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Leopards Are Good to Think With: Spotting the Zanzibar Leopard in Jozani Forest

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Table of Contents

Acknowledgments……...……3

Abstract……4

Introduction……..5

Background……..6

Methods……8

Results……11

Discussion……..17

Conclusion…….33

Recommendations……..35

References..……37

Appendix 1…….38

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Abstract

In this project, the modern narrative of the Zanzibar leopard was studied in Jozani-Chwaka Bay National Park. Game cameras were installed and various locations around the national park to try and gather primary evidence that supported the existence of a leopard population in the forest. In addition, local community members were interviewed about recent leopard related activities. No biological evidence was gathered that supported the existence of the Zanzibar leopard and information collected from interviews indicated a potential shift in which other organisms are considered leopards. Recommendations were made for future research to be able to better understand the complex meaningfulness of the narrative of the Zanzibar leopard and how the narrative shifts over time.

Dhahania

Katika Utafiti huu, Masimulizi ya kisasa kuhusiana Chui wa Zanzibar yalifanyiwa utafiti katika Ghuba ya Chwaka na hifadhi Jozani. Kamera maalum zilitegeshwa katika maeneo tofauti katika maeneo ya msitu wa hifadhi ya Jozani ili kuweza kupata pamoja na kukusanya taarifa za msingi ambazo zitaweza kuthibitisha uwepo wa Chui wa Zanzibar na idadi yao katka msitu wa Jozani. Kwa kuongezea , wajumbe wa wanavijiji wlihojiwa juu ya uwepo wa Chui wa Zanzibar na mahusiano yake katika shughuli tofauti . Hakuna ushahidi wa Kisayansi uliokusanywa ambao unathibitisha kuwepo kwa Chui wa Zanzibar na kwa taarifa zilizokusanywa kutoka kwa Wahojiwa inaonesha wamepotea na Wanyama wengine wananafikiriwa kuwa ndio Chui wa Zanzibar. Ushauri unaotokana na utafitu huu ni tafiti za baadae kuweza kufahamu kwa undani masimulizi ya Chui wa Zanzibar na kwa kiasi gani walipotea kwa muda wote.

Introduction

Recently, there has been rekindled interest in the scientific hunt for the Zanzibar leopard. The Zanzibar leopard (*Panthera pardus adersi*) is an animal most officials considered to be extinct in the 1990's after a lengthy campaign to eradicate the leopards enacted by the Zanzibar government in the 1960's (Walsh, 2008; Walsh & Goldman, 2007). Despite this, efforts to find potential Zanzibar leopards persist. Claims of interactions with the leopards still circulate on Unguja Island. In 2018, there was a "Zanzibar leopard" said to have been recorded via game camera in Jozani-Chwaka Bay National Park and aired on international television. While experts remain skeptical regarding the legitimacy of that sighting and video, continued interest in the extinct leopard at the national and international scale warrants further investigation as well as a reassessment of the long-term legacy of Zanzibar leopards. Due to all of these recent events, my study will attempt to understand two questions, namely is the Zanzibar leopard still present in Jozani-Chwaka Bay National Park and what is the current narrative of the Zanzibar leopard that persists in relation to various stakeholders?

The study aims to collect primary data on potential leopards in the form of photographic evidence (or convincing secondary evidence), as well as to compile anecdotal evidence from local communities and other people who are in direct contact with the leopard narrative in Jozani Forest. The study will attempt to union the biological data with sociological evidence to portray a more complete and updated socio-ecological narrative about the significance of the Zanzibar leopard. The data will provide insights into the current status of a potentially critically endangered organism. Additionally, the study will provide a pathway to understand how local communities address power dynamic issues through usage of the leopard symbol. Moreover, the study will document thoughts and beliefs of local communities adjacent to Jozani Forest in 2019.

Background

Panthera pardus adersi, or the Zanzibar leopard, stirs a variety of thoughts and emotions in those familiar with it. The Zanzibar leopard is a separate species of leopard from the Tanzanian mainland leopard: *Panthera pardus*. It is notably smaller and has a distinctive coat with clustered rosettes around the neck (Pakenham, 1984). Culturally, the Zanzibar leopard is primarily associated with witchcraft and the ability of *waganga*, or traditional healers, to use leopards for evil deeds, such as attacking enemies or harming livestock (Walsh & Goldman, 2012). After the Zanzibar revolution in 1964, the government created a campaign to eradicate all of the remaining Zanzibar leopards in an effort to thwart witchcraft and the intense fear many communities felt towards the apex predator (Goldman & Walsh, 2002; Walsh & Goldman, 2007). The result of this campaign was a severe decline in the Zanzibar leopard population until the animal was assumed to be extinct in the mid 1990's(Walsh, 2008).

The concept of extinction is one that is particularly difficult for scientists. It proves difficult to scientifically claim that a species is extinct due to the possibilities of inaccessible populations, elusive animals, or the persistence of the animal in a different geographical area. Additionally, the definition of extinction is a philosophical challenge. For example, biologically an animal may be considered extinct; however, the organism may still be seen in the activities and thoughts of the local community, and the cultural importance of the organism may persist long into the future. This is the biggest challenge in the definition of extinction because many organisms still live on in non-scientific ways.

Despite the alleged extinction of every leopard population on Unguja, villagers still regularly report leopard sightings in and around Jozani-Chwaka Bay National Park. Presently, there is an air of uncertainty and anxiety towards the potential leopard population in Jozani

Forest, where villagers and rangers insist on the persistence of a small leopard population up to the present.

Jozani-Chwaka Bay National Park, established in 2004, is a 50 km^2 forest in the central-southern portion of Unguja and is the only national park in the Zanzibar Archipelago. The geography is significantly different there than on the rest of Unguja. The park has dense forest canopies, thick brush, and is relatively removed from large local communities. As a result, the park serves as a refuge for wildlife that would normally be at risk due to habitat destruction. For this reason, the forest serves as an ideal site to study island mammals, which includes the potentially extinct Zanzibar leopard.

There are several reasons that Jozani Forest is the best place to study potential leopards. First, there is a high number of Zanzibar leopard sightings in and around the national park. Although many of these sightings are based on anecdotal evidence- there has not been any confirmed leopard sighting since the last reported kill in 1995 - the importance of the utilization of information provided by local communities is accented in this particular study as those communities have lived in close proximity to the national park for decades (Walsh, 2011). The second reason why Jozani-Chwaka Bay National Park was selected as a study site is that previous studies also have engaged this topic in the national park. As a result, a synthesized methodology will be more effective due to the use of a consistent site across each study as well as to keep the critical events and interpretations of the leopard narrative as streamlined as possible.

Previous survey methods for the Zanzibar leopard have included the use of game cameras at several locations in Jozani-Chwaka Bay National Park in addition to proximal villages. To maintain a consistent narrative and update the leopard story, I will use the same general methods

employed previously but also survey some locations that may have not been surveyed previously. I also intend to ask slightly different questions of interviewees in this study.

