



The Current Status of Wildlife Captive Facilities in Tanzania

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ABSTRACT

Wildlife captive facilities (WCFs) are accommodations for ex-situ conservation of wild animals, they include wildlife ranches, farms, breeding facilities, orphanage centers, sanctuaries and zoos. Tanzania harbours a number of these facilities, however, information on exact number, types, functioning status, size, composition and health is limited. This study employed key informant interviews, participatory observations and counts to generate information on the status of WCFs in Tanzania. Descriptive statistics and Gross Profit Margin were used to analyze data on WCF status and cost-benefit analysis respectively. Results showed that Tanzania has 28 active and 42 dormant WCFs. Most of WCFs were established mainly for business and community services. About 182 species from 33 families and 14 orders are housed in these facilities, attracting both local and foreign visitors. The visiting fees are the main source of income in WCFs. Generally, the active WCF meet the purpose of their establishment by having satisfactory species richness, diversity and abundance and good health. However, there is need to improve the overall standard. Reliance on fees make most WFC run under significant loss, especially zoos. Thus, this study recommends provision of education for both communities and investors, establishment of Private-Public

Partnership investment mode and WCF consultancy.

Keywords: Wildlife Captive Facilities - Tanzania Wildlife Management Authority - Sanctuaries – zoos – ranches – farms.

INTRODUCTION

Currently, the animal world is at peril as a result of global environmental changes (Boonstra, 2013). The change in climate, land use and land cover, deforestation, and degradation has resulted in a disruptive impact on organisms including wild animals (Acevedo-Whitehouse and Duffus 2009). This has culminated into changes and depletion of quality habitats for wild animals thus threatened survival and in some cases leading to extinction (Keulartz 2015). In response to the ongoing challenges of in-situ conservation (conservation within their natural environment) in the 1970-1980s the world began to turn its attention to the conservation of wildlife and endangered species in wildlife captivity (McGregor and Zippel 2008). Wildlife captive facilities include wildlife ranches and farms, wildlife breeding facilities, wildlife orphanage centers, sanctuaries and zoos (Kirkwood 1996, Mooers 2017, Wildlife *et al.* 2020). These Categories are classified based on size and purposes of establishment (Corkeron 2009). While facilities like wildlife breeding



centers, wildlife orphanage centers, sanctuaries and zoos have no size limits (Mooers 2017, Mehta and Singh 2018), facilities like wildlife farms and ranches have limits of sizes from 500 - 2,000ha and 2,000 - 25,000ha respectively (Kirkwood 1996, Lungren 2000).

Captivity of wildlife is influenced by various purposes including education, conservation, breeding programs, research, farming and as an attraction for leisure and business (Corkeron 2009, Leus 2011). With continuing human pressure on the environment, captive or semi-captive management is likely to become a component in the conservation of an increasing range of wild animal species in the world (Zimmermann 2010). It was reported that because zoos and aquarium are established in close proximity to urban centers, they attracts millions of people per year exceeding nearly half the number of people visiting national parks, protected areas, baseball, basketball and football games (WAZA 2005). Besides offering leisure, wildlife captive facilities play an important role to build a connection between human and natural world through creation of awareness about the value of nature and conservation of natural resources especially in urban areas (Corkeron, 2009).

In the face of global challenges, Tanzania has an extraordinary institutional record in establishing protected areas (PAs) (Caro and Davenport 2016). Mainland Tanzania, which covers an area of 942 433 km² has gazetted 22 National Parks (NPs) covering a total area of 99,306.5 km² (TANAPA 2020). In addition to this, there are Game Reserves (GRs), Game Controlled Areas (GCAs) and Open Areas (OAs) which cover 169 553 km² in total (Musika *et al.* 2021). Moreover, Nature Reserves (NRs), a new level of protected area, has been created to upgrade the protection of key Forest Reserves (FRs) which is the best chance to reduce habitat loss and increase species protection

(Geldmann *et al.* 2013). In order to reach out to a wider community especially those located in urban areas, several captive facilities exist in Tanzania, although the exact records of these facilities are not known. Furthermore, the country is lacking captive breeding sites, and there is only one proposal for the establishment of an orphanage center to be located at Doma, Morogoro (Ngilangwa *et al.* 2018).

Although some information on wildlife captive facilities establishment, qualification of registration, revocation, cancellation, suspension of registration, de-registration, monitoring and evaluation in Tanzania is well presented and covered under Wildlife Policy and Wildlife Conservation Act No.5 of 2009 (URT 2020), information on the type, functioning status, size, purposes, species composition, abundance and health of animals in these potentially lucrative facilities in Tanzania is scarce. Therefore, this study aimed at documenting current status of Wildlife captive facilities in Tanzania for future reference. The study focused mainly in assessing and document on: 1) the current types, status, size and purpose of establishing WCFs; 2) the species composition, abundance and health of animals; 3) the users of WCFs; and 4) cost and income generated when running WCFs.

MATERIAL AND METHODS

The study was conducted in sixteen regions of Tanzania, within the 5 Tanzania Wildlife Management Authority (TAWA) management zones, which are: 1) Northern zone which include Arusha, Kilimanjaro, Manyara regions; 2) Coastal zone encompassing Dar es Salaam, Tanga, Pwani, and Morogoro regions; 3) Lake zone which covers Kagera and Mwanza regions; 4) Southern zone: Iringa, Mbeya, Ruvuma and Lindi regions; and 5) Western zone which include Shinyanga, Tabora and Kigoma regions (Figure 1).

