Dietary Composition and Feeding Preference of Mantled guereza *Colobus guereza* (Rüppell, 1835), in Maze National Park, Ethiopia (#99661)

Second revision

Guidance from your Editor

Please submit by **24 Jan 2025** for the benefit of the authors .

Structure and Criteria
Please read the 'Structure and Criteria' page for guidance.

Custom checks
Make sure you include the custom checks shown below, in your review.

Raw data check
Review the raw data.

Image check
Check that figures and images have not been inappropriately manipulated.

If this article is published your review will be made public. You can choose whether to sign your review. If uploading a PDF please remove any identifiable information (if you want to remain anonymous).

Files

Download and review all files from the materials page.

1 Tracked changes manuscript(s)
1 Rebuttal letter(s)
1 Figure file(s)
5 Table file(s)
7 Raw data file(s)

Custom checks

Field study

- Have you checked the authors field study permits?
- Are the field study permits appropriate?

Structure and Criteria

Structure your review

The review form is divided into 5 sections. Please consider these when composing your review:

1. **BASIC REPORTING**
2. **EXPERIMENTAL DESIGN**
3. **VALIDITY OF THE FINDINGS**
4. General comments
5. Confidential notes to the editor

You can also annotate this PDF and upload it as part of your review

When ready submit online.

Editorial Criteria

Use these criteria points to structure your review. The full detailed editorial criteria is on your guidance page.

BASIC REPORTING

- Clear, unambiguous, professional English language used throughout.
- Intro & background to show context. Literature well referenced & relevant.
- Structure conforms to PeerJ standards, discipline norm, or improved for clarity.
- Figures are relevant, high quality, well labelled & described.
- Raw data supplied (see PeerJ policy).

EXPERIMENTAL DESIGN

- Original primary research within Scope of the journal.
- Research question well defined, relevant & meaningful. It is stated how the research fills an identified knowledge gap.
- Rigorous investigation performed to a high technical & ethical standard.
- Methods described with sufficient detail & information to replicate.

VALIDITY OF THE FINDINGS

- **Impact and novelty is not assessed.** Meaningful replication encouraged where rationale & benefit to literature is clearly stated.
- All underlying data have been provided; they are robust, statistically sound, & controlled.
- Conclusions are well stated, linked to original research question & limited to supporting results.

Standout reviewing tips

The best reviewers use these techniques

Tip	*Example*
Support criticisms with evidence from the text or from other sources	*Smith et al (J of Methodology, 2005, V3, pp 123) have shown that the analysis you use in Lines 241-250 is not the most appropriate for this situation. Please explain why you used this method.*
Give specific suggestions on how to improve the manuscript	*Your introduction needs more detail. I suggest that you improve the description at lines 57- 86 to provide more justification for your study (specifically, you should expand upon the knowledge gap being filled).*
Comment on language and grammar issues	*The English language should be improved to ensure that an international audience can clearly understand your text. Some examples where the language could be improved include lines 23, 77, 121, 128 – the current phrasing makes comprehension difficult. I suggest you have a colleague who is proficient in English and familiar with the subject matter review your manuscript, or contact a professional editing service.*
Organize by importance of the issues, and number your points	*1. Your most important issue* *2. The next most important item* *3. …* *4. The least important points*
Please provide constructive criticism, and avoid personal opinions	*I thank you for providing the raw data, however your supplemental files need more descriptive metadata identifiers to be useful to future readers. Although your results are compelling, the data analysis should be improved in the following ways: AA, BB, CC*
Comment on strengths (as well as weaknesses) of the manuscript	*I commend the authors for their extensive data set, compiled over many years of detailed fieldwork. In addition, the manuscript is clearly written in professional, unambiguous language. If there is a weakness, it is in the statistical analysis (as I have noted above) which should be improved upon before Acceptance.*

Dietary Composition and Feeding Preference of Mantled guereza *Colobus guereza* (Rüppell, 1835), in Maze National Park, Ethiopia

Abraham Tolcha Corresp., 1 , **Matewos Masne** 2 , **Belayneh Ayechw** 2

[1] Biodiversity Research and Conservation Center, College of Natural and Computational Sciences, Arba Minch University, Ethiopia. Correspondence Email: tolcha.abraham@yahoo.com Orcid: 0000-0002-4172-5281, Arba Minch, Southern, Ethiopia

[2] Department of Biology, College of Natural and Computational Sciences, Arba Minch University, Ethiopia., Arba Minch, Southern, Ethiopia

Corresponding Author: Abraham Tolcha
Email address: tolcha.abraham@yahoo.com

Knowledge of feeding ecology is essential for effective management of a primate and its habitat. The Mantled guereza *Colobus guereza* is a predominantly folivorous monkey that occurs in different parts of eastern Africa, including the Maze National Park in Ethiopia. Despite many studies conducted in the area, there is no up-to-date data that was carried out on feeding ecology of the *Colobus guereza*. The aim of this study is to determine the dietary composition and feeding preference of the *Colobus guereza* in the park. To better understand this, we randomly selected three study groups along the Maze River. We used instantaneous scan sampling method to collect feeding data from September 2021-August 2022. We followed guerezas from 6:30 to 10:30 in the morning and 13:30 to 17:25 in the afternoon collecting feeding activity data between 5 minute intervals during 10-minute scan duration. Overall, guerezas were observed to eat eight plant species and unidentified invertebrates in the park. Of these, *Trichilia emetica* contributed the highest proportion accounted 53.36% and 27.83% in the wet and dry season respectively, while unidentified invertebrates were rarely utilized over the course of this study. We also found that young leaves were consumed more (n=1794, 75.31%) in the wet while mature leaves were eaten more (n=1215, 43.61%) over the other diet components in the dry season. These results suggest that the *guerezas* in the park exhibit temporal dietary flexibility. The observed dietary flexibility may be partly due to seasonal changes in availability of food plant parts in the groups' home ranges in the park. Our results suggest that maintaining the park is critical to protect food plant species for this primate, which at present constitutes only a few.

Title: Dietary Composition and Feeding Preference of Mantled guereza *Colobus guereza* (Rüppell, 1835), in Maze National Park, Ethiopia

Abraham Tolcha[1*], Matewos Masne[2]and Belayneh Ayechw[2]

[1]Biodiversity Research and Conservation Center, College of Natural and Computational Sciences,Arba Minch University, P.O. Box 21, Arba Minch, Ethiopia.

Correspondence

Email: tolcha.abraham@yahoo.com; Orcid:0000-0002-4172-5281

[2]Department of Biology, College of Natural and Computational Sciences,Arba Minch University, P.O. Box 21, Arba Minch, Ethiopia.