Methods

Two distinct methodologies were employed to better understand the current status and role of the Zanzibar leopard: biological methods and anthropological methods.

Biological Methods

To attempt to capture any primary evidence related to the existence of the Zanzibar leopard, three game cameras were placed at various sites within the national park. The sites were selected through identification of trackways of various animals such as pigs and genets, or other types of potential prey for the Zanzibar leopard. Additionally, some sites were selected based on previous leopard sightings and data collected from interviewees in the local community. Cameras were then set up to cover a large area of the selected site, typically angled towards a large open space, in order to monitor an area for leopard activity(Vitkalova & Shevtsova, 2016; Wang & Macdonald, 2009). Sometimes, the sites were baited with fish guts suspended in water, as recommended by park staff. The GPS coordinates were recorded for each camera and new sites were selected once every three days. This methodology was repeated until seven total sites

were sampled (Figure 1).

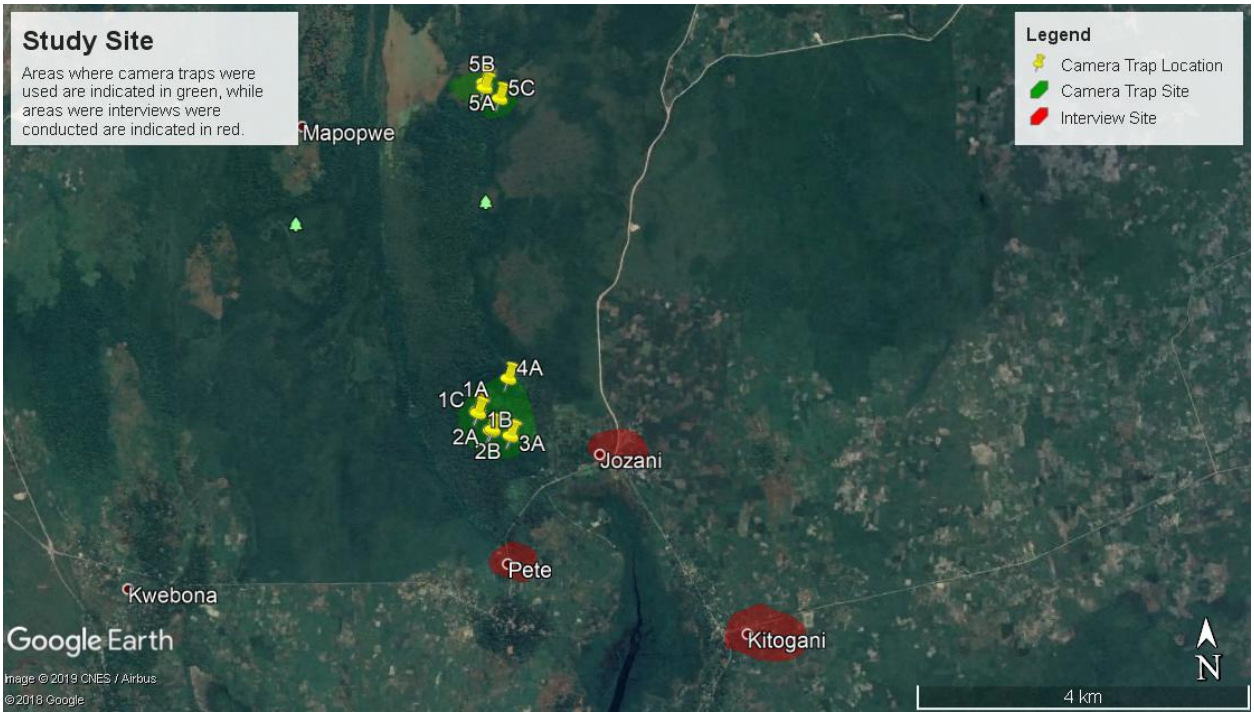

Figure 1: Map of the study site including locations of camera trap placement and interview sites.

Anthropological Methods

The second aspect of the project was data collection from local community members to construct an updated narrative about the Zanzibar leopard. Interviewees were classified into one of four stakeholder categories: Jozani employee, government official, villager, or *mganga*. Interviews were semi-structured in order to better gain specific information about the Zanzibar leopard (Bernard, 2013). Precautions were taken in the interview methodology to avoid anxiety in the interviewee about my motives relating to the leopard (Goldman & Walsh, 2002).General community members, including villagers and some non-ranger Jozani employees, were asked the following questions:

1. Which animals in Jozani Forest do you know about?

2. Are any of these animals dangerous?
3. Have you heard of the Zanizbar leopard?
4. Have you had any personal experiences with the Zanzibar leopard?
5. When was the last sighting?
6. Do you think the leopards are still around?
    a. Why?
    b. Where do you think the Zanzibar leopard lives?
7. What would you do if you saw a Zanzibar leopard?

Each type of specialized stakeholder was asked additional questions after covering this general questionnaire. The additional asked questions were as follows:

Waganga

1. What is the importance of leopards?

Park Rangers

1. Do you believe that there is a leopard population in Jozani Forest?
    a. Why?
    b. Where?
2. When was the last time someone saw a leopard in Jozani Forest?

Village Leaders

1. Have there been any leopard sightings in your village in the last three months?
2. Do you think that leopards are present in or around your village?

The aim of this study and its interview questions was to get more information about the role of the leopard in communities around Jozani Forest. To get more information about leopard sightings, the exact interview script among interviewees was not maintained perfectly because certain respondents had more information about leopards than others. As a result, there will be more emphasis placed on the stories and events that were reported during the study period.

Results

Since the objective of the study was to update the narrative of the Zanzibar leopard, the results section is organized to review the collected data from the biological portion of the study, show basic statistics collected from interviews, as well as to reflect information collected about certain relevant events.

Biological Results

The game cameras failed to record any evidence that suggested the existence of the Zanzibar leopard. In the study, the game cameras experienced decreased functionality due to battery challenges. One camera, camera A, worked consistently the entire duration of the camera trap component of the study (10/11/2019 to 27/11/2019). The cameras recorded other animals in the forest such as the leopard-like Servaline genet (*Genetta servalina)*(Figure 2), but none of the animals resembled *Panthera pardus adersi* nor was there any convincing secondary evidence that suggested the persistence of the Zanzibar leopard. Additionally, forest surveys for secondary evidence including leopard scat, claw marks on trees, and animal carcasses were all negative.

Figure 2: A Servaline genet was recorded at 8:40 am approximately 2 km down the Wangwani trail from the Park entrance.

