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# Conservation Coverage: An assessment of the protection of highly threatened species of birds and mammals in Tanzania

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Conservation Coverage


An assessment of the protection of highly
threatened species of birds and mammals in Tanzania


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Abstract:

43 species of birds and mammals are either critically endangered or endangered within Tanzania. Compromised to halt the rapid loss of biodiversity, the Tanzanian government, several non-governmental organizations, government agencies and zoological institutions are attempting to preserve these highly-threatened species. This project assesses the current state of conservation for those species by: 1) diagnosing their captive populations in Tanzania, through visits to zoological institutions in the country and in a global scale by using ZIMS, a global database for zoos and aquariums. 2) determining the protected areas in which the species are found by overlapping distribution maps with protected areas found in the country and interviewing wildlife experts and 3) determines which species are protected by NGO's or government agencies, done by conducting interviews with key informants of six conservation organizations/agencies in Tanzania.  In addition, the project identifies prioritization aspects considered by organization when developing conservation strategies and the challenges faced by the organizations when implementing such strategies. Finally, a ranking of the species is created, listing the highly-threatened species from the ones which are less protected to those which are the most protected.

It was found that 75% of the species were protected by at least one conservation method, but only 28% were protected by the three studied strategies. 11 highly threatened species are not protected by any scheme, most of which are "less iconic" species, like shrews, bats or dull-coloured passerines.

Key words: conservation, critically endangered, endangered, NGO's, government agencies, captivity, Tanzania

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**Introduction:**

Current biodiversity loss trends are estimated to be between 1,000 and 10,000 times higher than the natural extinction rate (WWF, 2017). To determine the likelihood of a species going extinct the International Union for the Conservation of Nature (IUCN) assesses species and categorized them into seven categories depending on their threat level (figure 1). Different criteria are considered in the assessment, including population growth/decrease rate, percentage of habitat loss or range size.



(IUCN, 2012)
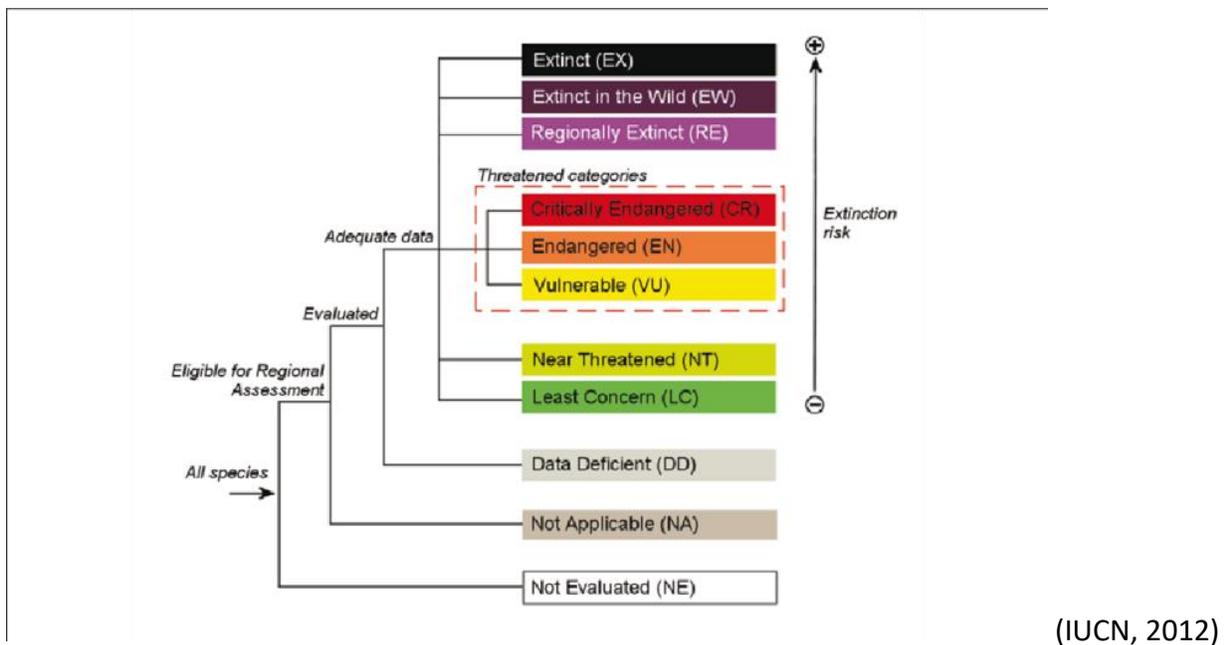
*Figure 1: IUCN Categories*

As part of the Sustainable development goals of 2015 is the need to halt biodiversity loss, to which Tanzania became a signatory country.  Though no species have been reported to go fully extinct in the country, there are currently 40 species of mammals and 49 species of birds within Tanzanian territory which fall under the threatened categories of the International Union for the Conservation of Nature (figure 2) (IUCN, 2018).

*Figure 2: Comparison of threat categories for mammal and bird species in Tanzania*

To protect the country's natural resources, the government has designated 16 national parks and at least 40% of its territory is in some form protected (URT, 2014). Unfortunately for the Tanzania's biodiversity: human, spatial and economic resources are limited (Faith, 1992) and despite the large size of protected areas, most wildlife populations continue to decrease, except for elephants (Tanzania Natural Resource Forum, 2008). Because of such declines, and the inability to protect all biological resources, non-governmental organizations have stepped into the country aiming to do so. Barbara Gemmill and Abimbola Bamidele-Izu argue in their piece "The role of NGOs and civil society in global environmental governance" that NGO's play five major roles in environmental governance and conservation: "(1) collecting, disseminating, and analyzing information; (2) providing input to agenda-setting and policy development processes; (3) performing operational functions; (4) assessing environmental conditions and monitoring compliance with environmental agreements; and (5) advocating environmental justice" (Gemmill & Bamidele-Izu, 2002). In the case of this study all five roles may be considered to contribute towards a species conservation but roles number one & three would better encompass work in the field directly with an individual species or ecosystem.

Moreover, captive populations play an important role in the preservation of species. They act as a safety population for species which experience rapid declines and can supply animals into the wild (Dominguez, 2018). Tanzania has already seen captive populations save one of its species: the Kihansi spray toad (*Nectophrynoides asperginis*) (IUCN SSC Amphibian Specialist Group,

2015). Originally native to the Udzungwa mountains, became extinct in the wild after the construction of the Kihansi dam. Fortunately, reintroduction projects are underway and individuals have already been sent back to Tanzania from US institutions (Wildlife Conservation Society, 2010). Exemplifying how captive populations of the endangered species preserves them from extinction.

Consequently, a multi-layered assessment has been conducted to assess the existing conservation programmes which protect such species. The assessment considers three different aspects or "conservation umbrellas": 1) the species presence in protected national parks, game reserves or conservation areas of Tanzania, 2) their current captive population in Tanzania and a global scale, and finally, 3) existing conservation projects put in place by conservation NGO's or government agencies. Resulting in a ranking of the species being the least to the most protected.