Co-authors' email: matewosmasneamu@gmail.com; belaynehayechw@gmail.com

ABSTRACT

Knowledge of feeding ecology is essential for effective management of a primate and its habitat. The Mantled guereza *Colobus guereza* is a predominantly folivorous monkey that occurs in different parts of eastern Africa, including the Maze National Park in Ethiopia. Despite many studies conducted in the area, there is no up-to-date data that was carried out on feeding ecology of the *Colobus guereza*. The aim of this study is to determine the dietary composition and feeding preference of the *Colobus guereza* in the park. To better understand this, we randomly selected three study groups along the Maze River. We used instantaneous scan sampling method to collect feeding data from September 2021-August 2022. We followed guerezas from 6:30 to 10:30 in the morning and 13:30 to 17:25 in the afternoon collecting feeding activity data between 5 minute intervals during 10-minute scan duration. Overall, guerezas were observed to eat eight plant species and unidentified invertebrates in the park. Of these, *Trichilia emetica* contributed the highest proportion accounted 53.36% and 27.83% in the wet and dry season respectively, while unidentified invertebrates were rarely utilized over the course of this study. We also found that young leaves were consumed more (n=1794, 75.31%) in the wet while mature leaves were eaten more (n=1215, 43.61%) over the other diet components in the dry season. These results suggest that the *guerezas* in the park exhibit temporal dietary flexibility. The observed dietary flexibility may be partly due to seasonal changes in availability of food plant parts in the groups' home ranges in the park. Our results suggest that maintaining the park is critical to protect food plant species for this primate, which at present constitutes only a few.

Keywords/Phrases: *Colobus guereza*, Conservation, Dietary composition, Feeding Preference, Habitat, Matured leaf, Maze river, Season, Young leaf

INTRODUCTION

Habitat change and climate change are significantly limiting species' access to essential food sources (*Terborgh, 2015; Ellsworth, 2017*), and leading to biodiversity loss (*Maestre et al., 2012*). Understanding species' dietary composition and preferences is fundamental for guiding the development of sound conservation practices for a species and its habitat (*Ramesh & Downs, 2013*). Feeding ecology studies can be used to identify crucial food resources and their spatio-temporal availability (*Sengupta et al., 2015*) and to quantify the effects of habitat change, loss and fragmentation on animal populations (*Irwin et al., 2010*).
The ongoing habitat modification due to a variety of anthropogenic pressures *(Estrada et al., 2017; 2020; Estrada & Garber, 2022; Garber, 2022*), and climate change provides a strong premise for studying diet composition and food preference in primate species. For instance, about 65% of primate species are threatened with extinction, and ~75% have declining populations as a result of persistent human pressures on natural environments leading to widespread loss and degradation of tropical forests *(Estrada et al., 2017; Rudran, 2019*). Habitat loss and degradation result in loss or decline of important food plant species for primates (*Estrada et al., 2017; de Paula Mateus et al., 2018*), and this may eventually drive a primate species into extinction. Even those primate species that occupy protected areas like national parks are equally affected by climate change. Climate change could affect availability of primates' food resources through in part by altering phenological patterns of some food plant species (*Pinto et al., 2023*). The effect of climate change provides a strong basis for studying feeding ecology for primate species in protected areas in order to provide baseline feeding data that can be monitored in the future.

Primates feed on a diverse array of plant items and animal tissues to meet their nutritional needs (*Coiner-Collier et al., 2016*). In response to habitat changes, they can develop ecological and behavioural flexibility (*Arroyo-Rodríguez & Fahrig 2014; Mekonnen et al., 2018*). Studies indicate that species exhibit microhabitat preferences, occupying specific forest strata or habitat types (*Campbell et al., 2018; Matsuda et al., 2022*) to exploit various resources that meet their nutritional requirements. The spatial and temporal resource availability is among the factors which can determine the distribution of a primate species (*Mendoza-Soto et al., 2024*). Food availability in animal's diet is influenced by seasonal variations among other environmental factors *(Chouteau, 2006*). Some primate food resources, for instance, young leaves decline in dry season and this may compel folivorous primates to include more barks and mature leaves in their diet (*Arseneau-Robar et al., 2021*). Dietary shifts typically correspond with seasonal resource scarcity (*Yiming, 2006; Hanya & Chapman, 2013)* and probably seasonal changes in chemical composition of food plant species (*Matsuda et al., 2022; Ravhuhali et al., 2022*). Thus, a shift in an individual's diet should reflect the most profitable foods available at a specific time and place, which may also mean the most nutritious, the easiest to find, or the easiest to process (*Lambert & Rothman,2015*).

Primates are among the most endangered mammals, facing significant threats from habitat loss, hunting, and the illegal pet trade (*Cowlishaw et al., 2004; Estrada et al., 2017*). While their general feeding ecology is well understood, it is important to recognize that feeding ecology is highly site-specific and species-specific, influenced by factors such as local vegetation, seasonal resource availability, and competition with other species (*Chapman et al., 2002; Estrada et al., 2017*). To guide ecological restoration efforts and inform sustainable forest management practices, we need site-specific information to ensure the availability of critical food resources for primates (*Ganzhorn et al., 2017*). The *Colobus guereza* is a Least Concern species by IUCN (*de Jong et al., 2019*), and occurs in different parts of equatorial Africa, including Ethiopia. In Ethiopia, the species was reported to be present in the Maze National Park by Dansan & Tekalign (2022). It feeds mainly on leaves (*Harris & Chapman 2007; Matsuda et al., 2020*). The amount of different plant parts eaten vary among groups and seasons (*Harris & Chapman 2007; Ibrahim et al., 2017; Matsuda et al., 2020*). Despite many studies on its feeding ecology on different parts of its geographical range, the species was not studied in the Maze National Park up to present.

The aim of this study was to determine dietary composition, and feeding preferences of *C. guereza* in the park. Here, we hypothesized that seasonal change affects food availability, which in turn determines the dietary composition and feeding preference of the study species. Our findings suggest that season affects the accessibility of diet components and consequently influence feeding preferences of the *C. guereza*. This study is expected to offer an opportunity to create and implement successful habitat conservation strategies to preserve important food resources in the Park.

METHODS AND MATERIALS

Study area

We conducted this study at Maze National Park (MzNP) along the Maze River, a critical habitat for our target species. This park is located in a bio-diverse region of southern Ethiopia, situated between the Gamo and Gofa Zones. It provides a unique and varied landscape that supports a rich array of flora and fauna. The park is situated between 6°18'30" to 6°29'00" N latitude and 37°7'30" to 37°22'30" E longitude, positioning it within a specific ecological and climatic zone of Ethiopia. The elevation ranges from 900 to 1200 meters above sea level, which influences the climate, vegetation, and biodiversity (*Befekadu & Afework, 2006*). The annual rainfall varies between 843 mm and 1321 mm, which reflect variability in precipitation. The Maze area's climate exhibits a distinct seasonal pattern characterized by a rainy season from March to October and a dry season from November to February. The lowest temperature during the rainy season is 15.3°C in June, suggesting relatively mild temperatures, which may be beneficial for plant growth and biodiversity during this time, and the highest temperature during the dry season is 33.5°C in February (Mamo, 2012), indicating hotter conditions that could lead to water stress for plants and increased evaporation rates.

The park is home to a remarkable variety of mammalian fauna (e.g. orbi *Ourebi aourebi*, bohor red buck *Redunca redunca*, buffalo *Syncerus caffer*, warthog *Phacochoerusafricanus*, bush buck *Tragelaphus scriptus*, greater kudu (*Tragelaphus strepsiceros*), lesser kudu (*Tragelaphus imberbis*), Water buck *Kobus ellipsiprymnus*, bush pig *Potamocherus larvatus*, anubus baboon *Papio anubis*, vervet monkey *Chlorocebus pygerythrus*, Mantled guereza *Colobus guereza*, lion *Panthera leo* leopard *Panthera pardus*, wildcat *Felis silvestris*, and serval cat *Leptailurus serval*, in addition to varied floral composition. It also comprises varieties of bird species, reptiles, amphibians and insects.