Another piece of biological evidence included an alleged dead juvenile leopard which was found on the road between JozaniChwaka-Bay National Park and Pete 8-12 months ago. The national park kept the specimen frozen for further studies to be conducted on its physical remains. The specimen was feline in morphology, measured just under 1m in length, and resembled a feral cat. The coat was light and dark grey with black stripes on the legs and some darker grey stripes along the body (Figure 3, C & D). The underside was white with black spots (Figure 3, C). The head was relatively angular with small vertical black stripes down each eye (Figure 3, B). The paws were also very small in comparison to members of *P. pardus* (Figure 3, A). The specimen was frozen solid upon investigation of it (so some features such as the head are less visible because the head was frozen to the torso

region..

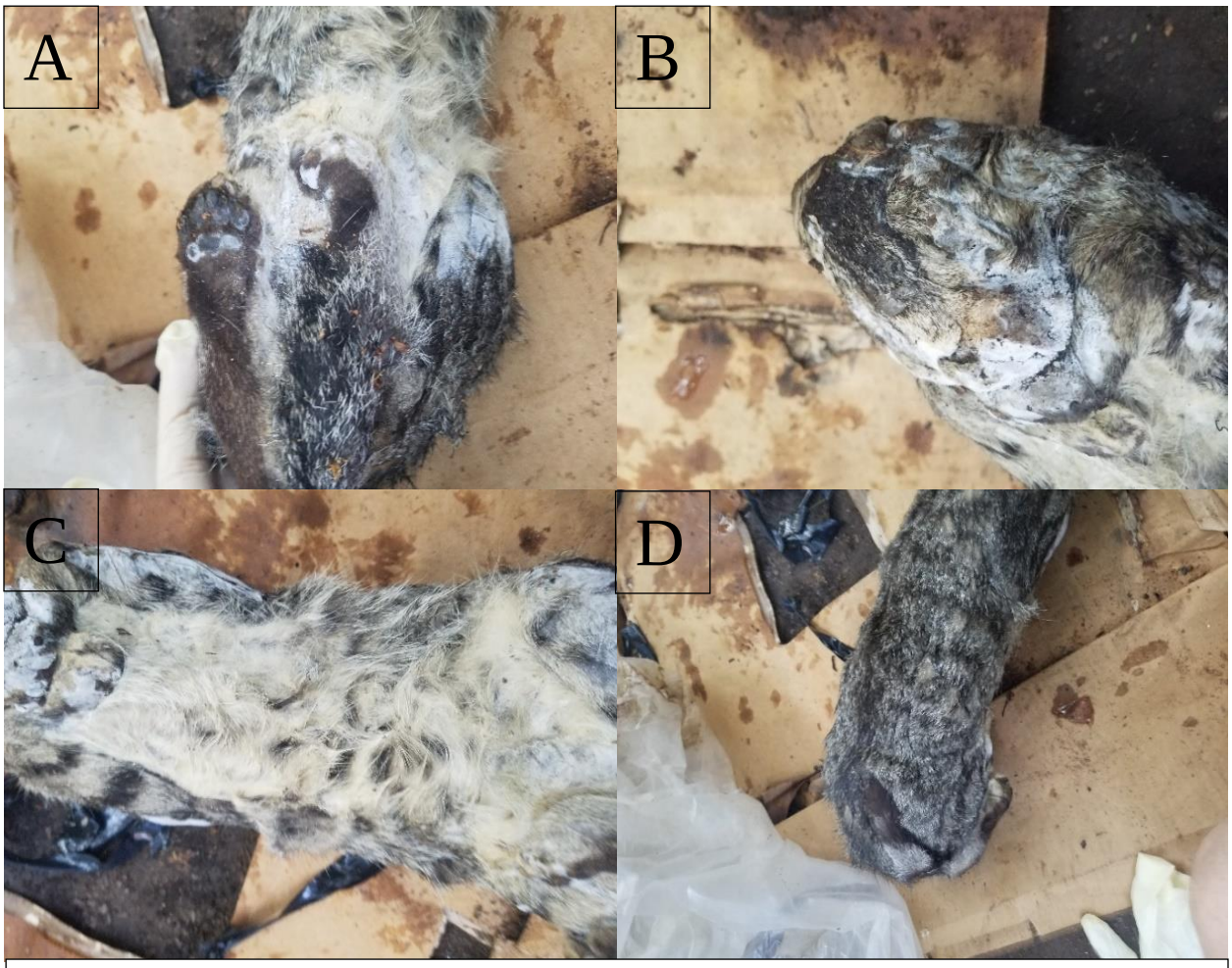

Figure 3: Photographs of the alleged leopard specimen including: The relative paw structure and size (A), documentation of the head (B), the white underside with black spots (C), and the gray, striped coat with leg stripes (D).

Each night I also conducted *ad hoc* night surveys for an hour at between the hours of 7:00 PM and 1:00 AM. During these surveys, I searched for the leopard in various regions of the park. I listened for the distinctive sawing growls leopards typically vocalize, in addition to excessively rustling leaves. I observed open spaces for movement and searched trees and tree canopies for carcasses or felines. I recorded no data that supported the presence of the *P. pardus adersi*. However, on several occasions I found felids, such as genets or civets.

Anthropological Results

Several results were surmised from conducted interviews, such as the discovery of two variants of "leopards," updated documentation of local leopard sightings, and a better understanding of how different groups of people perceive the current status of the Zanzibar leopard.

Some of the most vital evidence collected from the interviews was the discovery of two different variants of the Zanzibar leopard: Kisutu and Konge. Interviewees described the Kisutu variant as a felid with a yellow coat and reddish or black spots. The Kisutu variant is notably larger than the Konge variant. The Konge variant has a gray coat with black spots and stripes on the legs. Their heads are rounder and bigger than the rest of their body and have vertical stripes down the eyes. Both leopard variants have been sighted in the villages that surround Jozani-Chwaka Bay National Park; however, the Kisutu variant has not been seen within the last 20 years.

Through interviews, three specific events that occurred in the last three years were discovered: a juvenile Konge leopard that was killed on the road from Jozani to Pete, an alleged half-consumed unspecified species of antelope carcass recovered on Wangwani trail, and the consumption of an unspecified species of monkey on exhibition at the National Park.

The first event involved a deceased juvenile leopard recovered on the road between Jozani and Pete in 2019. The leopard was 0.75m long and was described as a Konge variant. Upon its discovery, the carcass was reportedly taken to the hospital and then delivered to Jozani-Chwaka Bay National Park for further study. It is evident that the "leopard" preserved by the national park is the same leopard that was recovered during this event.

The second event involved a study conducted by the national park. The national park conducted a survey with transects of game cameras 6km down the Wangwani Trail in 2018. Allegedly, a half-consumed antelope carcass fell out of one of the trees and triggered a game camera along the transect. The national park failed to provide me with the video recording of the incident. Some of the villagers, in addition to the staff at Jozani, had knowledge of this incident. One higher ranking park administrator completely concealed the event and claimed that I misunderstood what was told to me by the rangers and villagers.