Preliminary research was made to determine the existing threats for the 43 species (figure 3). Information was gathered from the IUCN red list and it was found that there are mainly ten threats to the species in Tanzania, with habitat loss and poaching being at the top of the list (IUCN Red List, 2008-2017), thus considering the "protected area" conservation umbrella as the most important.
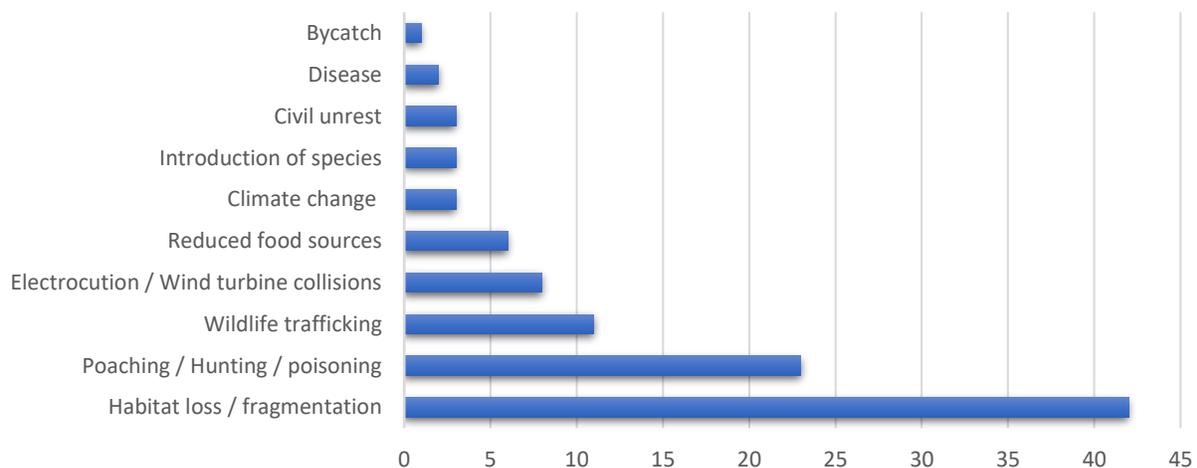


Figure 3: threats for highly threatened species

**Specific objectives**

The study aims to fulfill the following 4 objectives:

- Identify the species of highly threatened birds and mammals protected by either protected areas, governmental/non-governmental action or captive populations in Tanzania and a global scale
- Indicate which of the highly-threatened species receive the least conservation attention in Tanzania
- Determine existing limiting factors/challenges which inhibit further conservation action for government and non-governmental institutions
- Recognize existing forms of species prioritization for conservation action to occur within organizations and government agencies

It is expected that most species will be protected at least one of the possible categories; however, it is also predicted that more charismatic or larger species will have more protection over smaller less appealing species. This would be expected to be particularly prevalent with bats and shrews which would be less protected than primates, wild dogs or rhinos in the mammal category. Nevertheless, it is not expected that the "charismatic phenomenon" will be as prevalent within birds. This is because other factors, like the species role in the environment, may overshadow its charisma. This is expected to be more prevalent with vulture conservation, which despite their ugly appearance is a priority around the world with crashing populations.

The conclusions of the study would shed light on the species which are highly endangered but are not present in protected areas or have no conservation projects aimed at their preservation. By sharing this information with participatory members, it is expected that such species would be considered for future conservation strategies. Finally, determining if species have viable captive populations would also reduce the immediate pressure of preserving the species in the wild as there is at least the possibility to reintroduce such species in the future.

**Methods:**

**Study area:** The United Republic of Tanzania is a country in east Africa which encompasses an area of 947,300 sq. km and has a population of 53.95 million inhabitants (CIA, 2018). It borders Kenya, Uganda, Rwanda, Burundi, Democratic Republic of the Congo, Zambia, Malawi and Mozambique; in addition to the Indian Ocean. The country ranges in altitude from sea level to 5,895 meters above sea level in Mount Kilimanjaro, the highest mountain of the African continent. Tanzania hosts two of the 36 global biodiversity hotspots, the Eastern Afromontane and the eastern African coastal forests (CEPF, 2018). The country has established 16 national parks and over 40% of the country's territory is protected.

For purposes of the study, most of the interviews were conducted either in Arusha or Dar es Salaam, though telephonic interviews allowed interviews with additional key informants from other regions of the country. Zoological institutions visited were only located in the Arusha/Dar es Salaam Area.

**Species studies:** The species used for the study are all the mammal and bird species found within Tanzanian territory which fall under IUCN threat categories "Endangered" or "Critically Endangered" as of April 1st, 2018. (Table 1 and 2).

Table #1: Highly threatened mammal species of Tanzania

| Mammals (CR) | Mammals (EN) |
|---|---|
| Phillips' Congo Shrew (*Congosorex phillipsorum*) | Blue Whale (*Balaenoptera musculus*) |
| Black Rhinoceros (*Diceros bicornis*) | Abbott's Duiker (*Cephalophus spadix*) |
| Rondo Dwarf Galago (*Galagoides rondoensis*) | Sanje River Mangabey (*Cercocebus sanjei*) |
| Kipunji (*Rungwecebus kipunji*) | Desperate Shrew (*Crocidura desperata*) |
| | Mduma's Shrew (*Crocidura mdumai*) |
| | Tanzanian Shrew (*Crocidura tansaniana*) |
| | Tanzanian Woolly Bat (Kerivoula africana) |
| | African Wild Dog (*Lycaon pictus*) |
| | Geata Mouse Shrew (*Myosorex geata*) |
| | Kihaule's Mouse Shrew (*Myosorex kihaulei*) |
| | Udzungwa Red Colobus (*Piliocolobus gordonorum*) |
| | Zanzibar Red Colobus (*Piliocolobus kirkii*) |
| | Chimpanzee (*Pan troglodytes*) |

| | Ashy Red Colobus (*Piliocolobus tephrosceles)* |
|---|---|
| | Mountain Reedbuck (*Redunca fulvorufula)* |
| | Indian Ocean Humpback Dolphin (*Sousa plumbea)* |

Table #2: Highly threatened bird species of Tanzania

| Birds (CR) | Birds (EN) |
|---|---|
| Long-billed Forest-warbler (*Artisornis moreaui)* | Madagascar Pond-heron (*Ardeola idae)* |
| Rüppell's Vulture (*Gyps rueppelli)* | Steppe Eagle (*Aquila nipalensis)* |
| White-backed Vulture (*Gyps africanus)* | Basra Reed-warbler (*Acrocephalus griseldis)* |
| Hooded Vulture (*Necrosyrtes monachus)* | Sokoke Pipit (*Anthus sokokensis)* |
| White-headed Vulture (*Trigonoceps occipitalis)* | Loveridge's Sunbird (*Cinnyris loveridgei)* |
| | Grey Crowned-crane (*Balearica regulorum)* |
| | Spotted Ground-thrush (*Geokichla guttata)* |
| | Amani Sunbird (*Hedydipna pallidigaster)* |
| | Uluguru Bush-shrike (*Malaconotus alius)* |
| | Egyptian Vulture (*Neophron percnopterus)* |
| | Grey Parrot (*Psittacus erithacus)* |
| | Sokoke Scops-owl (*Otus ireneae)* |
| | Usambara Hyliota (*Hyliota usambara)* |
| | Usambara Weaver (*Ploceus nicolli)* |
| | Rubeho Akalat (*Sheppardia aurantiithorax)* |
| | Usambara Akalat (*Sheppardia montana)* |
| | Udzungwa Forest-partridge (*Xenoperdix udzungwensis)* |
| | Lappet-faced Vulture (*Torgos tracheliotos)* |

Different data collection methods were used to identify the existing protection for the highly-threatened species of Tanzania

Protected areas: species distribution maps publicly available in the IUCN website were overlaid with maps of existing protected areas of Tanzania, if the distribution map covered an existing protected area the species would be deemed as present within. Additionally, IUCN often lists protected areas in which the species are present in their assessments. Moreover, species distribution information was complemented by Emmanuel Lyimo and Anthony Raphael, which work for TAWIRI and the east African birding industry respectively. Emmanuel Lyimo has access to wildlife inventories of Tanzania's protected areas, and Anthony is an expert on birds of East Africa and member of Nature Tanzania.

Captivity**:** a visit to three captive wildlife collections was conducted in Arusha and Dar es Salaam, to visually assess the presence of highly threatened species in captivity. Those institutions were the Meserani Snake Park, Dar es Salaam Zoo and Bahari Zoo. Additionally, through the Zoological Information Management System (ZIMS) global captive population of the species were accessed. Finally, to further complement information on captive animals in Tanzania, an online research was conducted of other captive institutions in the country to determine if additional individuals were present. Because no online inventories/websites were available for most zoological institutions, travel recommendation sites like TripAdvisor became sources of pictures and first hand recommendations of visitors to the place.