Maze National Park (MzNP) is predominantly covered by savannah grassland interspersed with scattered deciduous broad-leaved trees, creating a diverse landscape that supports a variety of wildlife. The majority of the park consists of plains enriched by open vegetation dominated by Combretum and Terminalia species, which play a critical role in providing habitat and food sources for the local fauna. The Maze River, originating from the surrounding highlands, flows along with its numerous tributaries, traverses the park from the northern to the southern end, creating vital riparian zones that serve as corridors for wildlife movement and habitat for aquatic and semi-aquatic species. This unique combination of savannah grasslands and riverine habitats makes MzNP an important area for our target species.

The Maze River is essential to the park's biological well-being because it forms verdant riparian areas that provide a variety of species with places to reproduce and feed. Given an important habitat to primates, particularly for guerezas, in which no feeding activity has been detected rather than the riverine habitat over the study period (Fig. 1).

Study groups

Three groups of *C. guereza* were targeted for this study. One group with three individuals at Maze camp site (group-1); another group with two individuals at Domba site (group-2); and the third group with three individuals at Lemasse site (group-3); were randomly selected along the River Maze. We monitored those groups in their home ranges for the duration of the study, with a research team assigned to each group to look at dietary ecology and potential differences in feeding activities.

Data collection

Plant phenology and dietary preferences

During reconnaissance before starting actual data collection for this study, we made marking for individual plants (trees, shrubs) with DBH ≥ 10 cm. To assess food availability, we collected vegetation data within the three groups' home range using randomly located nine plots of 20m × 20m for large trees i.e., ≥ 10 cm in diameter at breast height, DBH). We placed the plots within the home range of each study group and we carefully observed all plant parts being used as food sources for each month over the study period. Each month, all stems in every plot were carefully examined through the study year and assigned to one of its food items (young leaf, mature leaf, fruit, bark, shoot and flower). We computed selection ratios for each plant species that was observed to have been fed by the *Colobus guereza*. Values close to zero indicate rejection, implies the plant species was eaten less than would be expected based on its availability, while large values show preference selected more than predicted based on availability. Thus, the avoidance of an item does not to indicate the item is never consumed and does not mean a non-food item (*Clink et al., 2017*). We sampled a total of 9 plots, each accounted 20m × 20m = 400m^2, i.e., a total area of (400m2 x 9 = 3600m^2), 3 plots for each site (Maze camp site, Domba site, Lemasse site) within the home ranges' of three randomly selected study groups along the Maze River. Due to the homogeneity of the habitat, there is no need to compare the dietary composition differences between the groups. Most plant species were identified in the field, while those that could not be identified were collected and later brought to Arba Minch University for further examination and taxonomic identification by experts. For the analysis of food availability, we used 12 months of phenological data concerning the eight plant species that were most frequently consumed by the study species.

Diet composition

We collected feeding data for12-month period between September 2021 to August 2022~~)~~ using instantaneous scan sampling (*Altmann 1974,2009*). For the dry season, we collected data from September 2021 to February 2022, and for the wet season, from March 2022 to August 2022. The feeding data were collected through direct observation using binoculars from designated viewpoints (*Altmann, 2009*). Observations were conducted for a fixed period of 10 minutes, with 5-minute intervals, during the morning from 6:30 to 10:30 and in the afternoon from 13:30 to 17:25 (*Fashing et al., 2007*). During scans, the plant species, plant parts, growth forms, and other animals consumed were recorded *(Fashing et al.,2014; Jarvey et al., 2018; Mekonnen et al., 2018*). We categorized the food components as Young leaf: a newly grown leaf that is still developing and has not yet reached its full maturity, often smaller, softer, and lighter in color compared to mature leaf; Mature leaf: a fully developed leaf that has reached its maximum size and structural maturity, typically tougher, darker in color compared to young leaf; Fruit: the reproductive structure of a plant that contains the seeds, ripe and often eaten by animals; Bark: the protective outer layer of the stem or trunk of a woody plant, and composed of multiple layers, not to mean dead layers but, living layers; Shoot: the aboveground vegetative part of a plant includes the stem and buds; Flower: the reproductive structure of a plant, and are responsible for sexual reproduction in plants; Unidentified invertebrates: Small, non-vertebrate animals that could not be identified to a specific taxonomic level, particularly insects. We then compared the number of feeding observations for each food items.

Data analysis

We combined feeding data from the three groups ~~were~~ into ~~a~~ one dataset before the computations of proportions of each diet component. The analyses were executed in XLSTAT 2023.1.3 (1407) and SPSS software version 22. Of the total of 11520 scans, we recorded 5168 (44.86%) feeding activities over the study period, (Wet: 2382, 46.09%; Dry: 2786, 53.91%). We computed the proportion of the diet components for seven food classes (young leaf, mature leaf, fruit, bark, shoot, flower, unidentified invertebrates) recorded through the study period by dividing the number of records of a particular diet component by the total number records from all diet components. The proportion of each diet component was then converted into percentages. The chi-square test was employed to test for the seasonal and monthly variations in proportions of the diet components. To assess the feeding preferences of various food plant species in a given habitat, we computed the selection ratio for each species. Stem density measurement for each food plant species present in the study area, we calculated the total stem density, which represents the number of stems per unit area. We also determined the percentage of each food plant species relative to the total number of food plants in the study area.

Computation of Selection Ratio: The selection ratio (SR) for each species was calculated using the formula: SR = Percentage of Species/Stem Density Percentage

Where: The percentage of a certain food plant species among all food plants is referred to as the percentage of species. The stem density percentage describes the ratio of the stem density of a particular food plant species to the total stem density of all species.

Thus, a species is preferred over others in the habitat if the selection ratio is greater than 1. A species may be avoided if its selection ratio is smaller than 1, which indicates that it is less desirable. A selection ratio equal to 1 indicates neutral selection, meaning the species is utilized in proportion to its availability.

Field permit

The Office of Executive Research Directorate and the Biodiversity Research and Conservation Center, Arba Minch University were approved the fieldwork under research permit (AMU/TH2/BRCC/09/2014). Hereby, we can guarantee that no animal capture and tissue or blood sample was taken from the subject species, as data were recorded through direct observation without animal capture.

RESULTS

Food plant species consumption and preferences

We found that six tree plants (*Acacia polyacantha*, *Millettia ferruginea*, *Moringa stenopetala*, *Syzygium guineense*, *Trichilia emetica* and *Ficus sycomorus*) and two shrub species (*Carissa spinarum*, *Grewia villosa*) that were grouped under seven families (Apocynaceae, Fabaceae, Myrtaceae, Moringaceae, Meliaceae, Moraceae and Malvaceae) were consumed by C. guereza in the study site. Except for the Fabaceae, all are represented by a single species. Overall, *Trichilia emitica* was the ~~most~~ top plant species preferred to the rest (Table 1).