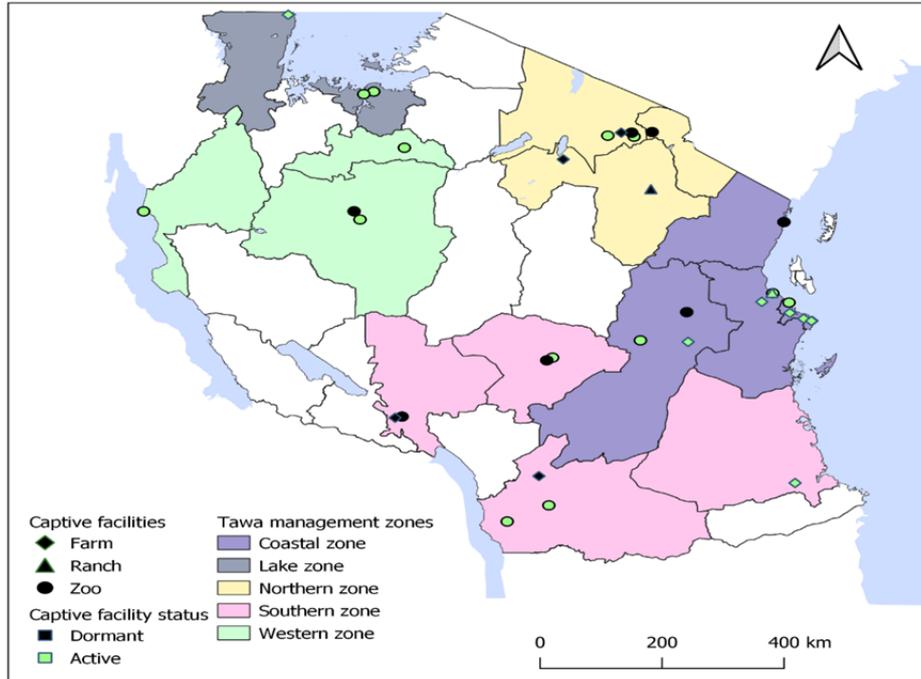


Figure 1: Map of Tanzania showing TAWA management zones and distribution of WCFs.

Sampling design

Site visits surveys were done to obtain data from all Wildlife captive facilities (WCFs) within the 5 TAWA management zones in sixteen regions of Tanzania. Each WCFs was visited once in order to identify operating and non-operating captive facilities (Active and dormant). Depending on the number of WCF in a zone, a range of 5 – 10 days were spent in each zone. A list of registered wildlife captive facilities under Wildlife Conservation Regulation of 2020 and Wildlife Conservation Act No 5 of 2009 was obtained from the Tanzania Wildlife Management Authority (TAWA).

Data Collection

At each WCF visited, data were collected through key informant interviews. The key informants were either the owner, manager or caretaker of a WCF, and TAWA officers responsible for captive facilities in a zone. A pre-prepared questionnaire with a set of questions was administered to the key informants, a total of 70 key informants were interviewed during this study. Information such as history of the facility, running cost

and generated revenue were recorded. Additionally, direct observation and count were used to collect other information such as types, conservation status, size (age classes), and available and abundance of species, and health status of the animals.

Data Analysis

Descriptive statistics was used to determine percentage of type, functioning status and number of users visiting different WCF, also in the analysis on the frequency of responses on the purpose of establishing the WCFs and ranking on the health of animals. Cost-benefit analysis of WCF was analyzed through Gross Profit Margin to get Profit Margin ratio.

$$\text{Gross Profit Margin} = \frac{\text{Revenue} - \text{Costs}}{\text{Revenue}} \times 100\%$$

Animal species data were computed to produce species composition and abundance at different WCFs. The results are presented in form of tables and figures for easy of interpretation.



RESULTS

Types and status of wildlife captive facilities in Tanzania

Currently there are 70 wildlife captive facilities (WCFs) in Tanzania which are of three categories: 1) wildlife farms, 2) wildlife ranches, and 3) zoos. Almost half of these facilities (48.6%) were wildlife farms, closely followed by zoos, (41.4%) lastly were wildlife ranches, (10%) (Table 1).

Moreover, of the 70 WCFs, 28 facilities are operating (active) and 42 facilities are not operating (dormant) (Table 1). Zoos had the highest number of active facilities (14), equivalent to 50% of all the active facilities, followed by wildlife farms (11) and wildlife ranches (3), equivalent to almost 11%. (Figure 2a: Table 1). Within TAWA management zones, most active wildlife captive facilities are located in Coastal zone

(13), followed by southern (5) and northern (4), lastly lowest number of active facilities was observed Lake zone (3) and Western zone (3) as shown in Figure 2b. In a different note, wildlife farms had a higher number of inactive WCFs (23), equivalent to 54.7% of all inactive facilities, while wildlife ranch had the least number (Table 1, Figure 2a). Within TAWA management zones, Northern zone and Coastal zone had the highest number of inactive facilities, while lake zone and Western zone had the least number of inactive facilities (Table 1, Figure 2b).