NGO/Government agency protection: Interviews which discussed the organizations/agencies main goals, projects, prioritization strategies, challenges and expectations were held. A total of 12 conservation organizations or government agencies were contacted to participate in the project but only six agreed to be interviewed (Table 3). For the organizations/agencies that did not participate in interviews (Table 3 – marked), material was extracted from their website. The interviews would be conducted at the office of the organization and with a key informant of the organization. Such informants were selected in a non-random manner, either by being contacts shared from other organizations or by communicating with the organization directly and have a member be allocated for the short interview. Prior to each interview, a rough guide with pre-existing information of the organizations projects was created, aiming to not waste time with aspects like an organizations mission or history. The outline for the interview guide is found in appendix I, though follow up questions differed amongst different organizations. Similarly, interviewees were asked to sign a consent sheet expressing the purposes of the project (Appendix II).

Table #3: Organizations and agencies to work with:

| Non-governmental organizations | Government Agencies |
|---|---|
| Frankfurt Zoological Society (Not interviewed) | USAID Protect (Non-Tanzanian) |
| Wildlife Conservation Society | TANAPA[1] (Not interviewed) |
| Traffic | |
| Birdlife International | |
| World Wildlife Fund | |
| The Nature Conservancy | |

Data analysis: Descriptive statistics are used to depict the current status of the 43 species in the three umbrellas of conservation. A holistic approach will then be done in which the species are divided according to the number of umbrellas of conservation which protect them (Value of 0-3), leading to the creation of a ranking of the species. Such ranking should have the highly-threatened species which are least protected at the top while those which are highly protected at the bottom. In the case in which two or more species are found to have the same value, additional information like the IUCN assessment, number of protected areas found within its range in Tanzania, captive population, estimated wild population and range size were considered.

In addition, descriptive statistics are used to portray the challenges and prioritization techniques which NGO's and government agencies use to develop conservation strategies.

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[1] Information used for "Protected areas" umbrella but not for NGO/Government Agencies' work

**Results and discussion:**

As explained above, the species were assessed in three different umbrellas of protection: presence in protected areas, captive populations and work done by NGO's and government agencies. Thus, the results are presented as different categories before a holistic analysis was made.

Protected areas:

A list of 28 protected areas composed of all national parks, the only conservation area and multiple game reserves in Tanzania were used as a measurement for existing protection of species. The number of protected areas in which species are found was plotted (figure 4) finding that 46.5% of the species do are not found in protected areas in Tanzania. 20.9% are found in one protected area and 9.3% of the species are found in two protected areas. This results in only 23.2% of the species to be protected by 3 or more protected areas in the country. The average number of protected areas per species for mammals was of 1.55 protected areas while the value for birds was of 6.65.
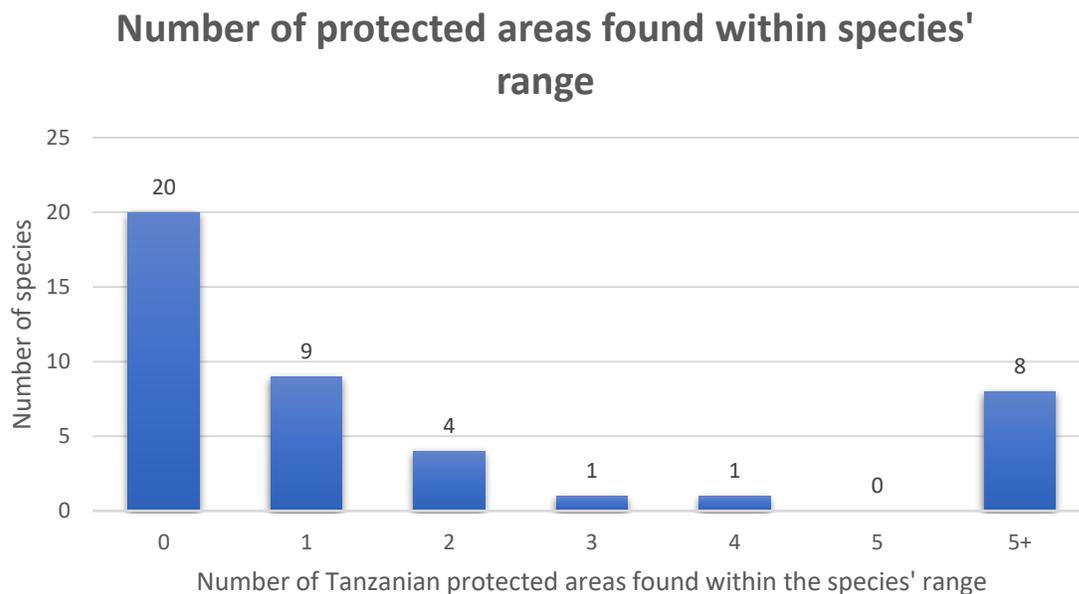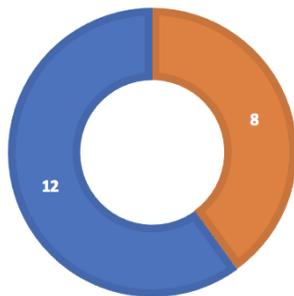


**Number of protected areas found within species' range**

*Figure 4: Number of protected areas found within a species range*

Though initially alarming, the fact that 20 species aren't present in any of the 28 protected areas used in this study does not mean that no areas of their range are protected. This study was unable to access information for all game reserves and natural reserves and community forests have not been considered, allowing for some of the species to be protected in those areas. The lack of protection of many species, however, may be the result of establishing protected areas based on perceived notions of areas which need protection over those which have been thoroughly studied and require protection. Such method of selecting protected areas was prevalent in the colonial rule of Tanganyika in which European powers dictated areas to be emptied of human habitation to be designated for conservation.

The very high disparity between the average number of protected areas between mammals and birds is attributed to the very high number of protected areas in which some species are found. Five species of vultures and the grey crowned crane are protected by at least 20 protected areas each, though some of them exist at very low densities and their high mobility allows them to exit and enter multiple protected areas within their lifetime, thus skewing the data into a higher number of average protected areas. If those 6 species are left out of the average, the mean number of protected areas per bird species drop to a 0.47 protected areas per species.
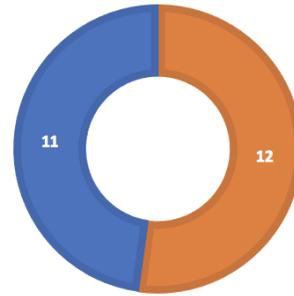


*Figure 5: Comparison of protection offered by protected areas*

A division of the percentage of species of mammals and birds which are protected by protected areas was done (figure 5). This results in 60% of mammal species being protected by at least one protected area and 40% by none. For birds, only 47.8% of the species are protected by at least

one protected area and of those, five species are found in over 20 of them. The high number of unprotected bird species correspond to several factors. Initially, several migrant species move with such frequency that protected areas can't offer them necessary protection, as the species may use them for rest but leave with almost immediate effect. Thus, species like the Basra Reed Warbler, the Madagascar Squacco Heron and the Steppe Eagle are not considered to be local in any of the protected areas. Additionally, many bird species are endemic to the eastern arc mountain range, which extends between Kenya and Tanzania. Of the mountain range, however, only 30% of the original forest remains (N.D.Burgess, et al., 2007), thus, it is necessary to ensure that remaining forests in the area are protected or several species of birds as well as mammals and reptiles could be lost.

Finally, it was found that the protected areas with the highest number of threatened species are Ngorongoro Conservation Area (11), Udzungwa Mountains N.P (10), Mahale Mountains N.P (9) and Serengeti N.P (9). On the other hand, the protected areas with the lowest number of threatened species were Jozani Chwaka N.P (1), Arusha N.P (2), Gombe Stream N.P (3) and Kilimanjaro N.P (3).

Captive populations:

As a second conservation umbrella, the global captive population of the highly-threatened species was identified.  Additionally, a diagnose of the Tanzanian captive population for the species was also done.

The global Zoological Information Management System (ZIMS) was used to diagnose the captive population of the highly-threatened species in captivity. In addition, three zoos were visited in Dar es Salaam and Arusha to visually identify the presence of these species in Tanzanian captive populations.  Information was also gathered online from cheetah rocks (Zanzibar), Zanzibar land animal park (Zanzibar) and Kaole Snake Park (Bagamoyo). However, because those institutions were not visited, one can't analyze accurately the species and number which are present.