During the wet season, *Trichilia emetica* contributed the largest proportion to the total amount of young leaf consumption, accounting for 52.85% (n=948). This was followed by *Grewia villosa* at 20.68% (n=371), while *Moringa stenopetala* was rarely reported, with only 0.5% contributions (n=9) (Table 2). The second most popular food item this season was mature leaves, with *Trichilia emetica* and *Grewia villosa* making up the largest portions making up 53.12% and 46.88% respectively (Table 2). During the dry season, the *Moringa stenopetala* contributed the largest portion (386, 49.87%) of all young leaf consumption and *Millettia ferruginea* contributed the least (0.13%) (Table 2).

Diet composition of guerezas

The annual diet of C. guereza comprised of young leaf, matured leaf, fruit, bark, shoot and flower (Table 3). Young leaf was the most consumed plant part in the overall annual diet. Based on seasons, there was seasonal variation in number of feeding records of all food plant items (Young leaf: $\chi 2 = 405.140$, df = 1, $p < 0.05$; Mature leaf: $\chi 2 = 651.563$, df = 1, $p < 0.05$; Fruit: $\chi 2 = 105.593$, df = 1, $p < 0.05$; Shoot: $\chi 2 = 125.063$, df = 1, $p < 0.05$). Young leaf as the major food item was more frequently consumed in the wet season (n=1794, 75.31%) while mature leaves were consumed more over the other food components during the dry (n=1215, 43.61%) than wet season (Table 3). Interestingly, consumption of unidentified invertebrates was also recorded to increase by about 1.63% in the dry season (Table 3). The results also demonstrate some monthly variations in consumption of different plant parts or diet components by guerezas (Table 4).

DISCUSSION

Food plant species consumption and preferences

Comparable to other studies on feeding ecology of *Colobus guereza* across its geographical range, our study reports very few plant species consumed by this primate. In this study, we recorded eight plant species in the Maze National Park which are fewer than that observed in Kalinzu Forest (39 plant species) by Matsuda et al. (2020). Of these eight species, only two plant species *Trichilia emitica* (39.6%) and *Grewia villosa* (21.01%) had the highest feeding records and thus dominate monkeys' diet. The observation of few plant species eaten by guerezas suggests that the dietary plant richness of this primate is very low in the park. This provides an urgent need to conserve the park to ensure the long-term presence of important food plant species. It appears that the guerezas in MzNP consumes food plant species as expected from its availability across its home range. Most of the plant species preferred (having high selection ratios) are those which are quite abundant in the groups's home ranges (Table 1 and 5). However, this does not necessarily indicate that they are the most nutritious or preferred food sources, but rather they are fed because they are quite abundant in the habitat and not because they are most nutritious. Future studies should analyze nutrient content and other phytochemical composition of plants eaten in order to draw decisive conclusion on plant food preferences.

Our study demonstrates a seasonal variation in frequency with which certain plant species were eaten. For example, *Trichilia emitica* was most frequently eaten during the dry season while *Syzigium guinense* and Grewia villosa were eaten in the dry season. Seasonal variation in plant phenological patterns can in part explain the observed variation in feeding plant species between seasons. We observed that monthly dietary diversity increased as the number of available plants with young leaves reduced during the dry season (Table 2). For example, the plant species such as *Ficus sycomorus*, *Millettia ferruginea* and *Moringa stenopetala* were not used as food source for the study species during the wet season, because of sufficient young leaves, with exceptions thus *Moringa stenopetala* only contributed small amount in May (Table S2). On the other hand, *Moringa stenopetala* significantly contributed to the study species bearing more young leaves during the dry season (Table 2). This way, eight plant species from seven families and one non-plant source, i.e., unidentified invertebrates offered food items to the *C. guereza* in the study area. This was particularly due to the effects of the declining availability of young leaves from *Trichilia emetica* and *Grewia villosa*. Much of the dietary diversity in the study group is seemingly attributable to the availability young leaf portion of their diet.

Many colobine species, have increased dietary extent during times and areas with low availability or quality of resources (*Hu, 2011; Clink et al.,2017*). The present study depicted, the dietary extent increased with decreasing in young leaf availability during the dry season.

Food plant parts/item consumption.

We found that the guerezas exploited different plant parts, leaves being mostly eaten in the MzNP. However, it is not surprising for them to consume mostly young leaves because these monkeys like other colobines are anatomically adapted to feed on leaves that facilitate their leaf-eating habits, including their preference for young leaves due to their nutritional benefits (e.g. *Gonzalez & McGraw, 2021; Mola et al., 2022*). In line with this, studies show that leaves accounted for high proportion (42–49%) by folivorous-frugivorous monkeys (Lima et al., 2024). Another study has shown that Bale monkey, a folivore specialist, spend more time munching on new bamboo tree leaves in Southern Ethiopia (*Mekonnen et al., 2018*). Similarly, the leaves accounted for highest proportion of *Colobus guereza's* food items (71.6%) in Borena-Sayint National Park, Northern Ethiopia (*Hussein et al., 2017*) and 82% in Bale Mountains National Park, Ethiopia (*Petros et al., 2018*).

Furthermore, young leaves were highly eaten compared to mature leaves. This observation is in line with a study on feeding ecology of guerezas at Saja Forest, Kaffa Zone, Southwest Ethiopia, that reported the monkeys to eat young leaves over mature leaves (*Mola et al., 2022*). Similarly, *Matsuda et al., (2020)* reported the *C. guereza* to consume up to 87% young leaves in the Kalinzu Forest in Uganda. Young leaves are preferred because they have low fiber content, high nutrients and easier to digest (*Kumar & Singh, 2018*). Thus by preferentially consuming these food items, the guerezas are able to maximize their nutrient intake while minimizing the ingestion of toxic compounds. Interestingly, the guerezas were observed to increase the consumption of invertebrates during the dry season by 1.63% (Table 2). The high consumption of invertebrates during the dry season could be strategy to increase intake of proteins from invertebrates rather than getting it from young leaves which were lowly eaten in this season.

The results of this study have demonstrated some seasonal dietary flexibility for the guerezas in the study site. We observed the study species use young leaves and matured leaves interchangeably during the wet and dry seasons. They consume a lot of young leaves during the wet season and mature leaves during the dry season and vice versa. Throughout the study months, there were considerable changes in availability and consumption rate of diet items (Table 5). This is attributed to seasonal variations in phenological patterns that affect the availability of food items which eventually influence seasonal dietary composition for the guerezas. For instance, in the field, we observed that when young leaves were insufficient during the dry season, hence the monkeys change their diet use by increasing consumption of mature leaves. This is consistent with the previous study where resource availability is highly variable; folivorous monkeys eat more leaves during periods of low fruit availability *Hanya & Bernard (2012).* Research findings found, proboscis monkeys varied in response to monthly changes in food availability, but did not vary among forest types (*Feilen & Marshall,2020*). In addition, the influence of seasonality on the diet reported at Tanjung Putting National Park, thus fruits comprised high proportion of the diet from January to May, while young leaves consumed the highest proportion of the diets from June to December (*Yeager,1989*). This might be attributed the fact, that the season contribute to the availability and even the quality of diet components and this drives the flexibility for feeding of the species. However, *Colobus guereza* consumed high amount of young leaf during the study period, in riverine habitat of the park.

The results of this study demonstrate that the guerezas exhibit seasonal and monthly dietary variability in response to availability of food components across months or seasons (Table 4 and 5). Dietary flexibility is a strategy that enables primates to survive during periods of food shortage (*Feilen & Marshall,2020*) or exploit different parts having different food resources across their home ranges or habitats (Mekonnen et al., 2018).