The third event involved a monkey on display for guests at the national park in 2017. The monkey was reportedly in a cage near the reception for guests to view. The next day, the cage was allegedly open and the monkey had been half consumed. Some rangers believed that this was evidence of the Zanzibar leopard because there are no other natural animals in Jozani Forest that could kill a monkey in this manner. Other rangers discredited this event as a dog attack or some alternative carnivore.

While these events were reported most frequently in interviews during the study period, there also were some isolated leopard sightings that were reported in interviews. Notable events in this category included an *mganga* who sighted a leopard in 2016. The leopard reportedly sat in an intermediate portion of the tree, no more than 3 m from the ground, and watched the *mganga* gather medicinal plants briefly before it ran away. This leopard was spotted on the road within Jozani-Chwaka Bay National Park. Other events within the last ten years also were reported. However, there were not enough specific details provided to further investigate claims.

I interviewed several respondents in the national park about the ‘Extinct or Alive?’ Animal Planet crew’s alleged video footage of the Zanzibar leopard from 2018. Park officials were relatively dismissive towards the topic and either claimed that the tape was faked or that

they had not heard of the footage before my mention of it. Some of the park officials told me that a specialist determined the tape was illegitimate, but failed to provide a name of the specialist, report about the analysis of the tape, or any sort of data that proved the legitimacy or illegitimacy of the tape.

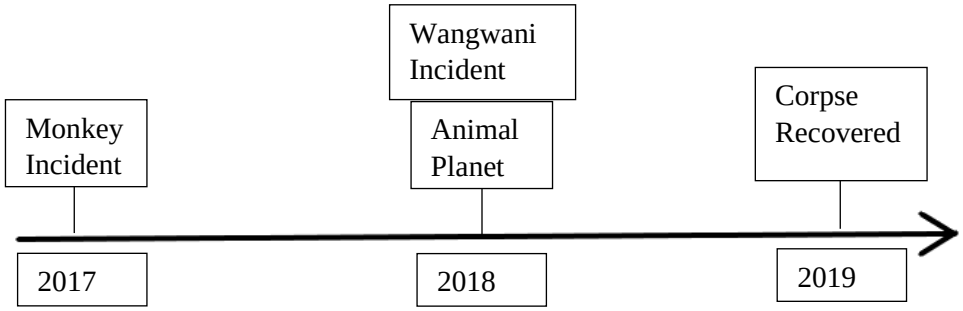

Figure 4: Summary of notable reported leopard-related disturbances in and around Jozani-Chwaka Bay National Park

To better organize and compile the relevant leopard related events, Figure 4 summarizes when each event occurred to provide better context for each of the four events.

Overall, there was no major attitude Zanzibaris had towards the Zanzibar leopard. The data does not support any trends in attitude among age groups, nor any majority thought or emotion expressed toward the leopard (Figure 5). Many of the respondents felt combinations of emotions, such as fear, excitement, surprise, and/or happiness.

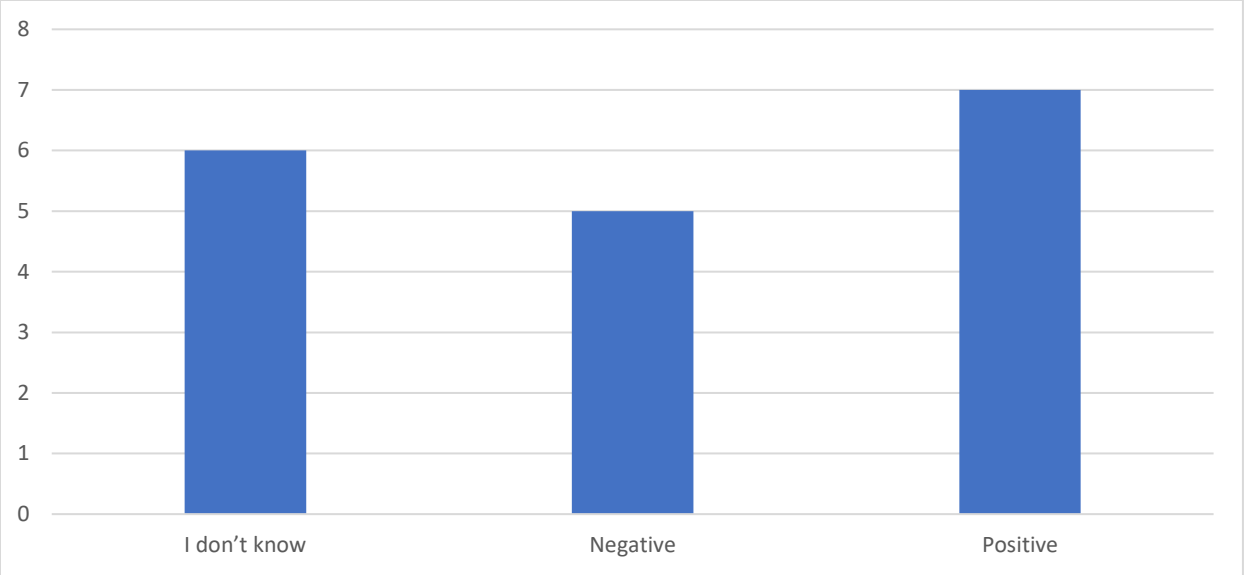

Figure 5: There is no general attitude Zanzibaris have towards the Zanzibar leopard.

Discussion

The discussion section is written in three different parts to better focus on the biological insights, anthropological insights, and unified evidence and interpretation that comprise a socio-ecological narrative.

Biological

The game cameras failed to capture any evidence of the persistence of *Panthera pardus adersi*. As a result, the lack of supportive biological evidence contributes to the idea that the leopard is extinct. The game cameras also failed to capture other wildlife that is known to Jozani-Chwaka Bay National Park, such as Red Colobus Monkeys (*Piliocolobus kirkii*) and Bush Pigs. So, the results of the game camera should not be weighted heavily in the study due to their failure to capture much more common animals than the leopard.

The game cameras did successfully record two Servaline genets over the course of the study. The Servaline genet is yellow with brownish-black spots and appears as a smaller form of a traditional leopard. The Servaline genet, despite its resemblance to a leopard, bears no close evolutionary history to the Zanzibar leopard and simply shares some phenotypic features (Figure 2). The genet was recorded at 8:40 am, which is an unusual time to observe the elusive nocturnal carnivore.

The Servaline genet is relatively rare to see and could be easily confused with a leopard for someone without experience in mammal identification. Additionally, one of the words for Servaline genets in Kiswahili is “uchui” which means “false leopard” and is derived from the word for leopard: “chui.” As a result, some connection between the Zanzibar leopard and the servaline genet has already been made linguistically, which could potentially explain some of the leopard sightings as Servaline genet sightings.