Of the 43 highly threatened species only 14 have registered captive populations. The full list of the species, the number of captive individuals according to ZIMS and the number of individuals observed in Tanzanian zoos was found (Table 4). For some species, the captive population was impossible to determine due to its large size so they have been listed at 1000+, referring to a population larger than one thousand individuals. Four species of mammals were found to exist in captivity with population ranging from 20 to 1000+ and 9 species of birds are also present with populations ranging from 6 individuals to 1000+.

Table #4: Captive populations of Tanzania's highly threatened species of birds and mammals

| Species | Captive population | Sexes (M.F.U) | Tanzanian zoo population |
|---|---|---|---|
| Mammals (CR) | | | |
| Black Rhinoceros (*Diceros bicornis*) | 201 | 95.106.0 | ------- |
| Mammals (EN) | | | |
| African Wild Dog (*Lycaon pictus*) | 695 | 369.313.13 | ------- |
| Chimpanzee (*Pan troglodytes*) | 1000+ | | ------- |
| Mountain Reedbuck (*Redunca fulvorufula*) | 20 | 9.11.0 | ------- |
| Birds (CR) | | | |
| Rüppell's Vulture (*Gyps rueppelli*) | 206 | 101.89.16 | 0.0.2 |
| White-backed Vulture (*Gyps africanus*) | 143 | 63.47.33 | 0.0.1 |
| Hooded Vulture (*Necrosyrtes monachus*) | 176 | 78.64.34 | 0.0.1 |
| White-headed Vulture (*Trigonoceps occipitalis*) | 57 | 29.22.6 | ------- |
| Birds (EN) | | | |
| Madagascar Pond-heron (*Ardeola idae*) | 6 | 3.3 | ------- |
| Steppe Eagle (*Aquila nipalensis*) | 144 | 55.61.28 | ------- |
| Grey Crowned-crane (*Balearica regulorum*) | 1000+ | | 0.0.5 |
| Egyptian Vulture (*Neophron percnopterus*) | 239 | 92.95.52 | ------- |
| Grey Parrot (*Psittacus erithacus*) | 1000+ | | ------- |
| Lappet-faced Vulture (*Torgos tracheliotos*) | 69 | 27.29.13 | 0.0.3 |

Out of the 14 species, 3 were subdivided into the subspecies which were present in Tanzania (Table 5), and in the case of a reintroduction project, those are the ones which should ideally be reintroduced. The captive population for the subspecies is smaller than that of the species and ranged between 12 individuals and 520. The very small eastern chimpanzee population may be due to a much higher captive population of other species or, more likely, the origin of captive animals not being known and thus needing genetic testing to determine the subspecies to which they belong.

Table #5: Captive populations of Tanzania's highly threatened subspecies of birds and mammals

| Species | Captive population | Subspecies | Subspecies total | Subspecies sexes (M.F.U) | Tanzanian zoo population |
|---|---|---|---|---|---|
| Mammals (CR) | | | | | |
| Black Rhinoceros (*Diceros bicornis*) | 201 | Eastern black rhino (*D. b. michaeli*) | 160 | 70.90.0 | ------- |
| Mammals (EN) | | | | | |
| Chimpanzee (*Pan troglodytes*) | 1000+ | Eastern Chimpanzee (*P. t. schweinfurthii*) | 12 | 3.9.0 | ------- |
| Birds (EN) | | | | | |
| Grey Crowned-crane (*Balearica regulorum*) | 1000+ | East African grey crowned crane (*B. r. gibbericeps*) | 520 | 227.237.56 | 0.0.5 |
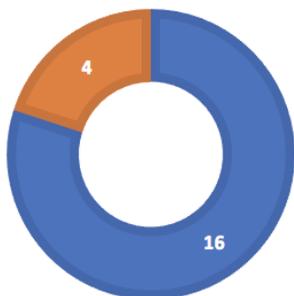


*Figure 6: Comparison of protection offered by captive projects*

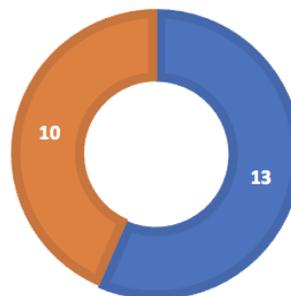When comparing the protection captive populations offer to highly threatened species, only 20% of mammals have captive populations in comparison to 43.4% of bird species. This value is still below 50% for both classes. When considering captive populations in Tanzania, 0% of mammals exist in captivity and only 21.7% of the bird species exist in captivity distributed in the following manner:

Dar es Salaam Zoo

- 0.0.2 Rüppell's Vulture (*Gyps rueppelli*)
- 0.0.3 Lappet-faced Vulture (*Torgos tracheliotos*)
- 0.0.4 Grey Crowned-crane (*Balearica regulorum*)

Meserani Snake park

- 0.0.1 White-backed Vulture (*Gyps africanus*)

Kaole Snake Park

- 0.0.1 Hooded Vulture (*Necrosyrtes monachus*)

Zanzibar land animal park

- 0.0.1 Grey Crowned-crane (*Balearica regulorum*)


Captive populations provide a safety net and allow for reintroduction of species which have ceased to exist in the wild. As mentioned previously, this has already been the case in Tanzania with the Kihansi spray toad and ensuring that highly threatened species had a captive population would at least ensure that if the species goes extinct in the wild, it doesn't go truly extinct. Zoological institutions can, in addition to keeping that safe population, provide funds for in-situ conservation, educate the public and allow for research of captive individuals. Unfortunately, not all zoos around the world serve these purposes and many are run as businesses with little interest in the welfare of the individual animals nor their conservation. To ensure that such standards are met and zoos serve pro-conservation purposes, zoological associations have been created and accreditation processes have been put in place. Associations like the world association of zoos and aquariums (WAZA), the American association of zoos and aquariums (AZA) or the Latin American association for zoos and aquariums (ALPZA) meet on an annual (or bi-annual) basis to share experiences and expertise on breeding and keeping certain species. Additionally,

cooperation programmes like the European endangered species programme allow for genetic diversity to be maintained by constantly managing captive populations. Unfortunately, zoos in Africa often fall into the businesslike models and don't make part of the larger associations, for instance, only four of the 280+ members of WAZA are in Africa.

When the zoological institutions in Tanzania were visited, it was evident that safety standards and minimum requirements are not considered and when asked where the animals were sourced from the response from staff was "bought from the inner country" at the Bahari zoo and "captured from the wild or bought" from the Dar es Salaam Zoo. Further evidencing the lack of contribution that Tanzanian zoos have towards conservation. To further comprehend the issue, the Tanzanian legislation was revised. The wildlife conservation act of 2009 states in its section 90 that "any activity related to wildlife ranching, wildlife farming, zoos, game sanctuaries and captive breeding shall be conducted in accordance with the regulations made by the ministry" (Wildlife Conservation Act, 2009). Though the "regulations made by the ministry" mentioned were never found and are presumed to not exist. In other words, no laws on the purpose for zoos exist, allowing for their use as businesses with little investment, if any, in conservation projects. Hence, the captive populations of highly threatened species in Tanzanian zoos were added into tables no.4 and no.5 but were not added into the global captive population column. This suggests that Tanzanian zoos are contributing to the extirpation of endangered species rather than helping prevent it. It is imperative for the Tanzanian government to consider the issue or for external organizations to involve themselves with captive populations in the country.

Another issue to consider is that, because zoological institutions mostly rely on entrance fees for their maintenance and their involvement in conservation action (at least outside Tanzania), most of the animals kept in captivity are "iconic" species which the public is interested in seeing. This explains why the highly-threatened species of Tanzania which are protected by captive programmes are rhinos, primates or large attractive bird species. It is crucial that less "iconic" species also take part in these captive programmes.

NGO/Government agency protection:

The third conservation umbrella was work done by NGO's or government agencies to protect the species themselves or ecosystems which they inhabited.