CONCLUSION

The results of this study demonstrate low richness of dietary plant species for guerezas in the park. The observation of only eight plant species with only two mostly eaten by the monkeys provide impetus for effective protection of the park to ensure the long-term presence of important food plant species. The reliance of this primate on few plant species gives a daunting future to the survival of this population in the face of ongoing climate change. However, seasonal dietary flexibility in plant species and food plant items (plant parts and invertebrates) provide some promising future as this observation suggest that the primate can respond to habitat changes through ecological flexibility. Our research showed that the habitat found in rivers plays a significant role containing all essential food plants and making a suitable place for the species to reside. We found that plant species' parts, particularly leaves i.e., young and mature, are a fundamental diet items to the *Colobus gureza*. The plant species such as *Trichilia emetica*, *Grewia villosa*, *Syzygium guineense* and *Moringa stenopetala* were reported among the most important food sources provide sufficient leaves (young, mature) to the subject species over the study period, and we suggest to be conserved for sustainable conservation of the species. Overall, we strongly recommend that the protection of the riverine habitat will result in effective conservation of *Colobus guereza* and its habitat in the Maze National Park.

Acknowledgements

We are grateful to the Biodiversity Research and Conservation Center and the Office of Executive Research Directorate, Arba Minch University for funding us to carry out this study. Our thanks should also go to all staff members of Maze National Park, for their cooperation and support throughout this work.

Funding

We, Abraham Tolcha and the team were funded by the Biodiversity Research and conservation Center, Arba Minch University Ethiopia, with the project code GOV/AMU/TH2/BRCC/09/2014. The funder offered some logistics and covered financial costs during our field work.

Grant Disclosures

The following grant information was disclosed; Biodiversity Research and conservation Center, Arba Minch University, Ethiopia, GOV/AMU/TH$_2$/BRCC/09/2014.

Competing Interests

The authors have no competing interests to declare.

Author Contributions

Abraham Tolcha: conceived and designed the all research work, led the project, performed the experiments and field data collection, analyzed the data, prepared the draft manuscript, reviewed the draftmanuscript and enriched, and approved the final version.

MatewosMasne: conceived and designed the experiments, performed the field data collection, analyzed the data, reviewed the draft manuscript, and approved the final draft.

Belayneh Ayechw: conceived and designed the experiments, performed the field data collection, analyzed the data, reviewed the draft manuscript, and approved the final draft.

Data Availability

Data will be available based on the data sharing policies and procedures of the journal.**Supplemental Information**

Supplemental information for this work can be found online at web site of this journal.

REFERENCES

Altmann J. 1974. Observational study of behavior: sampling methods. *Behaviour* **49(34):**227-266

Altmann J. 2009. Observational Study of Behavior : Sampling Methods Author (s): Jeanne Altmann Published by : BRILL Stable URL : http://www.jstor.org/stable/4533591. *Behaviour* ***49*(3):**227–267. https://doi.org/10.1080/14794802.2011.585831

Ameha A, Nielsen OJ, Larsen HO. 2014. Impacts of access and bene fi t sharing on livelihoods and forest : Case of participatory forest management in Ethiopia. *Ecological Economics* ***97*:**162–171. https://doi.org/10.1016/j.ecolecon.2013.11.011

Arroyo-Rodríguez V, Fahrig L. 2014. Why is a landscape perspective important in studies of primates? *American Journal of Primatology* ***76*(10):**901–909. https://doi.org/10.1002/ajp.22282

Befekadu R, Afework B. 2006. Population status and structure of Swayne's Hartebeest (*Alcelaphus buselaphus swaynei*) in Maze National Park, Ethiopia. *International Journal of Ecology and Environmental Science* **32:**259-264.

Bernard H, Matsuda I, Hanya G, Phua MH, Oram F, Ahmad AH. 2018. Feeding ecology of the proboscis monkey in Sabah, Malaysia, with special reference to plant species-poor forests. In Primates in Flooded Habitats: Ecology and Conservation (Nowak K, Barnett AA, Matsuda I, eds.), pp 89–98. Cambridge, Cambridge University Press.

Cancelliere EC, Chapman CA, Twinomugisha D, Rothman JM. 2018. The nutritional value of feeding on crops: Diets of vervet monkeys in a humanized landscape. *African Journal of Ecology* ***56*(2):**160–167. https://doi.org/10.1111/aje.12496

Chapman, CA, Balko, EA. 2002. Primate and forest dynamics: The role of the primate community in forest regeneration. In: Primate Ecology and Conservation (pp. 64-92).

Cambridge University Press.

Chaves ÓM, Stoner KE, Arroyo-rodríguez V. 2019. Differences in Diet Between Spider Monkey Groups Living in Forest Fragments and Continuous Forest in Mexico Author (s): Óscar M . Chaves , Kathryn E . Stoner and Víctor Arroyo-Rodríguez Published by : Association for Tropical Biology and Conservation St. *Biotropica* ***44*****(1):**105–113. https://doi.org/10.1111/j. 1744-7429.2011.00766.x

Chouteau P. 2006. Influences of the season and the habitat structure on the foraging ecology of two coua species in the western dry forest of Madagascar. *Comptes Rendus - Biologies*, **329(9):**691–701. https://doi.org/10.1016/j.crvi.2006.06.005

Clink DJ, Dillis C, Feilen KL, Beaudrot L, Marshall AJ. 2017. Dietary diversity, feeding selectivity, and responses to fruit scarcity of two sympatric Bornean primates (Hylobates albibarbis and Presbytis rubicunda rubida). *PLoS One* **12:**e0173369.

Coiner-Collier S, Scott RS, Chalk-Wilayto J, Cheyne SM, Constantino P, Dominy NJ, Elgart AA, Glowacka H, Loyola LC, Ossi-Lupo K, Raguet-Schofield M, Talebi MG, Sala EA, Sieradzy P, Taylor AB, Vinyard CJ, Wright BW, Yamashita N, Lucas PW, Vogel ER, 2016. Primate dietary ecology in the context of food mechanical properties. *Journal of Human Evolution* ***98*****(April 2018):**103–118. https://doi.org/10.1016/j.jhevol.2016.07.005

Cowlishaw G, Dunbar, RIM. 2004. Primate Conservation Biology. University of Chicago Press.

Dansa M, Tekalign W. 2022. Primate diversity and species' distributions in Maze National Park, southern Ethiopia, *African Zoology* **57(2):**121-125. DOI: 10.1080/15627020.2022.2087478

de Jong YA, Butynski TM, Oates JF. 2019. Colobus guereza. The IUCN Red List of Threatened Species 2019: e.T5143A17944705. http://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T5143A17944705.en

de Paula Mateus D, Groeneveld J, Fischer R, Taubert F, Martins VF, Huth A. 2018.

Defaunation impacts on seed survival and its effect on the biomass of future tropical forests. *Oikos* **127(10):**1526–1538. https://doi.org/10.1111/oik.05084

Dunn JC, Asensio N, Arroyo-Rodríguez V, Schnitzer S, Cristóbal-Azkarate J. 2012. The ranging costs of a fallback food: liana consumption supplements diet but increases foraging effort in howler monkeys. *Biotropica* **44:**704–714.