The recovered “leopard” carcass was morphologically distinct from any variant of the *Panthera pardus*. The coloration was grey and striped, unlike the traditional leopard pelt of yellow with brown-red rosettes (Kingdon, 1997; Walsh, 2008). Additionally, *P. pardus* is much bigger than the presented carcass, which was only 0.75 m in length. The paws were also not enlarged like members of the *Panthera pardus* species and the facial structure was slightly enlarged in comparison to a domestic cat, however, was not as severely enlarged as a leopard.

While the exact species of the specimen is unknown, its features strongly resemble what the local community describes as a Konge leopard. The specimen included some of the Konge leopard hallmark features such as a grey coat, smaller size, vertical stripes down the eyes, and black spots against a white coat (at least on the underside). Even though the specimen is clearly not biologically a leopard, the local community accepts this specimen as evidence of a Konge

leopard *in lieu* of a Kisutu leopard (which would align much closer with the biological Zanzibar leopard).

After further data collection from interviews in the local community and the national park it became clear that this specimen was the reported leopard that was found on the road between Jozani and Pete. This detail is particularly important because the communities that surround Jozani-Chwaka Bay National Park accept the specimen as the most recent evidence of the persistence of the Zanzibar leopard and is well-documented. As a result, the recovered corpse provides insight on what qualifies as a leopard sighting, which possibly explains some of the reported leopard-related disturbances in the immediate communities around Jozani Forest.

Despite community assertions, the recovered carcass is not evidence of the biological persistence of *P. pardus ardersi*. The morphological features of the recovered carcass do not closely resemble the Zanzibar leopard in terms of coat color, rosette pattern, bone structure, facial structure, or any other distinguishing features of the Zanzibar leopard. The carcass was also much too small to be any large adult cat. Due to these reasons, the preserved corpse does not show any connection to *P. pardus adersi*.

Due to the inability to document any supportive primary evidence of the existence of the Zanzibar leopard as well as the inability to collect any secondary evidence of the biological existence of the Zanzibar leopard, the biological portion of the study rejects the hypothesis that the Zanzibar leopard persists in Jozani-Chwaka Bay National Park. The findings also help to explain some of the recent leopard sightings reported by Zanzibaris in the area. The recovered corpse was accepted by most people who knew about it to be the actual Zanzibar leopard. Due to the misidentification of the recovered organism as the Zanzibar leopard, it decreases the

likelihood of credible *P. pardus adersi* sightings. As a result, the combination of these data reject the idea that the Zanzibar leopard is still present in Jozani-Chwaka Bay National Park.

Anthropological

Throughout conducted interviews, there were many reported leopard disturbances. These ranged from the interviewee who heard about a community member who saw the leopard weeks earlier to claims of antelope carcasses found in trees. To distill the information and gain better insight on the leopard narrative, I will focus on the four events that were reported several times from different interviewees: The monkey incident in 2017, the Wangwani incident, as well as the Animal Planet sighting in 2018, and the recovered leopard corpse in 2019. All interviewees have been assigned pseudonyms to preserve their anonymity in relation to this study.

The Monkey Incident

The monkey incident involved a caged monkey on display near the reception area for guests. As Said Ali lamented, overnight, the cage was opened, and the monkey was killed with half "of the skin and musculature eaten" and only bones in the consumed areas (10/11/2019). During my investigation, it became apparent that nobody had seen the leopard in this incident and the Jozani rangers assumed that a leopard was the only animal able to open a cage and consume half of a monkey.

Another detail I learned from my night surveys is that there were always two night watchmen on guard at the restaurant near the reception area of the park. If a monkey had been attacked and eaten, it would have been very noisy. As a result, the watchmen should have heard the attack. When I asked park administrators who the night watchmen were the night of the monkey's death, nobody could provide me with an answer. There was no official report of the

monkey's death or any investigation into night watchmen input from that night near the reception area at the park.

Some rangers believe the attack resembled some other nocturnal carnivore upon the recommendation of external researchers, such as domesticated dogs or a large cat. While these are perfectly acceptable theories, it is still difficult to ascertain how the cage was opened in the reported attack. The specific model of the cage was not provided upon my interviews so the size and quality of the cage and locks are unknown; however; it is doubtful the average domesticated dog or cat would be able to open a cage even if a food source was trapped inside of the cage.

A last detail involves the description of the monkey corpse. Said Ali stated that the monkey was killed in "only a way a leopard could kill," in reference to the half-consumed carcass of the monkey (10/11/2019). Generally, leopards pounce prey and snap the neck of the prey to avoid potential injury ("Facts About Leopards | Kruger National Park Wildlife," n.d.). The reported damage to the monkey included damage to the chest and leg areas; however; no interviewee reported any damage to the neck or head of the prey. Leopards may hunt differently in a controlled environment, but the leopard would have likely still snapped the monkey's neck to prevent any damage the monkey could have caused to the potential leopard.

Due to the overall lack of detail in accounts of the incident, as well as a failure to provide any reports or evidence of discussions with the night watchmen, more information is needed on the monkey incident before it can be determined if a leopard was involved or not. The reported event, as of now, neither supports nor refutes the Zanzibar leopard's persistence due to a lack of supportive primary and secondary evidence related to this incident.

The Wangwani Incident

During the interview process, it became apparent that Wangwani featured many of the leopard sightings in the community. Wangwani is an area of the national park that is about 7 km from the park entrance. The section is removed from the rest of the national park and park visitors. Many community members report leopard related disturbances in this area deep inside the park. Among these incidents is the event I dub the "Wangwani Incident."

In interviews with park officials, I learned of a project to document park wildlife that occurred in 2018. The study included a transect of a dozen game cameras 6km into the Wangwani area of the park. Muhammad Ali, a park administrator, described how a game camera captured an "antelope carcass fallout of a tree," (15/11/2019).Park administrators and rangers claimed that this was evidence of the persistence of a Zanzibar leopard population because of the inability for any other endemic animal to drag carcasses up trees, especially bigger animals, like small antelopes.

While this secondary evidence is certainly supportive of the existence of the Zanzibar leopard, the legitimacy of the incident should be questioned. When I asked to see the footage, the park administration failed to provide a report of the incident or any of the alleged video footage. As a result, this secondary evidence cannot be accepted without more concrete information about the event. I asked other park officials about the incident and one of them had not heard of the event entirely. He claimed that I must have misheard the other officials tell me about how the Red Colobus monkeys live in the trees. Despite this bizarre explanation, other officials and villagers were aware of the Wangwani incident.

Similar to the monkey incident, it is difficult to make any reasonable claim about the status of the Zanzibar leopard without any concrete presented evidence. While something unusual most likely did occur (based on the number of respondents who knew of it) in the Wangwani area, the validity of its relationship to the Zanzibar leopard is unknown without the proper evidence. There are several explanations to the incident based on the information that has been presented.