Though one cannot fully differentiate the work done by NGO's and government agencies from that offered by protected areas, as they often work hand in hand, they have been categorized in a third form of protection. A total of 6 organizations were interviewed and asked about their existing protection programs, prioritization strategies and challenges.
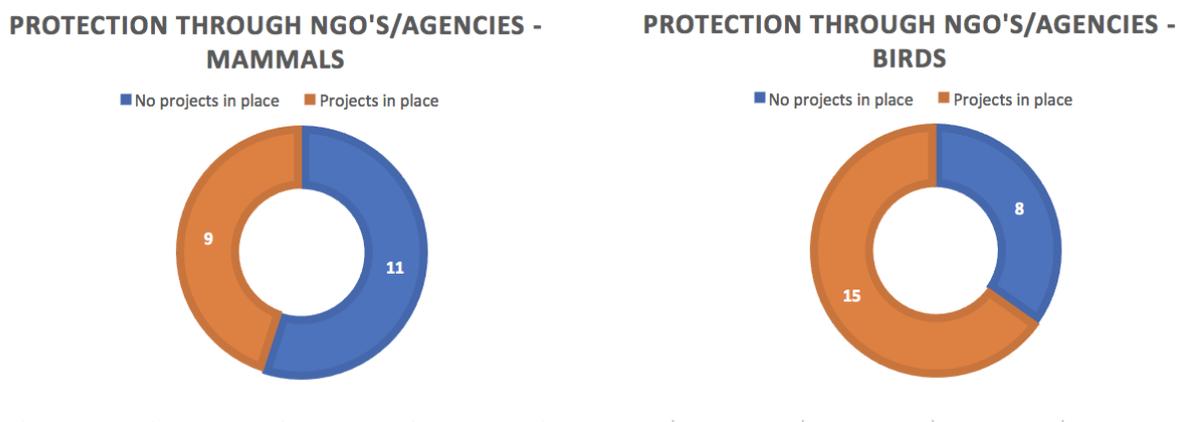


*Figure 7: Comparison of protection offered by NGO's and government agencies*

When comparing the protection offered by NGO's to mammals and birds the results suggest that NGO's or government agencies protect 45% of the mammal species and 65% of bird species, wither directly or by preserving their habitat. The work that NGO's/agencies are doing, however, is hard to quantify. If only one organization is doing research with a species or 4 organizations are in partnership funding anti-poaching patrols, expanding national parks capacities and working with education of nearby communities, the effect on the species would be vastly different. Despite such challenge, and oversimplifying organizations' involvement by plotting the results in a present-absent basis, more than 50% of highly-threatened mammal species or their habitat are not protected by NGO's or a government agency. This is not to say that it is the non-governmental organizations' responsibility to protect all highly-threatened species, but if government action is not enough/efficient, some other entity should intervene.

Challenges:

Responses to the question "What would you consider the limiting factors of the organization to be?" or "What are the biggest challenges in the implementation of the conservation projects?" have been plotted in figure No. 8 below.

Frequency of challenges encountered by NGO's/Agencies
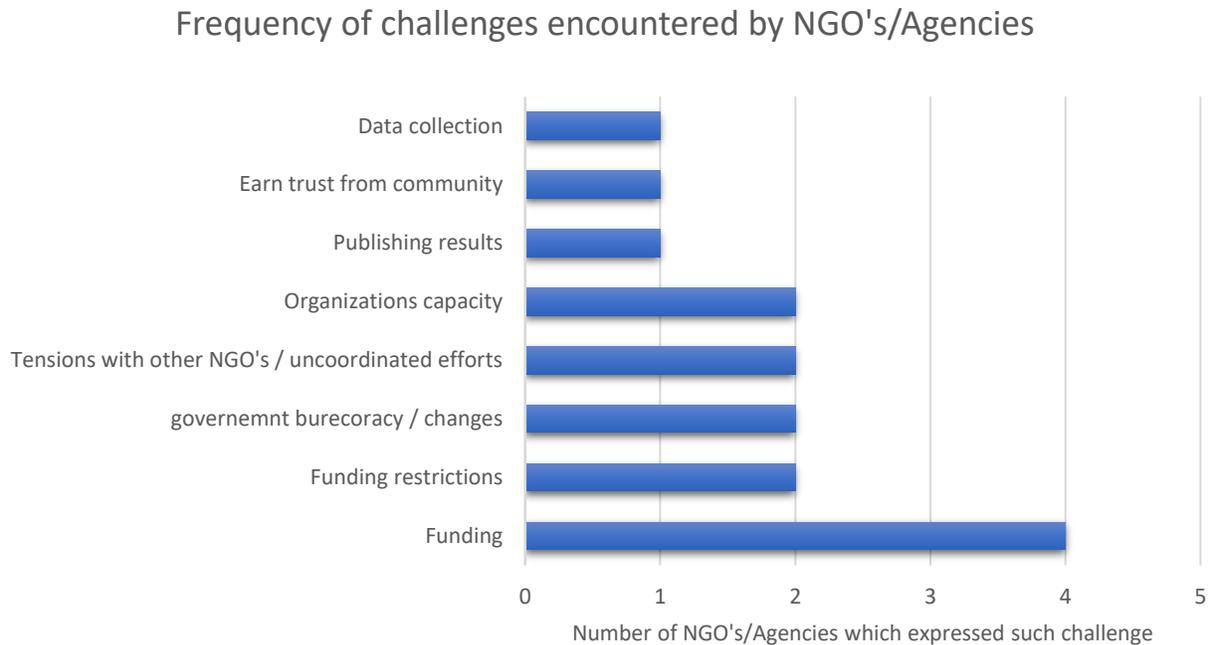


*Figure 8: Frequency of challenges encountered by NGO's and Government agencies*

The most common challenge for conservation organizations working in Tanzania was funding. This is because most of the NGO's or agencies work on a fundraising basis and don't have a steady flow of income which ensures their work through the years. Several interviewees suggested that with environmental problems around the world, and multiple NGO's considering the same sources of funding, it was very hard to guarantee income for their organizations projects. Similarly, funding restrictions was frequently mentioned. Some organizations mentioned that even when the funding is available, they are unable to use it in forms which the organization requires. For instance, some organizations fund anti-poaching patrols but their donors don't allow the funds to be used for purchase of weapons or training for fire arms use, thus not allowing for complete anti-poaching training to occur. Similarly, another organization expressed that some donors will provide funds for a species which they would want to preserve but didn't necessarily

fall under the organizations' conservation strategy and thus, caused human resources to be allocated into less pressing issues. Despite this, that same interviewee expressed that the organization is not forced to accept all donor proposals. Another interviewee argued that all these problems may be overcome with better planning and that other organizations should foresee those kinds of limitations at the time of planning a project.

Several organizations mentioned that government bureaucracy was an issue or that changes in government did challenge the organization. In Tanzania, many organizations work in hand with the government but as government officials change the work is slowed down and new relationships must be established with the new government. Similarly, those who rely on external governmental funding may experience the effects of rapid shifts in political ideologies which reflect on sudden donation cuts. With the same frequency, organizations expressed that tensions with other NGO's or uncoordinated efforts between them, as well as a small organizational capacity, may have obstructed conservation actions within the country.

Finally, the challenges which were least encountered were: earning trust from communities, collecting data and publishing results. Interestingly, one interviewee mentioned that when the organization publishes results on the current status of conservation within the country, they needed to explain who is at fault, however, they can't point fingers at the government or other organizations or agencies as that may deteriorate their relationship with those other parties and further hinder future conservation opportunities. One organization also expressed that earning the trust of communities they work with is challenging and a lengthy process, given their apathy towards having their activities and/or grazing areas restricted in favour of wildlife. Finally, data collection was expressed as a challenge for one organization, especially when it involves illegal activities, like poaching or wildlife trafficking because of the dangerous nature of the activities.

Prioritization strategies:

Responses to the question "Why have you chosen this/these species/ecosystems? / How do you prioritize which species/ecosystems to work with?" were plotted in figure No.9 below.