Size of Wildlife captive facilities

The area of each visited wildlife captive facility highly varied depending on the type of facility. However, on average it ranges from 74 hectares for zoos to 2,270 hectares for wildlife ranches (Figure 3).

Table 1: Types and status of wildlife captive facilities of Tanzania

| Zone | Region | Active | | | Total | Dormant | | | Total |
|--------------|---------------|-----------|----------|-----------|-----------|-----------|----------|-----------|-----------|
| | | Farm | Ranch | Zoo | | Farm | Ranch | Zoo | |
| Coastal | Dar es salaam | 4 | 0 | 2 | 6 | 3 | 0 | 0 | 3 |
| | Morogoro | 1 | 0 | 1 | 2 | 1 | 1 | 1 | 3 |
| | Pwani | 3 | 1 | 1 | 5 | 8 | 1 | 1 | 10 |
| | Tanga | 0 | 0 | 0 | 0 | 3 | 0 | 2 | 5 |
| Northern | Arusha | 0 | 1 | 1 | 2 | 2 | 0 | 5 | 7 |
| | Manyara | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 3 |
| | Kilimanjaro | 0 | 1 | 1 | 2 | 1 | 0 | 2 | 3 |
| Southern | Iringa | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 2 |
| | Lindi | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| | Mbeya | 1 | 0 | 1 | 2 | 0 | 0 | 0 | 0 |
| | Ruvuma | 0 | 0 | 2 | 2 | 1 | 0 | 1 | 2 |
| Western | Kigoma | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Shinyanga | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| | Tabora | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 2 |
| Lake | Bukoba | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| | Mwanza | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 |
| Total | | 11 | 3 | 14 | 28 | 23 | 4 | 15 | 42 |

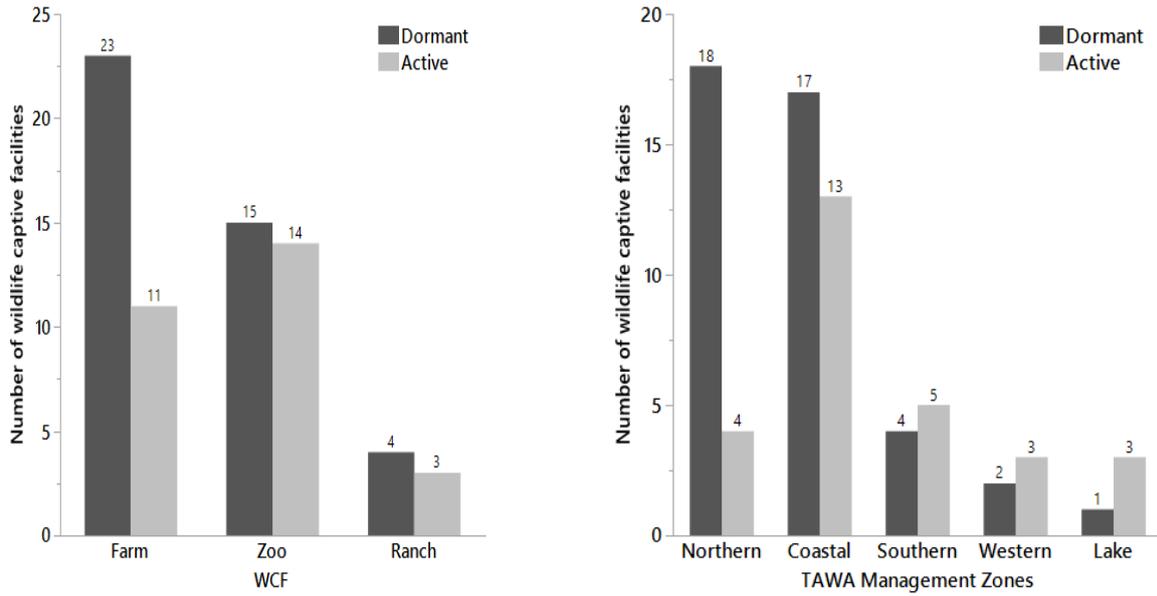


Figure 2: (a) Types and status of WCF and (b) Status of WCF per TAWA management zone