The first explanation is that the Wangwani event actually is secondary evidence of the Zanzibar leopard. Only leopards are known to store large carcasses in trees and no other animal on the island would be able to drag a carcass the size of an antelope up a tree. If the carcass actually was an antelope carcass and it was naturally found in the tree, then the only organism endemic to Unguja capable of this would be the Zanzibar leopard.

The second explanation is that the carcass was placed in the tree by a human. There are many self-proclaimed leopard hunters in the area and one of the primary ways to attract a leopard involves the placement of bait in the canopy of trees ("Hunt in Africa," n.d.). Through my interviews with the local community, one community member named Achmed Muhammad suggested "hanging carcasses in trees" to attract the Zanzibar leopard (15/11/2019). The same respondent reportedly heard about the Wangwani incident, so it is possible that another community member wanted to attract the leopard, baited the tree, and the bait fell from the tree and triggered the cameras.

The last explanation is that debris fell out of the tree and was mistaken for an antelope carcass. Park officials did not clarify exactly what happened to the carcass after it triggered the cameras along the transect. It is unknown if another animal took the carcass, if the carcass was never found again, or if the carcass was documented by the park. As a result, it is possible that

something else fell out of the tree to trigger the transect cameras. This could include anything from smaller animals (monkeys, genets, civets, or bush babies) to even just loose canopy or dead branches.

While it is unknown if the Wangwani event is acceptable secondary evidence of the persistence of the Zanzibar leopard, or if the event even happened, the event captures the fragmented beliefs and miscommunications that occur throughout the park. Each park administrator provided different insights into this specific event, from long descriptions of the study and what happened to denial of its existence. Regardless of whether a carcass fell out of a tree on the Wangwani trail, the event helps capture the interactions between leopard-related disturbances and community members, adding to the uncertainty of the case. Whether the uncertainty or mystery is created on purpose or simply by miscommunication is debatable; however, the Wangwani incident captures the complexities of interviews about specific leopard disturbances due to the various beliefs and backgrounds of each stakeholder group and/or individual respondent.

Animal Planet Sighting

Among the reported leopard related incidents, the only event that has documented evidence of *Panthera pardus* or potentially *P. pardus adersi* was the Animal Planet crew with the show 'Extinct or Alive.' The crew allegedly set up game cameras 7-9km from the park entrance in the Wangwani area. The cameras were baited with sardines, poultry, and other meat products. A game camera, the one near the sardines, reportedly documented a live Zanzibar leopard. This is the strongest evidence of the persistence of the Zanzibar leopard in the last decade. As a result, I tried to interview respondents about the footage and attempted to get study site information from park officials and past researchers.

The interviews about the footage were surprisingly barren. Many park employees had either never heard of the footage before or thought that the tape was simply faked. In an interview I had with Muhamad Ali, one of the more prominent park administrators, the tape was treated as the least important evidence of the Zanzibar leopard. On the other hand, the Wangwani incident and the monkey incident were viewed as pivotal evidence of the Zanzibar leopard's persistence. In addition to this, I could not receive any clear answers as to where the footage was taken. I reached out to researchers potentially involved with the camera crew but did not get access to the coordinates of the study site.

The footage had surprisingly little impact on the national park. One reason could be that the program reportedly aired footage without permission. As a result, it would be much more difficult for park officials to even be aware of the tape since "Animal Planet" is based in America. The tape would be relatively removed from national park staff and Jozani-Chwaka Bay National Park as a whole, which could explain the lack of connection and the fact that the staff feel less convinced by the tape in comparison to the events the rangers were much more involved in, like the Wangwani incident. Regardless, if the footage of the Zanzibar leopard was legitimate, then this would be the most pivotal piece of evidence in support of the leopard's existence, even if the park staff claims it as illegitimate or unimportant to the overall case.

Recovered Leopard Corpse

The retrieved leopard carcass is an integral part of the study because it represents a leopard sighting that is very well documented. The alleged leopard carcass was known by many respondents at all levels in the study. As a result, this piece of evidence is a uniting force in the study because nearly everyone who knew about the corpse accepted the corpse as primary evidence supportive of the persistence of the Zanzibar leopard.

The story of the recovered corpse began nearly a month before I started the study. On a previous trip to Jozani-Chwaka Bay National Park, a park ranger approached me and three other students and noted that they had evidence of the Zanzibar leopard: namely a juvenile leopard that was found dead on the road. Upon asking other rangers the same day, we heard a multitude different stories including: the leopard carcass was actually in Kenya for DNA analysis, the leopard was associated with witchcraft and was a Wachoui's, and the leopard was currently stored in the national park for preservation. The carcass was actually in the national park at the time. After some friendly discussion about the specimen, the staff allowed us to view the carcass. After the rangers showed us the carcass, we were asked if we could run DNA tests on the sample or if we knew anybody who could. We declined and the corpse was never spoken about with us again.

This background is important because it shows that the park staff is willing to show guests, or students, the carcass because they are so certain the specimen resembles the Zanzibar leopard. Additionally, it shows that the park staff believes that the specimen is primary evidence of the leopard and wanted to conduct DNA tests on the specimen to prove its identity as a leopard. This discussion was just one of many bizarre interactions related to the leopard carcass, but was the most important because it served as the background context for this study.

Throughout the interview period, it became apparent that many villagers were aware of the recovered leopard corpse and accepted it as evidence of the Zanzibar leopard. When I asked respondents about recent leopard disturbances, the leopard carcass was the most common evidence of a leopard-related disturbance. Despite this, most of the respondents had just heard of the leopard corpse but did not actually see it. This documents how quickly stories—whether they

are true or not—can spread in a rural setting and facilitate the persistence of myths and legends, such as the story of the Zanzibar leopard.

Among the interviews conducted, I met a person named Achmed Muhammad who was present when the alleged leopard corpse was found. He said that the corpse was "taken to the hospital" and then released into custody of the national park (15/11/2019). The respondent was confident that "it was a real leopard" and claimed that the "face was big like a cat, with a big tail, and had black lines down the eyes," (15/11/2019). He described the leopard specimen as about 2 feet long; however, there was not a good concept of feet or inches in the local community, so I will not focus on the specific measurements.

Other villagers and park staff responded similarly to the recovered corpse, and some claimed it was decisive evidence of the persistence of the Zanzibar leopard. Interviewees in the local communities would continually refer to the corpse when asked about recent sightings or disturbances in the last ten years. By the end of my interview sessions, I had enough information to ask clarifying questions about the corpse (and other leopard sightings) to try to determine if community members were aware that the leopard recovered did not resemble a traditional leopard. Most respondents knew that the leopard was of the "Konge" variety, but nonetheless accepted the leopard as evidence of the leopard population. This is evidence of the potential shift of the leopard narrative from one organism to another in the wake of the extinction of *P. pardus adersi*, which requires deeper analysis of the interactions between biological and anthropological data.