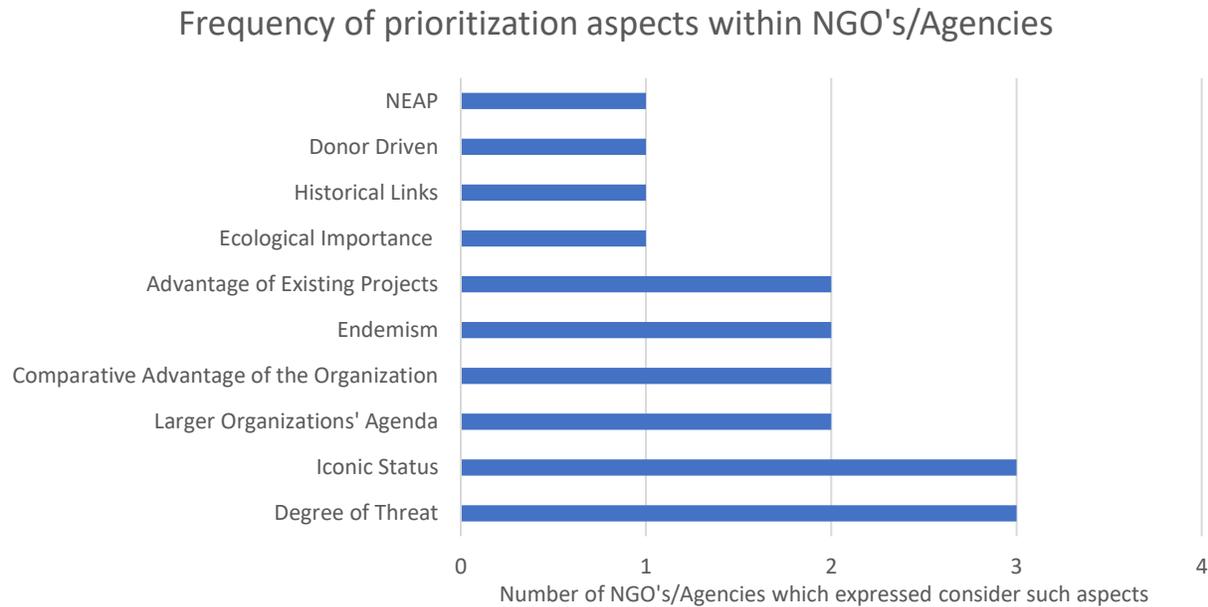**Frequency of prioritization aspects within NGO's/Agencies**



*Figure 9: Frequency of prioritization aspects considered by NGO's and Government agencies*

The most common aspects considered when selecting species or ecosystems to work with are degree of threat and iconic status. Evidently, species with higher degree of threat require more immediate action than those with lower degrees of threat. However, it was unexpected to find iconic status as important. When discussed with the interviewees, they argued that if they wanted to attract funding they were required to do projects with species that were attractive and iconic over those which were less appealing to the public. Four additional aspects came second with a frequency of two organizations each: Advantage of existing projects, endemism, comparative advantage of the organization and the larger organizations' agenda. When asked to further expand on their answers some interviewees mentioned that implementing a new project which works in hand with the government and other organizations may be difficult to initiate, thus, taking advantage of existing projects done by other organizations and the government is easier to accomplish. This same aspect was mentioned regarding changes in policy. Organizations would consider that advising the government in policies which were being revised was more

effective and less resource intensive than advocating for the revision of policies which were not initially considered for revision. This "opportunism" may have greater success and reduce time, human and monetary resources, but at the same time it may leave important issues unaddressed. One organization mentioned that they have been advocating for the prohibition of a poison used to kill vultures for 10 years unsuccessfully, because of the complicated policy reviews and government priorities, exemplifying that opportunism may have a more immediate effect but also should not be the only strategy used. Regarding endemism, it is argued that if a species is not protected in the country it is endemic to, then it will not be protected anywhere, and thus must be taken into account when selecting species or habitats to work with. A couple of organizations mentioned that the larger goals of the organizations' international office may dictate work which is done in the country. This then becomes a prioritization aspect in addition to a possible challenge (not directly expressed in the challenges question above). That is because decisions taken at international offices, far from the local contexts in which national offices are found may not necessarily be fully aware of the in-country priorities.

Finally, the aspects that were mentioned to only be considered by one of the organizations were: The National Environmental Action Plan (NEAP), Donor driven ideas, historical links of the species to the culture/country or organization and the species ecological importance. The NEAP, which was first created in 1994, would have been hypothesized to be a more prevalent aspect considered by organizations. This is because if all organizations worked under the same national document then they could "all build the same house" – as mentioned by one interviewee. However, it is speculated that the NEAP may not be entirely up to date with the national needs for biodiversity, despite being last updated in 2013, and organizations prefer to rely on their own assessments of needed work. Regardless, all organizations mentioned that at the time of planning a strategy they were open to input from other organizations and the government. Ecological importance was also originally hypothesized to be considered more amongst organizations. Given that species have different roles and impacts in the ecosystem and affect it in different forms, it is necessary to consider the importance of species when designing a project. Moreover, donor driven ideas are considered when they align with the organizations goals and

do not restrict the organization with a lot of restrictions (see challenges above).  Finally, the historical and cultural links of the species is considered when a particular species is important to a place and identity, but no examples were given by the interviewee.

Holistic approach:

To finalize the assessment on the current conservation status of highly threatened species in the country, an addition of the three conservation umbrellas was done (Figure 10).



## NUMBER OF PROTECTION UMBRELLAS PER HIGHLY THREATENED SPECIES

Legend:
- 0
- 1
- 2
- 3

Values: 11, 25%; 15, 35%; 5, 12%; 12, 28%
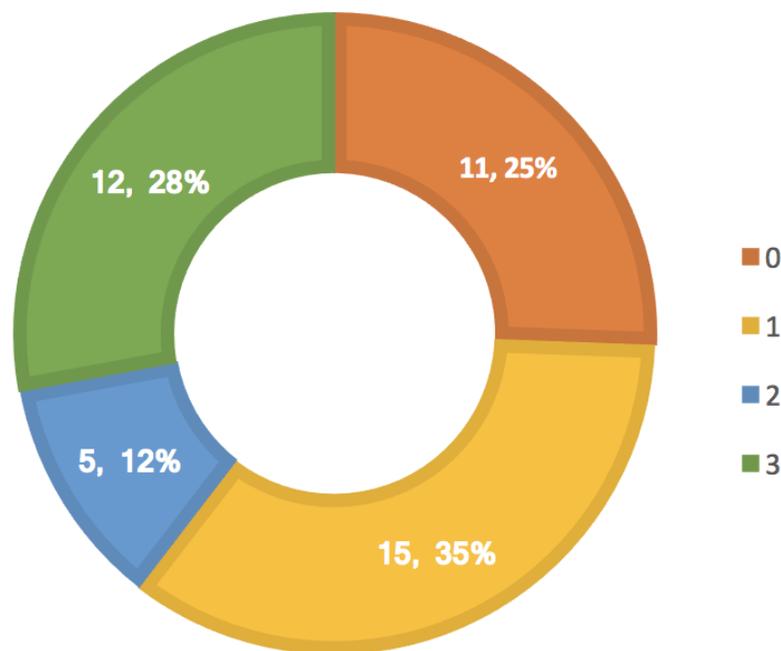
*Figure 10: Number of protection umbrellas protecting highly threatened species in Tanzania*

11 species, which account for 25% of the highly-threatened species of birds and mammals in the country are not protected by any of the conservation umbrellas discussed above. 15 species are protected by any one of them, 5 species are protected by two of them and only 12 species, 28% of the total species, are protected by all three umbrellas. Of the species which aren't protected by any of the umbrellas, seven were mammals and four species were birds. Of the seven mammal

species, all were shrews except for the Tanzanian woolly bat and the blue whale. Suggesting that shrews are the least protected species. In the case of the birds, the unprotected species were the Basra Reed Warbler, the Uluguru bush shrike, the Sokoke pipit and the Sokoke scops owl. One of those species migrates between Iraq and East Africa and most likely requires a multi-country effort. The other three species are endemic to the eastern arc mountains and highlight the need for further protection of the area, which is part of the global biodiversity hotspots.