Ego WK, Mbuvi DM, Kibet PFK. 2003. Dietary composition of wildebeest (Connochaetes taurinus) kongoni (Alcephalus buselaphus) and cattle (Bos indicus), grazing on a common ranch in south-central Kenya. *African Journal of Ecology* **41(1):**83–92. https://doi.org/10.1046/j.1365-2028.2003.00419.x

Ellsworth P. 2017. "Phenological mismatches and species interactions in climate change." *Ecological Applications* **27(4):**1222-1233.)

Estrada A, Garber PA. 2022. Principal Drivers and Conservation Solutions to the Impending Primate Extinction Crisis: Introduction to the Special Issue. *International Journal of Primatology* **43(1):**1–14. https://doi.org/10.1007/s10764-022-00283-1

Estrada A, Garber PA, Chaudhary A. 2020. Current and future trends in socio-economic, demographic and governance factors affecting global primate conservation. *PeerJ* ***8*:**1–35. https://doi.org/10.7717/peerj.9816

Estrada A, Garber PA, Rylands AB, Roos C, Fernandez-Duque E, Fiore A, Di Anne-Isola, Nekaris K, Nijman V, Heymann EW, Lambert JE, Rovero F, Barelli C, Setchell JM, Gillespie TR, Mittermeier RA, Arregoitia LV, de Guinea M, Gouveia S, Dobrovolski R,… Li B. 2017. Impending extinction crisis of the world's primates: Why primates matter. *Science Advances* ***3*(1):** https://doi.org/10.1126/sciadv.1600946

Fashing PJ. 2001. Feeding ecology of guerezas in the Kakamega Forest, Kenya: the importance of Moraceae fruits in their diet. *International Journal of Primatology* **22(4):**579-609.

Fashing PJ. 2007. African colobine monkeys: patterns of between-group interaction. In: Campbell CJ, Fuentes A, Mackinnon KC, Panger M, Bearder SK, editors. Primats in perspective. Oxford: Oxford University Press. p 201–224.

Fashing PJ, Nguyen N, Venkataraman VV, Kerby JT. 2014. Gelada feeding ecology in an intact ecosystem at Guassa, Ethiopia, variability over time and implications for theropith and hominin dietary evolution. *American Journal of Physical Anthropology* **155:**1–16.

Feilen KL, Marshall AJ. 2020. Responses to Spatial and Temporal Variation in Food Availability on the Feeding Ecology of Proboscis Monkeys (Nasalis larvatus) in West Kalimantan, Indonesia. *Folia Primatologica* **91(4):**399–416. https://doi.org/10.1159/000504362

Ganzhorn JU, Arrigo-Nelson SJ, Boinski S, Bollen A, Carrai V, Derby A, Zhao Q. 2017. The importance of protein in leaf selection of folivorous primates. *American Journal of Primatology* **79(3)** e22591.

Garber PA. 2022. Advocacy and Activism as Essential Tools in Primate Conservation. *International Journal of Primatology* **43(1):**168–184. https://doi.org/10.1007/s10764-021-00201-x

Gogarten JF, Guzman M, Chapman, CA, Koenig WD. 2012. Fastidious feeders: dietary breadth of Bwindi chimpanzees. *American Journal of Primatology* **74(11):** 1006-1018.

Gonzalez M A, McGraw WS. 2021. Feeding ecology and adaptations of colobine monkeys: A review of recent findings. *Primates* **62(3):**345-358. doi:10.1007/s10329-021-00863-5.

Hanya G, Chapman CA. 2013. Linking feeding ecology and population abundance: A review of food resource limitation on primates. *Ecological Research* **28(2):**183–190. https://doi.org/10.1007/s11284-012-1012-y

Hanya G, Bernard H. (2012). Fallback foods of red leaf monkeys (Presbytis rubicunda) in Danum Valley, Borneo. *International Journal of Primatology* **33:** 322–337.

Hu G. 2011. Dietary breadth and resource use of François' langur in a seasonal and disturbed habitat. *American Journal of Primatology* **73(11):**1176–1187. https://doi.org/10.1002/ajp.20985

Hussein I, Afework B, Dereje Y. 2017. Population structure and feeding ecology of Guereza (Colobus guereza) in Borena-Sayint National Park, northern Ethiopia. *International Journal* *of Biodiversity and Conservation* **9(11):**323–333. https://doi.org/10.5897/ijbc2017.1114

Irwin MT, Raharison JL Raubenheimer DR Chapman CA Rothman, J. M. 2014. Nutritional correlates of the "lean season": effects of seasonality and frugivory on the nutritional ecology of diademed sifakas. *American journal of physical anthropology*, 153(1):78-91.

Israel P, Sefi M, Hussein Gena YM. 2018. Population Status, Distribution, and Threats of Colobus guereza gallarum in Bale Mountains National Park, Southeastern Ethiopia. *International Journal of Natural Resource Ecology and Management* **3(3):**39–45. https://doi.org/10.11648/j.ijnrem.20180303.12

Jarvey JC, Low BS, Pappano DJ, Bergman TJ, Beehner JC. 2018. Graminivory and Fallback Foods: Annual Diet Profile of Geladas (Theropithecus gelada) Living in the Simien Mountains National Park, Ethiopia. *International Journal of Primatology* **39(1):**105–126. https://doi.org/10.1007/s10764-018-0018-x

Kibaja MJ, Mekonnen A, Reitan T, Nahonyo CL, Levi M, Stenseth NC, Hernandez-Aguilar RA. 2023. On the move: Activity budget and ranging ecology of endangered Ashy red colobus monkeys (*Piliocolobus tephrosceles*) in a savanna woodland habitat. *Global Ecology and Conservation* ***43*(2023):**1–15. https://doi.org/10.1016/j.gecco.2023.e02440

Kifle Z, Beehner JC. 2022. Distribution and diversity of primates and threats to their survival in the Awi Zone, northwestern Ethiopia. *Primates* **63(6):**637–645. https://doi.org/10.1007/s10329-022-01010-3

Lambert JE, Rothman JM. 2015. Fallback Foods, Optimal Diets, and Nutritional Targets: Primate Responses to Varying Food Availability and Quality. *Annual Review of Anthropology* **44(1):**493–512. https://doi.org/10.1146/annurev-anthro-102313-025928

Leighton M. 1993. Modeling dietary selectivity by Bornean orangutans: Evidence for integration of multiple criteria in fruit selection. *International Journal of Primatology* ***14*(2):**257–313. https://doi.org/10.1007/BF02192635

Lima, I.A., Bicca-Marques, JC. 2024. Opportunistic meat-eating by urban folivorous-frugivorous monkeys. *Primates* **65:**25–32 (2024). https://doi.org/10.1007/s10329-023-01098-1

Maestre FT, Quero JL, Gotelli NJ, Escudero A, Ochoa V, Delgado-Baquerizo M, García-Gómez M, Bowker MA, Soliveres S, Escolar C, García-Palacios P, Berdugo M, Valencia E, Gozalo B, Gallardo A, Aguilera L, Arredondo T, Blones J, Boeken B, Zaady, E. 2012. Plant species richness and ecosystem multifunctionality in global drylands. *Science* **335(6065):** 214–218. https://doi.org/10.1126/science.1215442

Mamo Y. 2012. Status of the Swayne's Hartebeest, (*Alcelaphus buselaphus swaynei*) meta-population under land cover changes in Ethiopian Protected Areas. *International Journal of Biodiversity and Conservation* ***4*(12):**https://doi.org/10.5897/ijbc12.024

Matsuda I, Tuuga A, Higashi S. 2009. The feeding ecology and activity budget of proboscis monkeys. *American Journal of Primatology* **71:**478–492.