Socio-ecological Impact

The recovered leopard corpse was the key to understanding the socio-ecological leopard narrative. The corpse added several important points to the study. First, it showed how quickly the leopard narrative could travel, as well as how information could become distorted. The corpse clearly did not resemble a leopard, and few people have seen the corpse, yet many villagers across several villages were not only aware of the carcass but accepted it as evidence of the persistence of the Zanzibar leopard. Secondly, the carcass led to the discovery of two variants of leopard: Kisutu and Konge. The Kisutu leopard appears to resemble *P. pardus adersi* while the Konge leopard appears to be some form of domestic cat. This discovery was vital because it shows how the leopard narrative has adapted to persist, despite the actual Zanzibar leopard being considered biologically extinct. The persistence of *P. pardus adersi* does not matter in this narrative because the *message* of the leopard is meaningful, not the actual organism. The leopard is a community symbol that is critically valued by the local community. As a result, it appears that a new organism has been introduced and accepted as a leopard by the local communities to continue the tradition of the story about Zanzibar leopards. Thirdly, the carcass represents a highly documented leopard sighting. This is important to gain insight on how leopard sightings are reported, treated, and documented. Since all of the primary evidence of the sighting has been retained, there are minimal distortions in the reported sighting and the description of the sighting. Even though the corpse is not *P. pardusadersi*, the community values the unknown organism as much as the actual leopard and, more importantly, the persistence of the narrative that is attached to the organism. The biological logistics no longer matter to the community;to them this is the Zanzibar leopard.

Regardless of the biological or anthropological evidence, the Zanzibar leopard always caused some sort of emotional response in interviewees. The emotional responses varied from fear, excitement, humor, weariness, and other similar responses. There is a general ambiguity around the Zanzibar leopard. Each interviewee expressed their slightly different attitude towards the leopard in terms of responses and body language in their interviews about the leopard. Even when a response to the leopard was positive or negative, there was usually a stipulation that challenged the emotion. For example, Said Hassan reported that he would be "surprised and scared" if he saw a Zanzibar leopard, but would also consider it to be "an amazing experience," (11/11/2019). Other respondents, such as Badru Ali, had a sense of humor about the topic and said he would "tell me first" if he ever saw a Zanzibar leopard (16/11/2019). Most of the interviewees were in this category of ambivalence towards the leopard.

One reason for the ambivalence towards the Zanzibar leopard could be its symbolism. The leopard has historically been used as a means of social control by *wachoui*(Walsh & Goldman, 2012). During the government's campaign to eradicate the leopard from Unguja Island, the power of social control was taken from local communities and consolidated in the central government. As a result, to feel strongly one way or the other about the leopard is associated with feeling strongly about power dynamics in the community. This was evident in a few of my interviews. For example, Badru Ali claimed he had seen a leopard but did not want to tell me when or where out of fear of persecution from the government. To reinforce this, Salma Said, the Sheh'ah of one of the villages near Jozani Forest, reported that she believed that "the leopards are all extinct." She also said that it "would be hard to prove" even if she saw a leopard (12/11/2019). As a government representative, it would make sense for Salma to say that the

leopard is extinct because she would not want to take a position that challenges the position of the Zanzibar Government.

The uneasy relationship between the local community and the government of Zanzibar expressed via the leopard is hardly a new concept. Over the past 60 years, i.e. after the leopard eradication campaign, the leopard persisted as a symbol through political tensions and has become a representative symbol of government-community tensions (M. Walsh & Goldman, 2012). In the present day, there are still many similar tensions to which the leopard symbol is connected.

Throughout my interviews, the issue of conservation came up several different times. Ali Ali discussed the dynamics between how population growth decreased natural resources in the forest, which destroyed the habitat for the leopard and ultimately leopard populations. In addition, Said Ali claimed that the biggest factor that lead to the extinction of the Zanzibar leopard was the "failure of the local community to conserve" resources (10/11/2019). The issue of conservation has been at the forefront of many of these local communities, especially after the establishment of Jozani-Chwaka National Park in 2004. Subsequent to the establishment of the park, Red Colobus monkey populations began to rebound, which led to an increase in monkey crop destruction for local farmers. In addition to this, conservation has limited what materials local communities can use and where the materials can be collected in relation the park boundaries. Naturally, these conservation practices led to the increase of tensions between the local communities who rely on these resources for survival and the government who created these ordinances.

Closely related to conservation in Zanzibar is tourism. Tourism is the most important economic sector on Unguja Island. After establishing Jozani-Chwaka Bay National Park, tourism

to the park was highly encouraged by the government and many infrastructure improvements were established to better accommodate larger numbers of foreign tourists. The result of this was significant westernization. Local community members began to have increased contact with westerners and western concepts. Among these concepts was conservation. One of the most critically important concepts in western countries, especially ones without an indigenous population that relies on the land, is conservation of sites as "nature". Interviews with the Jozani staff reflected their understanding of the importance of conservation, especially in the context of large mammals, such as the Zanzibar leopard. Rangers also have increased contact with westerners; however, so it is difficult to discern if these views of conservation reflect the views of the community or if the rangers discussed conservation to better appeal to my western bias. Nonetheless, the accommodations for westerners in the Jozani Forest area, as well as the local economy beginning to shift to cater to tourists, has impacted local communities and increased tensions between the local community and government.

One reason the Zanzibar leopard has been so closely tied to the narrative of conservation could be the product of tensions between the community and the government. In these communities, wealth and power is ultimately derived from the land, however, the government has now seized the land for protection. A villager might view this as the government's attempt to consolidate local power through conservation, which reduces the ability for villagers to sustain themselves and retain local autonomy. This is strikingly similar to the Zanzibar leopard narrative of the government's eradication of other forms of community power to centralize power in the government in the 1960's and since then. As a result, the Zanzibar leopard's ties to the narrative of conservation could reinforce the symbol of the leopard as an object of power. The failure of

communities to conserve the leopard could be a metaphor for the inability of the villages to retain power against the government.

Another reason the Zanzibar leopard might be tied to conservation involves the hybridization of westernization with the original leopard narrative. As communities have increased contact with westerners, they are more likely to accept certain foreign values and integrate them into their own culture. Between this extensive interface, as well as government efforts to westernize aspects of Zanzibar, the leopard narrative may have evolved to include ideas of conservation in the narrative. Cultures are incredibly dynamic and traditions are fluid. As a result, a shift in the leopard narrative could indicate a shift in cultural practices in the local community, whether these shifts are simply the blending of cultures, or rejection of old traditions for new ones. The leopard narrative and its interactions with conservation could be a product of this cultural dynamism.