Species ranking, showing species which are less protected on top and the most protected on the bottom.

| Mammals | Birds |
|---|---|
| Phillips' Congo Shrew (*Congosorex phillipsorum*) | Sokoke Pipit (*Anthus sokokensis*) |
| Tanzanian Shrew (*Crocidura tansaniana*) | Uluguru Bush-shrike (*Malaconotus alius*) |
| Tanzanian Woolly Bat (*Kerivoula africana*) | Basra Reed-warbler (*Acrocephalus griseldis*) |
| Geata Mouse Shrew (*Myosorex geata*) | Sokoke Scops-owl (*Otus ireneae*) |
| | Long-billed Forest-warbler/tailorbird (*Artisornis moreaui*) |
| Desperate Shrew (*Crocidura desperata*) | Rubeho Akalat (*Sheppardia aurantiithorax*) |
| Kihaule's Mouse Shrew (*Myosorex kihaulei*) | Usambara Hyliota (*Hyliota usambara*) |
| Blue Whale (*Balaenoptera musculus*) | Udzungwa Forest-partridge (*Xenoperdix udzungwensis*) |
| Rondo Dwarf Galago (*Galagoides rondoensis*) | |
| Indian Ocean Humpback Dolphin (*Sousa plumbea*) | Spotted Ground-thrush (*Geokichla guttata*) |
| Mduma's Shrew (*Crocidura mdumai*) | Amani Sunbird (*Hedydipna pallidigaster*) |
| Sanje River Mangabey (*Cercocebus sanjei*) | Usambara Akalat (*Sheppardia montana*) |
| Udzungwa Red Colobus (*Piliocolobus gordonorum*) | Loveridge's Sunbird (*Cinnyris loveridgei*) |
| Kipunji (*Rungwecebus kipunji*) | Madagascar Pond-heron (*Ardeola idae*) |
| Zanzibar Red Colobus (*Piliocolobus kirkii*) | Steppe Eagle (*Aquila nipalensis*) |
| Abbott's Duiker (*Cephalophus spadix*) | Usambara Weaver (*Ploceus nicolli*) |
| Ashy Red Colobus (*Piliocolobus tephrosceles*) | White-headed Vulture (*Trigonoceps occipitalis*) |
| African Wild Dog (*Lycaon pictus*) | White-backed Vulture (*Gyps africanus*) |
| Black Rhinoceros (*Diceros bicornis*) | Hooded Vulture (*Necrosyrtes monachus*) |
| Chimpanzee (*Pan troglodytes*) | Rüppell's Vulture (*Gyps rueppelli*) |
| Mountain Reedbuck (*Redunca fulvorufula*) | Egyptian Vulture (*Neophron percnopterus*) |
| | Grey Parrot (*Psittacus erithacus*) |
| | Lappet-faced Vulture (*Torgos tracheliotos*) |
| | Grey Crowned-crane (*Balearica regulorum*) |

As predicted originally, most of the heavily protected species are those which are iconic and charismatic, like the rhino and chimp or key species like the vultures. However, it had been predicted that primates were going to be some of the most protected and several primate species are only protected by one conservation umbrella. Nonetheless, small and not so charismatic shrews, bats and passerines are in high need of protection and in some cases research, as so little is known about them. To exemplify this, of the 10 least protected mammal species, seven were shrews or a bat species, which are very unappealing for public and if not protected in a protected area would be hard to promote for zoological institutions or fundraise for in NGO's. In terms of birds, the vultures may appear to be the most preserved, as they are present in captivity, protected in multiple protected areas and at least one organization works towards their conservations. However, due to their high mobility (one individual was tracked from Tanzania to Zimbabwe) they constantly exit protected areas and are poisoned (WCS; Claire Bracebridge, 2017), and their slow breeding rate hinders the population from growing rapidly. In February 2018, a retaliatory killing found 80 dead vultures (WCS Tanzania, 2017) and populations keep declining in all species, thus the fact that they find themselves at the bottom of the ranking list does not mean that a species is safe from extinction.

**Conclusion**

In conclusion, of the 43 highly threatened species of birds and mammals in Tanzania, it was found that 25% of highly-threatened species are not conserved under any conservation umbrella and only 28% of the highly-threatened species are preserved under the three conservation umbrellas. It was found that the umbrella that covers the most species of mammals is protected areas, while the one that protects more birds is NGO/government agencies work. The least protective umbrella for mammals and birds was captive conservation as only 14 of the 43 species are found in captivity. Thus, it is suggested to consider captive breeding programmes for remaining species with rapidly declining wild populations. However, at the same time stricter laws should apply and be enforced for zoological institutions within Tanzania, to ensure animal welfare and the incorporation of those captive animals into conservation projects.

As originally hypothesized, it was concluded that though the majority of species (75%) are protected by at least one protection umbrella. Similarly, it was also concluded that less appealing species are being less conserved than more appealing and charismatic species. Though this does not entire replicate with birds, which have highly preserved vultures – though still facing many threats.

Regarding nongovernmental organizations' challenges and prioritization, it was concluded that the biggest challenges faced was funding, though funding restrictions, uncoordinated efforts with other parties, government changes and the organizations capacity were also frequent challenges. This brings in the question of whose responsibility is it to conserve nature, and who should pay for it. Though those questions find no answers in this paper, it is important to reflect on our collective human responsibility to address issues which we have caused and remediate their detrimental effect. At the time of developing a conservation strategy, the prioritization aspects most commonly used were the degree of threat of a species and iconic status, followed by the larger agenda of the organization or its comparative advantage, if a species is endemic or simply by taking advantage of existing projects/policy reviews.

**Limitations, recommendations and ethical considerations:**

The limitations for the study made have been divided into the different protection umbrellas, as the information gathered for each had a different methodology:

Protected areas: Firstly, wildlife inventories exist for most protected areas in the country. Unfortunately, this information is not publicly available and despite existing efforts, it was impossible to access them. These inventories could provide more accurate information of the presence of endangered species within the designated areas. Secondly, interviewed experts may have made mistakes. This was confirmed when corroborating the information given by them with the maps publicly available at the IUCN red list website, thus the use of wildlife inventories would further prevent such mistakes from occurring. Finally, some of the IUCN maps for some species (little-known mammals) were non-exiting, in addition, at least 10 species assessments were last updated in 2008, resulting in a 10-yearlong gap of knowledge of population trend and inaccurate distribution maps.

Captive projects: Information was collected from ZIMS, which despite being a global database, only uses information which is provided to them. Though the zoos that use ZIMS are more likely to engage in conservation action over those who don't, as member zoos generally form part of larger zoo associations, the database is not exhaustive in its listing of all captive individuals. Moreover, captive breeding as a conservation technique is not prevalent in the country and its use as a national protective measure for some species is not accurate, hence the national captive population has been kept out of the "captive population" columns in the creation of the ranking.

Additionally, when visits to the zoological institutions were conducted, some individuals may have been overlooked or species missed. Though this was reduced by thoroughly searching for animals within their enclosures and speaking to staff at the site. Finally, due to the lack of publicly available animal inventories and/or websites for the Tanzanian zoological institutions, other sources like trip advisor were used to assess the presence and number of endangered species in

other institutions. Similarly, it is likely that species may have been overlooked or not present in the photographs publicly available in the website.

NGO's and Government Agencies: Only six of the 12 organizations contacted agreed to be interviewed, thus the small sample size may have affected results in the "challenges" and "prioritization strategies" and may not necessarily be representative of all conservation organizations in the country, thus a larger sample size would be recommended for future studies. Furthermore, key informants may not be able to represent the views of the entire organization or its projects, limiting the information collected to that which was known by the interviewee or what the interviewee wanted to share. For this reason, thorough online research was conducted on the organizations projects and reports before and after the interview. Similarly, because the interviews were conducted at the organization's/agency's office and with their staff members, it is possible that only positive information wanted to be portrayed and some aspects of the organization may have been left out.