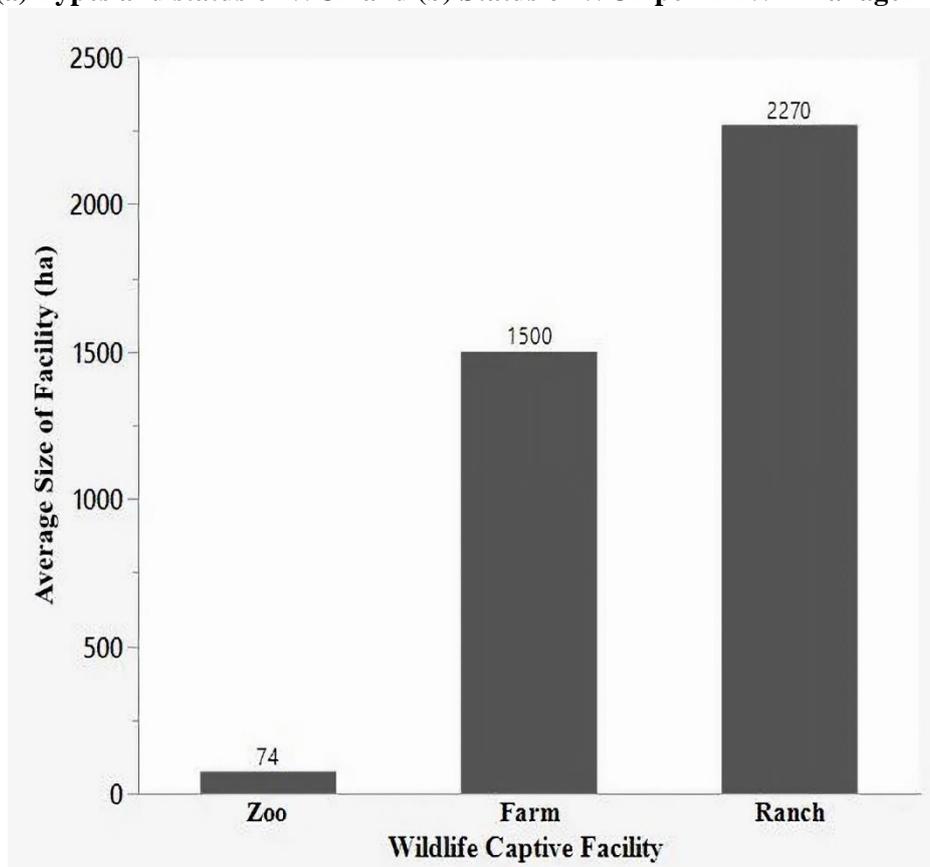


Figure 3: Average areas of types of wildlife captive facilities found in TAWA management zones



Purposes of establishing wildlife captive facilities in Tanzania

The study shows that different wildlife captive facilities were established for either of four major purposes: business, recreation, education and conservation. Among all visited WCFs, business was the major purpose for establishment, mentioned by 31% of all key informants in all zones. Conservation was the least of all purposes, mentioned by less than 20% of the key

informants in all zones (Figure 4a). However, in the northern zone, recreation was the major purpose, while business was the least purpose for establishment of wildlife captive facilities (Figure 4b). In the Southern zone, no wildlife captive facility for conservation purposes was established, while no such facility was established for education purposes in the Lake zone (Figure 4b).

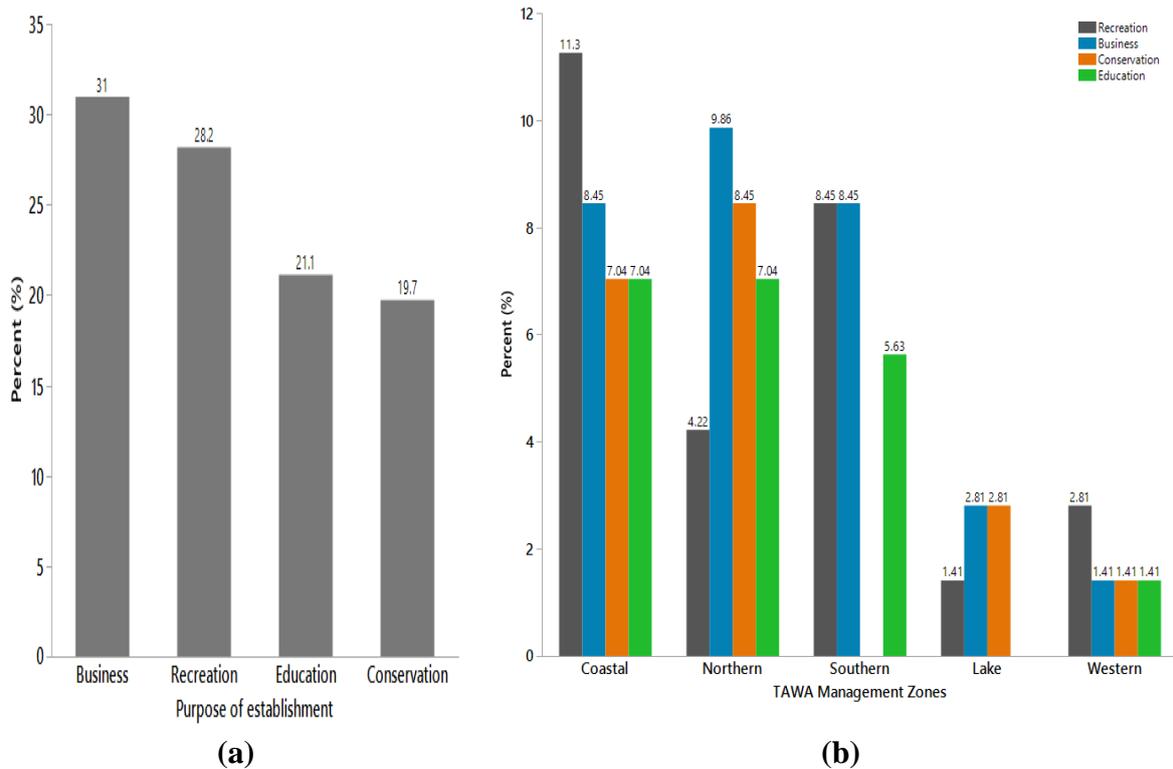


Figure 4: General purposes of establishing different WCF (4a): Purposes of establishing WCF per zones (4b)

