunting, Deforestation and Prediction of Zoonotic Disease Emergence.. *Emerging Infectious Diseases*. Vol11(12).www.cdcgov/eld
- [57] www.activewild.com
- [58] www.zsl.com. 7 Things you can do to help prevent Illegal wildlife Trade.