Holistic approach: The ranking system created may not be necessarily accurate of the species which require the most conservation action in the country. Species like the blue whale, which have an almost global distribution and have an increasing population, may not require more conservation action than species which are found behind them, like the Sanje River Mangabey. Besides, condensing conservation umbrellas into a value between 0-1 runs the risk of oversimplifying wildlife conservation. It is not the same to have a captive population of 6 or one of 200, nor it is the same to be present in one protected area of a 50 km2 or be present in several of several hundred square kilometers. Though for any of those cases the conservation umbrella value would be the same: 1. Similarly, it is impossible to quantify the efforts that NGO's and government agencies are doing across the country, and a value of 0-1 omits the intricacies of such efforts. Thus, a revision of ranking methods may be required. Finally, IUCN assessment dates range from 2008 to 2017, so old assessments may not encompass recently discovered populations, habitat loss for the past 10 years or newly developed conservation strategies protecting the species.

Recommendations for future studies:

Some of the species studied in this project are very unknown to science, especially the bats and shrews, thus further studies on the distribution, population and threats are required to better determine necessary conservation action. Additionally, future students may study in further detail the existing captive populations in the country, their welfare and the possibility of incorporating Tanzanian zoos into the larger conservation network of the country.

Ethical considerations:

- All members that were interviewed were asked to sign consent forms expressing the purpose of the study, when consent forms were not available, the purpose of the study was fully disclosed to the interviewees or sent by email before the telephonic interviews.

- No animals were harmed in the study and it was a purely observational assessment. However, the entrance fees for the visited zoological institutions probably will help perpetuate a sub-standard level of animal welfare and maintain an extractive exploitative zoo business within the country.

- By providing organizations and agencies with the ranking of species, one could speculate that there is a sense of responsibility over the protection of those species. In the case, such ranking was indeed used in the design of a new conservation strategy, a small mistake in my calculations could hinder a species from receiving necessary protective action.

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## Appendix I – Interview guide

Organizations name:
Organizations mission:
Organizations history/project bullet points:
Does your organization work with any of these mammal or bird species? (Check the box)

| Mammals (CR) | | Mammals (EN) | |
|---|---|---|---|
| Phillips' Congo Shrew (*Congosorex phillipsorum*) | | Blue Whale (*Balaenoptera musculus*) | |
| Black Rhinoceros (*Diceros bicornis*) | | Abbott's Duiker (*Cephalophus spadix*) | |
| Rondo Dwarf Galago (*Galagoides rondoensis*) | | Sanje River Mangabey (*Cercocebus sanjei*) | |
| Kipunji (*Rungwecebus kipunji*) | | Desperate Shrew (*Crocidura desperata*) | |
| | | Mduma's Shrew (*Crocidura mdumai*) | |
| | | Tanzanian Shrew (*Crocidura tansaniana*) | |
| | | Tanzanian Woolly Bat (Kerivoula africana) | |
| | | African Wild Dog (*Lycaon pictus*) | |
| | | Geata Mouse Shrew (*Myosorex geata*) | |
| | | Kihaule's Mouse Shrew (*Myosorex kihaulei*) | |
| | | Udzungwa Red Colobus (*Piliocolobus gordonorum*) | |
| | | Zanzibar Red Colobus (*Piliocolobus kirkii*) | |
| | | Chimpanzee (*Pan troglodytes*) | |
| | | Ashy Red Colobus (*Piliocolobus tephrosceles*) | |
| | | Mountain Reedbuck (*Redunca fulvorufula*) | |
| | | Indian Ocean Humpback Dolphin (*Sousa plumbea*) | |

| Birds (CR) | | Birds (EN) | |
|---|---|---|---|
| Long-billed Forest-warbler (*Artisornis moreaui*) | | Madagascar Pond-heron (*Ardeola idae*) | |
| Rüppell's Vulture (*Gyps rueppelli*) | | Steppe Eagle (*Aquila nipalensis*) | |
| White-backed Vulture (*Gyps africanus*) | | Basra Reed-warbler (*Acrocephalus griseldis*) | |
| Hooded Vulture (*Necrosyrtes monachus*) | | Sokoke Pipit (*Anthus sokokensis*) | |
| White-headed Vulture (*Trigonoceps occipitalis*) | | Loveridge's Sunbird (*Cinnyris loveridgei*) | |
| | | Grey Crowned-crane (*Balearica regulorum*) | |
| | | Spotted Ground-thrush (*Geokichla guttata*) | |
| | | Amani Sunbird (*Hedydipna pallidigaster*) | |
| | | Uluguru Bush-shrike (*Malaconotus alius*) | |
| | | Egyptian Vulture (*Neophron percnopterus*) | |
| | | Grey Parrot (*Psittacus erithacus*) | |
| | | Sokoke Scops-owl (*Otus ireneae*) | |
| | | Usambara Hyliota (*Hyliota usambara*) | |
| | | Usambara Weaver (*Ploceus nicolli*) | |
| | | Rubeho Akalat (*Sheppardia aurantiithorax*) | |
| | | Usambara Akalat (*Sheppardia montana*) | |
| | | Udzungwa Forest-partridge (*Xenoperdix udzungwensis*) | |
| | | Lappet-faced Vulture (*Torgos tracheliotos*) | |

What are the projects composed of?

Why have you chosen this/these species? / How do you prioritize which species to work with?

If another organization works with a species, would your organization also work with it?

What is the relationship like with other conservation NGO's?

What would you consider the limiting factors of the organization to be?

What are the biggest challenges in the implementation of the conservation projects?

Are there any species you currently don't work with and would want to start a project with?

## Appendix II – Consent form

**PARTICIPANT INFORMED CONSENT**

**Title of the Study:** *Conservation coverage: A governmental vs. non-governmental assessment of the protection of highly threatened birds and mammals in Tanzania*

**Student Name:** Adolfo Castro Dominguez

*I am a student with the SIT Wildlife Conservation and Political Ecology program. I would like to invite you to participate in a study I am conducting as part of my SIT Study Abroad program in Tanzania. Your participation is voluntary. Please read the information below, and ask questions about anything you do not understand, before deciding whether to participate. If you decide to participate, you will be asked to sign this form and you will be given a copy of this form.*

### PURPOSE OF THE STUDY
*To identify which of the 43 highly threatened species of birds and mammals are being conserved, what is being done and what hinders further protection.*

### STUDY PROCEDURES
*Your participation will consist of responding some questions on the organizations projects, strategies and challenges*

### POTENTIAL RISKS AND DISCOMFORTS
*There are generally no foreseeable risks to participating in this study and no penalties should you choose not to participate; participation is voluntary. During the interview, you have the right not to answer any questions or to discontinue participation at any time.*

### POTENTIAL BENEFITS TO PARTICIPANTS AND/OR TO SOCIETY
*Participation in this study will help determine which highly threatened species are less protected and thus should be prioritized for future projects*

### PAYMENT/COMPENSATION FOR PARTICIPATION
*There is no payment or compensation for participation.*

### CONFIDENTIALITY
*Any identifiable information obtained in connection with this study will remain confidential. I will not release the names of any participants who partake in this study. Everything shared within this space will remain confidential. I will not share this information with anyone, except for my assignment.*
*When the results of the study are published or discussed, no identifiable information will be used.*

### PARTICIPATION AND WITHDRAWAL
*Your participation is voluntary. Your refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this study.*
*"I have read the above and I understand its contents and I agree to participate in the study. I acknowledge that I am 18 years of age or older."*

*Participant's signature _____Date_____*

*Student's signature _____Date_____*

### STUDENT'S CONTACT INFORMATION
If you have any questions or want to get more information about this study, please contact me at adolfocastrod@gmail.com or +255 688051049

### RIGHTS OF PARTICIPANT – SIT CONTACT INFORMATION
To uphold the ethical standards of all SIT proposals, this assignment has been reviewed and approved by the Academic Director. If you have questions, concerns, or complaints and are unable to contact the student please contact her at: Felicity.kitchin@sit.edu