Species composition and abundance within the management zones

A total of 1,759 animal species from 149 families of aves (birds), reptiles, ungulates and primates were encountered from 28 active WCF in the five TAWA management zones. Overall, Coastal zone had higher number of both individual animals (925) and families (59), followed by Northern zone in number of animals (501), and Southern zone in families (49) (Table 2). Regions in the

Southern and Western zones had relatively good distribution of both animals and families in WCFs compared to other zones in which distribution was dominated by one region (Table 2). Although species composition and abundance vary between zones, generally, mammal (ungulates in particular) were the most dominant animals in terms of composition, while crocodiles were the dominant species in terms of number of individuals encountered (Table 3).



Table 2: Number of animals and families counted in different WCFs within 5 TAWA management zones

| Zone | Region | Animals | | | | Families | | | |
|---------------|---------------|------------|------------|------------|-------------|-----------|----------|-----------|------------|
| | | Farm | Ranch | Zoo | Total | Farm | Ranch | Zoo | Total |
| Coastal zone | Dar es salaam | 701 | | 30 | 731 | 39 | | 5 | 44 |
| | Morogoro | 17 | | 74 | 91 | 5 | | 8 | 13 |
| | Pwani | 102 | | | 102 | 2 | | | 2 |
| | | | | | 925 | | | | 59 |
| Lake zone | Mwanza | | | 46 | 46 | | | 12 | 12 |
| | | | | | 46 | | | | 12 |
| Northern zone | Arusha | | 379 | 98 | 477 | | | 14 | 16 |
| | Kilimanjaro | | | 24 | 24 | | | 3 | 3 |
| | | | | | 501 | | | | 19 |
| Southern zone | Iringa | | | 26 | 26 | | | 8 | 8 |
| | Lindi | 23 | | | 23 | 3 | | | 3 |
| | Mbeya | 55 | | | 55 | 17 | | | 17 |
| | Ruvuma | | | 102 | 102 | | | 21 | 21 |
| | | | | | 206 | | | | 49 |
| Western zone | Kigoma | | | 41 | 41 | | | 2 | 2 |
| | Shinyanga | | | 15 | 15 | | | 3 | 3 |
| | Tabora | | | 26 | 26 | | | 5 | 5 |
| | | | | | 82 | | | | 10 |
| Total | | 898 | 379 | 482 | 1759 | 66 | 2 | 81 | 149 |

In general, species dominance in WCFs varies by owners' preference and abundance in all zones. However, most of the WCFs were dominated by Nile crocodiles (*Crocodylus niloticus*), Impala (*Aepyceros melampus*), Blue wildebeest (*Connochaetes*

taurinus), and Peacock (*Pavo cristatus*) (Table 3). Moreover, the study also found the existence of exotic species such as Bonnet Macaques (*Macaca radiata*) in one of the zoos, this species is endemic to Southern India.

Table 3: Dominant species within 5 TAWA management zones

| Zones | Dominant species | | Family | Total |
|---------------|------------------|---------------------------------|--------------|-------|
| | Common name | Scientific name | | |
| Coastal zone | Nile crocodile | <i>Crocodylus niloticus</i> | Crocodylidae | 259 |
| Northern zone | Wildebeest | <i>Connochaetes taurinus</i> | Bovidae | 102 |
| Lake zone | Greater Kudu | <i>Tragelaphus strepsiceros</i> | Bovidae | 5 |
| Western zone | Impala | <i>Aepyceros melampus</i> | Bovidae | 20 |
| Southern zone | Peacock | <i>Pavo cristatus</i> | Phasianidae | 23 |

The TAWA Coastal zone

TAWA Coastal management zone is comprised of three regions; Dar es Salaam, Morogoro and Pwani regions. A total of 925 individual animals from 59 families were encountered in different types of WCF within this zone. Dar es salaam had the highest number of both individuals and families from two types of WCFs, similar to Morogoro region (Figure 5a, Table 2). Pwani region was the second in animal abundance in this zone, and they were all recorded from

one type of WCF (Table 2). Nile crocodiles (*Crocodylus niloticus*) were found to be the most dominant specie in this zone (Table 3). Other common species found in WCFs in this zone were Aldabra tortoise (*Aldabrachelys gigantea*), Maasai giraffe (*Giraffa camelopardalis*) and Ostrich (*Struthio camelus*).

The TAWA Southern zone

TAWA Southern zone has four regions; Iringa, Mbeya, Ruvuma and Lindi regions, a total of 206 animals from 49 families placed



in different types of WCF were recorded in this zone (Figure 5b, Table 2). Ruvuma had the highest number of both individuals and families from two types of WCFs), followed by Mbeya region (Figure 5b, Table 2), while Lindi had the least number of both individual animals and families (Table 2, Figure 5b). With 23 individuals, Peacock (*Pavo cristatus*) was the most abundant species in WCFs (Table 3). Other animal species recorded in this zone were blue monkeys (*Cercopithecus mitis*) at Lugali zoo, Ruvuma region and Olive baboon (*Papio anubis*) at Ifisi zoo, Mbeya region.