Matsuda I, Hashimoto C, Ihobe H, Yumoto T, Baranga D, Clauss M, Hummel J. 2022. Dietary Choices of a Foregut-Fermenting Primate, Colobus guereza: A Comprehensive Approach Including Leaf Chemical and Mechanical Properties, Digestibility and Abundance. *Frontiers in Ecology and Evolution* ***10*(March):**https://doi.org/10.3389/fevo.2022.795015

Mekonen S, Hailemariam B. 2016. Ecological behaviour of common hippopotamus (Hippopotamus amphibius , LINNAEUS , 1758) in boye wetland , jimma , ethiopia. *American Journal of Scientific and Industrial Research* **7(2):**41–49. https://doi.org/10.5251/ajsir.2016.7.2.41.49

Mekonnen A, Fashing PJ, Bekele A, Hernandez-Aguilar RA, Rueness EK, Stenseth NC. 2018. Dietary flexibility of Bale monkeys (*Chlorocebus djamdjamensis*) in southern Ethiopia: Effects of habitat degradation and life in fragments. *BMC Ecology* **18(1):**1–20. https://doi.org/10.1186/s12898-018-0161-4

Mekonnen A, Fashing PJ, Bekele A, Stenseth NC. 2020. Distribution and conservation status of Boutourlini's blue monkey Distribution and conservation status of Boutourlini ' s blue monkey (*Cercopithecus mitis boutourlinii*), a Vulnerable subspecies endemic to western Ethiopia. *Primates* **61(6):**785–796. https://doi.org/10.1007/s10329-020-00831-4

Mola M, Ayiza A, Asnakew M, Abuye T. 2022. Population Status, Diurnal Activity Pattern, Feeding Ecology, and Habitat Association of Colobus Monkey (Colobus guereza) in Saja Forest, Kaffa Zone, Southwest Ethiopia. *International Journal of Ecology* 2022. https://doi.org/10.1155/2022/5090212

Oates JF. 1994. The natural history of African colobus monkeys. Colobine monkeys: their ecology. *Behaviour and Evolution* 75-128.

Pinto MP, Beltrão-Mendes R, Talebi M, de Lima AA. 2023. Primates facing climate crisis in a tropical forest hotspot will lose climatic suitable geographical range. *Scientific Reports*, ***13*(1):**1–13. https://doi.org/10.1038/s41598-022-26756-0

Ramesh T, Downs CT. 2013. Impact of landuse on the diversity of ground-dwelling invertebrates in a South African forest-grassland ecotone. *Applied ecology and environmental research* **11(2):**145-163.

Ripple WJ, Abernethy K, Betts MG, Chapron G, Dirzo R, Galetti M, Levi T, Lindsey PA, Macdonald DW, Machovina B, Newsome TM, Peres CA, Wallach AD, Wolf C. 2016. Bushmeat hunting and extinction risk to the world's mammals. *Royal Society Open Science* ***3*(10):**https://doi.org/10.1098/rsos.160498

Rudran R. 2019. Purple-faced langur Semnopithecus vetulus (Erxleben, 1777). In Primates in Peril: The World's 25 Most Endangered Primates 2018–2020.

Saj TL, Sicotte P. 2007. Predicting the competitive regime of female colobus monkeys (*Colobus vellerosus*) from the distribution of food resources. *Behavioural Processes* **74(1):**72-79.

Seiler N, Robbins MM. 2016. Factors Influencing Ranging on Community Land and Crop Raiding by Mountain Gorillas. *Animal Conservation* **19(2):**176–188. https://doi.org/10.1111/acv.12232

Sengupta A, McConkey KR, Radhakrishna S. 2015. Primates, provisioning and plants: effects of human cultural behaviours on primate ecological functions. *PloS one* **10(11):**e0140961.

Sha JCM, Hanya G. 2013. Temporal Food Resource Correlates to the Behavior and Ecology of Food-Enhanced Long-Tailed Macaques (*Macaca fascicularis*). *Mammal Study* **38(3):**163–

175. https://doi.org/10.3106/041.038.0305

Sushma HS, Ramesh KP, Kumara HN. 2022. Determinants of habitat occupancy and spatial segregation of primates in the central Western Ghats, India. *Primates* **63(2):**137–147. https://doi.org/10.1007/s10329-021-00966-y

Soendjoto MA, Alikodra HS, Bismark M, Setijanto H. 2006. Jenis dan komposisi pakan bekantan (Nasa- lis larvatus Wurmb) di hutan karet Kabupaten Tabalong, Kalimantan Selatan (Diet and its compo- sition of the proboscis monkey [Nasalis larvatus Wurmb] in rubber forest of Tabalong District, South Kalimantan). *Biodiversitas* **7:**34–38.

Terborgh J. 2015. "Tropical Forests and the Future: The Threat of Deforestation." In Forest Ecosystems: Analysis at Multiple Scales. Springer, pp. 305-343.

Tekalign W, Bekele A. 2011. Population status, foraging and diurnal activity patterns of oribi (Ourebia ourebi) in Senkele Swayne's hartebeest sanctuary, Ethiopia. *Ethiopian Journal of Science* **34(1):**29–38.

Tesfaye D, Fashing PJ, Meshesha AA, Bekele A, Stenseth NC. 2020. Feeding Ecology of the Omo River Guereza (*Colobus guereza guereza*) in Habitats with Varying Levels of Fragmentation and Disturbance in the Southern Ethiopian Highlands. *International Journal of Primatology* ***42*****(1):**64–88. https://doi.org/10.1007/s10764-020-00189-w

van Casteren A, Oelze VM, Angedakin S, Kalan AK, Kambi M, Boesch C, Kühl HS, Langergraber KE, Piel AK, Stewart FA, Kupczik, K. 2018. Food mechanical properties and isotopic signatures in forest versus savannah dwelling eastern chimpanzees. *Communications Biology* **1(1):**https://doi.org/10.1038/s42003-018-0115-6

Yeager CP. 1989. Feeding ecology of the proboscis monkey (Nasalis larvatus). *International Journal of Primatology* ***10*****(6):**497–530. https://doi.org/10.1007/BF02739363

Yiming L. 2006. Seasonal variation of diet and food availability in a group of Sichuan snub-nosed monkeys in Shennongjia Nature Reserve, China. *American Journal of Primatology* **68(3):**217–233. https://doi.org/10.1002/ajp.20220

Figure 1

Study area map

Figure 1 Study area map of Maze National Park. Image credit: ArcGIS.