Regardless of the rationale, the consideration of biological data and sociological data has led to several outcomes in this study. First, the leopard narrative is intentionally preserved. The community values the story of the Zanzibar leopard, even if the subspecies is extinct. This could explain the shift towards other organisms being considered leopards, as well as explain the preserved leopard carcass acceptance as a leopard sighting. Secondly, the narrative still revolves around power. Regardless of the tensions present or power dynamics in the community, the leopard represents these struggles. Lastly, the leopard and its sightings represent cultural shifts towards westernization. Issues developed nations care about are often blended into the cultures of the developing world in attempts to become “more developed”. The leopard embodies this struggle as well, whether it describes the issue of conservation, scientific epistemologies, or any other western issue. The Zanzibar leopard is representative of these epistemological clashes and

cultural blendings. In summary, the leopard is a very powerful symbol in Zanzibar that embodies tensions and enables the negotiation of ideas in a changing world.

Conclusion

Throughout the study project, the narrative of the Zanzibar leopard began to unfold. The outcomes of the study resonate at the intersection of biological and sociological data and the changing epistemology of Zanzibaris in a changing world. The case seems to be yet another narrative that highlights the dynamism of power and the importance of the continual discussion of how power shifts among stakeholders over time. There is no specific emotion or meaning assigned to the leopard, which gives the symbol great versatility and persistence, even after the original organism has been declared extinct.

The study challenged the viability of conservation in some contexts. While the government wants to preserve natural resources for its interests and to protect environments for ecotourism, some of the national policies impose on communities that rely on protected natural resources. This results in tensions between those in the community and policy makers or government authorities

Ultimately, the study challenged the leopard sightings and assertions of the persistence of the Zanzibar leopard. Due to a lack of primary biological evidence that supports the persistence of the Zanzibar leopard, the evidence indicates that the Zanzibar leopard is very likely extinct. The greater result of the study, however, uncovered that the extinction of this organism is not the most important component to the narrative, but that the mechanisms in which community members keep the narrative alive reinforces the struggles for power on Unguja Island.

There were many confounding factors in this study. Among them, is the issue of translation. I used a translator to communicate specific abstract information with interviewees. This proved to be much more difficult than expected because sometimes the questions would not translate properly and clarifying questions would have to be asked to restore meaning to the question. Additionally, there were several times I found my translator sometimes paraphrased important or detailed information. I would frequently remind him of the importance of collection of as much information as possible. There was also great anxiety about the leopard and if my translator felt unprofessional, he would joke around with villagers about the leopard prior to interviews, which certainly impacted how interviewees perceived my study and shaped their answers.

An unexpected challenge to the study was the relative absence of women in traditional rural societies. The cultural role of women in rural villages revolves more around domestic jobs like cooking and caring for children and the house. As a result, I tried my hardest to interview as many women as I could to better represent the sexes in the study; however, it was challenging to achieve this in a very male-dominated local community where the voices best captured are almost always male.

Another confounding factor was the inability to get quality batteries for the game cameras. The batteries obtained on Unguja Island were not powerful enough to run the game cameras properly. As a result, the only consistently operational camera in the study was Camera A because I used batteries I purchased in America to power it. To get around this challenge, Cameras B and C were set to picture mode instead of video, but the cameras ultimately suffered battery related issues.

The last confounding factor was simply time. I collected data in the field for only three weeks. If the study had more time to operate successfully, then better game camera data could have been collected, more villagers could have been interviewed, and more people from various other stakeholder groups could have be interviewed. As a result, more time would have led to more usable data in the study.

Studies conducted subsequently should be aware of all of these specific factors prior to conducting similar studies. Additionally, future studies should further investigate the attitudes of each stakeholder group towards the leopard. Through this, a more complete narrative of the power dynamics associated with the leopard symbol could be understood. Additionally, specific attitudes of stakeholders could be further analyzed to better understand each component to the leopard narrative.

Recommendations

Further investigations should be devoted to understanding power conflicts in Zanzibar. There are clearly a lot of tensions at different scales, as in any large community. The only way to better understand the Zanzibar leopard is to further understand how power in Zanzibar is acquired, affects other communities, and how different stakeholders respond to shifts in power. By understanding these aspects, leopard sightings and popularity can be juxtaposed to these power shifts to better understand how the symbol interacts with current events in Zanzibar.

Additionally, further studies should focus on the role of new organisms being considered leopards and what criteria certain organisms need to be considered a “leopard” for certain stakeholders. In this study, the Konge variant of leopard was primarily investigated, but there could be other organisms being considered leopards. By understanding how leopard sightings are

characterized, the biological evidence for these “leopards” can be better interpreted and understood in relation to other “leopards”, past or present. For example, does the leopard have to be a felid or could a canid pass as a leopard in some communities? The further distortions to the biological aspects of the narrative are not only interesting but provide insight into how the definition of speciation shifts over time for local communities, in addition to how organism classifications are influenced under non-scientific epistemologies.

Future studies should conduct more comprehensive investigations into the biological aspects of the project. A better game camera survey of the park can provide several insights. Among these investigations, include the search for potential evidence that supports the existence of *P. pardus adersi.* Despite the lack of evidence that supports the persistence of the organism, there is still enough evidence to potentially support the existence of the original leopard and/or its variants. Additionally, further research into the camera traps could provide insight into other organisms that get mixed-up with the Zanzibar leopard. The result of this addition would be a better understanding on what role these other organisms play in the forest system, as well as their behavior which could help facilitate the addition of these organisms into the narrative.

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Appendix A

Below is a table of demographic information for each interviewee.

Name	ID	Age	Sex	Job	Stakeholder
Muhammad Ali	J1	40-65	M	Jozani Administration	Jozani
Achmed Haji	J2	20-40	M	Jozani Ranger	Jozani
Said Ali	J3	20-40	M	Jozani Ranger	Jozani
Majid Ali	J4	40-65	M	Jozani Ranger	Jozani
Said Hassan	J5	20-40	M	Jozani Ranger	Jozani
Haji Muhammad	V1	40-65	M	Farmer	Villger
Salma Said	S1	40-65	F	Sheh'ah	Government
Ali Ali	W1	40-65	M	Mganga	Villager
Ali Salim	V2	40-65	M	Grocer	Villager
Zura Salim	V3	20-40	F	NA	Villager
Said Muhammad	V4	65+	M	NA	Villager
Khadija Muhammad	V5	40-65	F	NA	Villager
Isa Omar	V6	20-40	M	NA	Villager
Achmed Muhmmad	V8	20-40	M	NA	Villager
Shara Omar	V7	20-40	F	NA	Villager
Ali Omar	V9	65+	M	Retired Ranger	Villager
Badru Ali	W2	40-65	M	Mganga	Villager
Zura Ali	J6	20-40	F	Ranger	Jozani
Haji Khamis	V10	40-65	M	NA	Villager
Haji Ali	V11	65+	M	NA	Villager
Said Omar	V12	65+	M	NA	Villager