The TAWA Lake zone

TAWA Lake zone has two regions Mwanza and Kagera, however in this assessment, animals were only found in Mwanza region. A total of 46 animals from 12 families were encountered in a zoo (Table 2). Greater Kudu (*Tragelaphus strepsiceros*) was the dominant species (Table 3), other abundant species were Impalas (*Aepyceros melampus*).

The TAWA Northern zone

Northern zone has four regions; Tanga, Arusha, Kilimanjaro and Manyara regions. A total of 501 individual animals from 19 families were encountered in WCF from two regions, Arusha and Kilimanjaro, no animals were recorded in Tanga and Manyara (Table 2). Arusha had highest number of both individuals and families from two types of WCFs. (Table 2). While individual animals were abundant in ranches, zoos were more diverse in terms of taxonomic families (Figure 5c, Table 2). Blue wildebeest (*Connochaetes taurinus*) (Table 3) was the most dominant species.

The TAWA Western zone

A total of 82 animals from 10 families were recorded in the Western zone which includes three regions; Kigoma, Tabora and Shinyanga (Table 2). Kigoma had the highest number of animals in WCFs (Figure 5d), but taxonomic families were relatively evenly distributed among the three regions (Table 2). Impalas (*Aepyceros melampus*) were the most dominant specie in this zone.

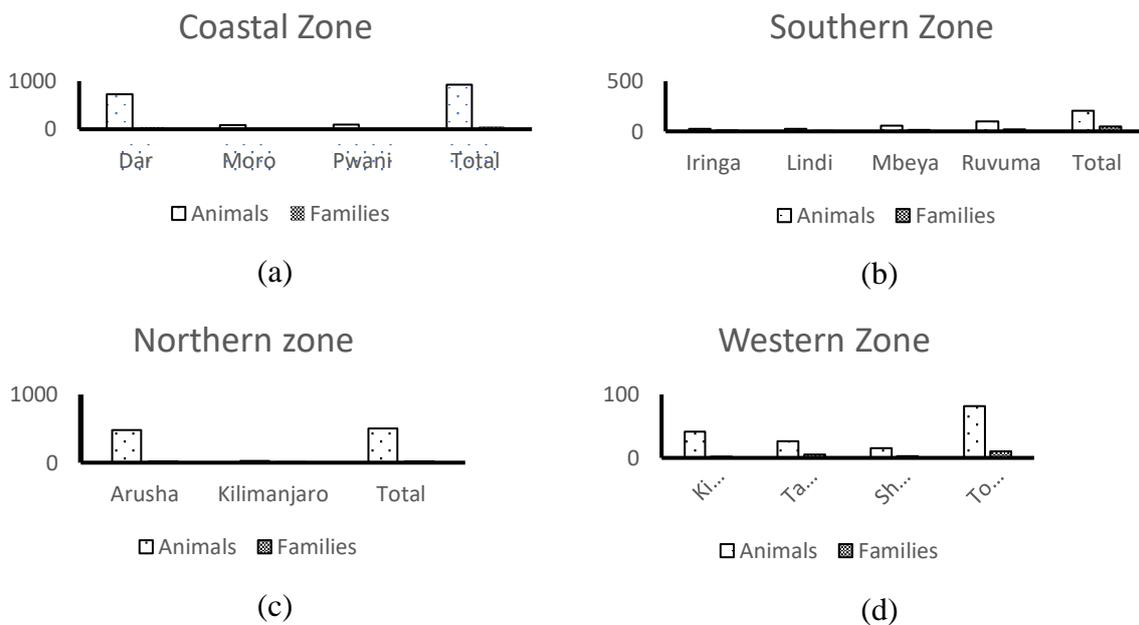


Figure 5: Total number of individuals and taxonomic families encountered in different WCFs in three regions within the Coastal zone.



Users of Wildlife Captive Facilities

The results show that users of wildlife captive facilities in Tanzania are both local and foreign visitors. Based on the information from owners, an estimate of 223,404 local and 1,781 foreigners visited different WCFs within the five TAWA

Management zones annually (Table 5). Wildlife captive facilities in Coastal zone had the highest number of visitors (201,525), equivalent to 89.5% of all visitors (Table 4). Dar es salaam had the highest number of local visitors to WCFs annually, while Arusha had the highest number of foreign visitors to WCFs (Table 4).

Table 4: Type and number of visitors to Zoo facilities

| Zones | Region | Foreign visitors per year | Local visitors per year |
|--------------|---------------|---------------------------|-------------------------|
| Costal | Dar es salaam | 20 | 200001 |
| | Morogoro | 1 | 1 |
| | Pwani | 500 | 1002 |
| | Tanga | 0 | 0 |
| | | 521 | 201004 |
| Lake | Mwanza | 212 | 7500 |
| Southern | Iringa | 0 | 500 |
| | Lindi | 0 | 3 |
| | Mbeya | 0 | 600 |
| | Ruvuma | 50 | 2800 |
| | | 50 | 11403 |
| Western | Tabora | 0 | 800 |
| Northern | Arusha | 998 | 10200 |
| Total | | 1781 | 223404 |

Cost-Benefit Analysis for the Past Five Years

The findings show that different costs are incurred and revenues are collected when running wildlife captive facilities. However, the total running cost for wildlife captive facilities includes the cost incurred in the establishment, operational costs and feeding costs. Likewise, it was found that visiting fees is the only source of revenue in wildlife captive facilities, especially zoos. This source of revenue is from local and foreign visitors in all facilities that allow people to visit. Also, the Gross profit Margin for WCF was obtained by subtracting total costs from total revenue for 5 years as shown in the Table 6.

DISCUSSION

According to results the observed wildlife captive facilities in Tanzania are zoos, wildlife farms, and wildlife ranches. Most of the facilities were categorized under wildlife farms, followed by zoos and then wildlife ranches. This was because Wildlife Conservation Act No. 5 of 2009 made it mandatory that investors engaged in the export of wild animals must own a registered wildlife captive facility under the Wildlife Division (WD) to support the business. This requirement accounted for the establishment of many WCFs.



Table 6: Gross profit margin of Wildlife Captive Facilities (WCF) in 5 years

| Costs and Benefits | Farms | Ranch | Zoo |
|------------------------------------|--------------|--------------|--------------|
| Average benefits (TZS) | 0 | 0 | 476,212,262 |
| Average costs for five years (TZS) | 159,427,273 | 179,500,000 | 851,724,545 |
| Gross margin | -159,427,273 | -179,500,000 | -375,512,283 |
| Average costs to | | | |
| Average establishment cost | 94,454,545 | 118,500,000 | 226,909,091 |
| Average operational cost | 8,858,182 | 11,200,000 | 98,213,091 |
| Average feeding cost | 3,027,273 | 1,000,000 | 26,154,545 |
| Average benefits from | | | |
| Local visitors (annually) | 0 | 0 | 48,897,444 |
| Foreign visitors (annually) | 0 | 0 | 46,287,057 |
| BC Ratio | 0 | 0 | 0.304295122 |
| Gross profit margin (percentage) | 0 | 0 | -0.788539718 |

It is also observed that most WCF are found in town areas. This is attributed to positive tourism perception, good transportation facilities, population and high conservation awareness. The findings are similar to WAZA (2015) who reported that the distribution of wildlife captive facilities in Europe was mainly influenced by good tourism perception, conservation awareness, population, and good transportation facilities where less travelling is involved. Most of wildlife farms were found to be dormant compared to zoos and wildlife ranches. This might be due to the reason that wildlife farms occupy large area and require high running costs and the major means of earning money was through exportation of live animals, which was banned, while zoos were most active because they continued to earn money from visitation fees (Barnes and Jones 2012). Location was observed to be the factor that led to dormancy of some facilities especially near the tourism circuits because most tourists prefer to visit the natural attractions like National parks rather than wildlife captive facilities (WCFs).

Zoos are the leading facility in terms of status of operation, with high number of active wildlife captive facilities. This might be due to abolition of live animal trade in 2015.

Activities of zoos were not affected by the abolishment because they (zoo) favor both business scheme and community services (Wade *et al.* 2001). Also, lack of restrictions in size of establishment and visitation time compared to farms and ranches. Unclear definition of types and purposes of WCF in Wildlife Conservation Act No. 5 of 2009 and Wildlife Conservation Regulation of 2020, lack of knowledge to most investors of types and purposes of WCF (Nijman *et al.* 2018) lead many investors to perform wrong activities. This forced many to invest more in zoos than farms and ranches.

According to the results, high number of wildlife captive facilities were established for business purpose. Since WCF is an investment which needs to sell products and services in order to generate profit (Cloete *et al.* 2007). A similar purpose was observed when the first WCF (Saanane Island Zoo) was established in Tanzania (Harvey 2020). Although there are some WCF which perform private recreation such as Abood Farm, Lake Holdings and Nyati Corporation.

Nevertheless, due to illegal hunting and other in-situ wildlife conservation challenges, some WCFs such as Tabora Game Park and Ruhila Zoo were established by the Government for conservation purposes,



specifically to create public awareness on the value of nature and build a strong relationship between communities and wild animal. Similar findings were reported by other studies (Corkeron 2009, Leus 2011, Hacker and Miller 2016) that zoos and aquariums play an important role in building natural relationships between humans and wildlife.

Many wildlife captive facilities were highly occupied by crocodiles, impala and wildebeest as detailed in the results. This is because of low running cost, low feeding costs and production costs where some of species are reproduced within WCF. Moreover, the abundance of crocodile and impala was attributed to their high adaptability to the environment (Achard and McCulloch 1967, Nijman *et al.* 2018). Animals like elephant, giraffe and bonnet macaque were found in few facilities because of the owners' interests, special attention required during capturing and up-keep in the facility. It was further noted that owner's economic status and perception about wildlife was key to the type and number of animals kept in captivity. This observation concur with the reasons recommended by WAZA (2015) that the number and type of animal in the captive depends on the ability of the owner to incur the management costs and priority.

Also, some facilities play a role intended to another type of facility A facility like Machame zoological garden play a role of orphanage center while registered as zoo that's why they have species like elephants. Most animals in WCFs shows good health condition due to the absence of diseases and therefore perform normal behaviors. Though some animal species (crocodiles and snakes) show poor health condition due to the presence of diseases like fungus and crocodile pox due to the poor cleaning of living environment, exposure to sunlight and eating food of the same type. Occurrence of these diseases disobey the five freedoms of

animals kept in captivity (Browning and Veit 2021).

With regard to the users of WCF, majority of the visitors are local because most of facilities are found near their place and easily accessible. Students are the most frequent visitors to the WCFs mainly for learning about the environment, wildlife conservation and leisure (Hacker and Miller, 2016). Also, types of animals kept in the facilities may reflect the number of visitors (D'Cruze *et al.* 2019). For instance, Dar es Salaam Zoo and Kassa zoo which have most attractive animals such as Leopard and Lions tend to have a high number of visitors. Also, WCF with unique species which are rarely found in the natural areas like snakes at Meserani, Mikumi and Kaole snake parks also have high number of visitation both local and foreign (Benjaminsen *et al.* 2013). Moreover, WCFs located on Non-Tourism Circuit (areas with few natural attractions) and Season of the year (holiday) tend to have high number of visitors coming for leisure, learning and be connected to the nature. For example, Coastal zone attracts more than 211,204 visitors annually. Generally, type of captivity, location, season of the year, type of animals in the captivity and other attraction facilities within WCF may determine the number of visitors. This findings is also reported by other scholars (van der Merwe and Saayman 2005, Corkeron 2009, WAZA 2015). Furthermore, zoos were the only facility with a high number of visitors than other WCF. This may be attributed by the regulation in which zoos allow visitors to visit at any time (Gusset and Dick 2011).

The cost and benefits in WCF were obtained through all running costs and revenue collected by different activities conducted in the facilities. The main sources of income in wildlife captive facilities were visiting fee for both local visitors and foreign visitors. The visiting fee varies from 1,000 TZS to 10,000 TZS depending on the type of visitors. The revenue collected in WCFs



were found to fluctuate according to the number of visitors which also depend on the type of WCF, types of animals, locations and season of the year. Similar findings were reported by Corkeron (2009) and Saayman (2005) that environmental appearance, seasons, type of WCF, types of animals and activities conducted in WCF can attract the number of visitors in WCF. Meanwhile, majority of WCF which allow visitors to visit any time specifically zoos and other WCF with peculiar species such as Giraffe and attractive species like Lions, Leopard and Crocodiles were able to collect high revenue. For example, Dar es Salaam Zoo with attractive species collect the revenue of 1,933,675,000/=TZS while WCF Wag-hill Zoo with herbivores such as wildebeest, Common eland and Impala generated less revenue of 57,650,600/=TZS.

Additionally, establishment, feeding and management costs were the major costs incurred when running WCF. Though it was found that feeding costs may determine the type of animal in captivity and may also predict the income generated in the captive in terms of profit or loss (Cloete *et al.* 2007). This is because feeding costs in WCF with carnivores is high compared to WCF with herbivores. Example, Dar es Salaam Zoo spends 360,000,000/=TZS on feeding while Meserani Snake Park spends 3,500,000/=TZS on feeding annually. However, some of WCFs which allow visitors throughout the year were able to recover the operational cost and generate a profit. However, through cost-benefit analysis, it was realized that for the past five years zoos were running on losses as the benefit cost ration is less than 1 (0.3). This finding was further supported by the results of gross profit margin, indicating that for the past five years the cost of running zoos were higher than revenue collected. Several factors, can contribute to this, but in most cases, this is caused by either company's inability to control costs, natural consequence with the industry in Tanzania,

like lack of awareness. However, the high negative gross profit margin ration seen in this study could also be due to macroeconomic difficulties beyond the control of a company's management.

The observed lack of benefit cost ration and gross profit margin ration on wildlife farms and ranches are much explained by their operation mode. Much as wildlife and ranches in Tanzania are allowed by regulation to operate commercially by selling products from their facilities such as meat and skin, these facilities in Tanzania still operate like domestic farms and ranches and do not collect any revenue from their product. This make it difficult to operate, because while they do not collect any revenue but still, they have running costs, and this could probably be the major reason that led to most of them being inactive.

CONCLUSION AND RECOMMENDATIONS

The result of this study revealed wildlife farms, wildlife ranches and zoos as the three types of wildlife captive facilities in Tanzania, zoos being the most active. Likewise, business is the leading purpose for establishing wildlife captive facilities in Tanzania. This study also conclude that species composition and abundance vary according to preference and income of owners. Most wildlife captive facilities with attractive species (Carnivores) have a large number of visitations and most visitors are locals. Furthermore, Wildlife captive facilities keeping carnivores have high running costs, outstanding to feeding costs and giving shelters due to the nature of the species. Additionally, in the Wildlife captive facilities annual revenue is mainly generated from visitors through entrance fee payment. Therefore, this study recommends that education should be provided to the communities and investors to create awareness about Wildlife captive facilities.



Also, establishment of Public and Private Partnership (PPP) model of investment which facilitate profitable running of WCF through sharing costs between government and private institutions and finally establishment of private WCF consultancy under moderator of WCF (TAWA) in order to help easy development of WCF business through professionals' involvement. However further studies and continued monitoring of the existence of wildlife captive facilities are needed, with emphasis on understanding the international standard of establishment and management of Wildlife captive facilities.

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