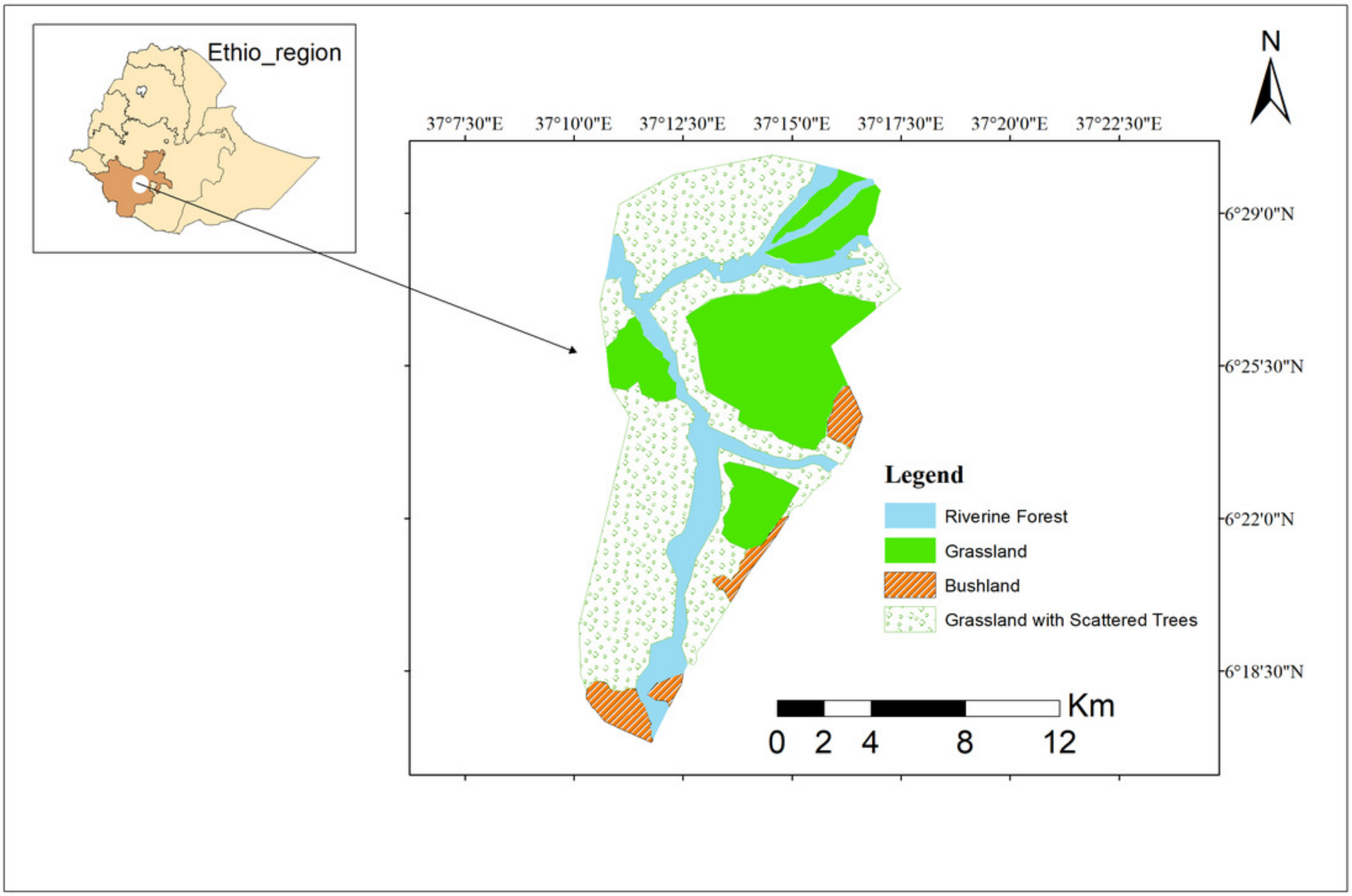

Table 1(on next page)

Feeding preference

Table 1 Feeding preference (selection ratio) of food plant species consumed by Colobus guereza during the study period.

Table 1 Feeding preference (selection ratio) of food plant species consumed by Colobus guereza during the study period.

Family	Species		% of food plant species	% stem density Stem/ha	Selection ratio	Rank
Apocynaceae	*Carissa spinarum*	Shrub	4.22	7.22	0.58	6
Fabaceae	*Millettia ferruginea*	Tree	2.32	4.16	0.56	7
Myrtaceae	*Syzygium guineense*	Tree	17.92	5	3.58	2
Moringaceae	*Moringa stenopetala*	Tree	7.64	4.16	1.84	4
Meliaceae	*Trichilia emetica*	Tree	39.59	9.16	4.32	1
Moraceae	*Ficus sycomorus*	Tree	0.81	4.16	0.19	8
Malvaceae	*Grewia villosa*	Shrub	21.01	9.44	2.22	3
Fabaceae	*Acacia polyacantha*	Tree	5.24	4.44	1.18	5

Table 2 (on next page)

Diet components

The proportion of dietary components from different plant species and non-plant sources consumed during the wet season (March to August) and the dry season (September to February) throughout the study period.

Table 2 The proportion of dietary components from different plant species and non-plant sources consumed during the wet season (March to August) and the dry season (September to February) throughout the study period.

Food items used	Food components consumed during wet and dry seasons (%)													
	Wet						Total	Dry						Total
	YL	ML	FR	Bk	Sh	FL		YL	ML	FR	Bk	Sh	FL	
Carissa spinarum	0	0	6.04	0	0	0	6.04	0	0	2.67	0	0	0	2.67
Millettia ferruginea	0	0	0	0	0	0	0	0.06	0	1.83	2.40	0	0.06	4.35
Syzygium guineense	12.93	0	0	0	0	0	12.93	1.90	10.37	3.30	0	0.1	6.49	22.16
Moringa stenopetala	0.38	0	0	0	0	0	0.38	13.86	0	0	0	0	0	13.86
Trichilia emetica	39.80	5.37	0	0	8.19	0	53.36	6.44	17.30	3.55	0	0.54	0	27.83
Ficus sycomorus	0	0	0	0	0	0	0	0	0	1.5	0	0	0	1.5
Grewia villosa	15.57	4.75	0	0	0	0	20.32	5.57	15.94	0	0	0	0.1	21.61
Acacia polyacantha	6.63	0	0	0	0	0	6.63	0	0	0	4.05	0	0	4.05
Unidentified invertebrates	-	-	-	-	-	-	0.34	-	-	-	-	-	-	1.97
Total	75.31	10.12	6.04	0	8.19	0	100	27.82	43.61	12.85	6.45	0.64	6.65	100

Table 3 (on next page)

Percentage composition

Table 3: Percentage composition of annual and seasonal dietary composition

Table 3: Percentage composition of annual and seasonal dietary composition

Plant parts eaten	YL	ML	FR	Bk	Sh	Fl	Unidentified inveretebrates
Wet season	75.31	10.12	6.06	0	8.19	0	0.34
Dry season	27.82	43.82	12.85	6.45	0.64	6.65	1.97
Annual /Overall	51.57±23.7	26.97±16.9	9.46±3.4	3.22±3.2	4.42±3.7	3.32±3.3	1.16±0.8

Table 4 (on next page)

Proportion of diet components

Table 4 Proportion of diet components used by *Colobus guerezas* for each month during the study period

Table 4 Proportion of diet components used by *Colobus guerezas* for each month during the study period

No.	Food components	Diet components consumed by *Colobus guerezas* over months of the year (%)											
		Nov. 2021	Dec. 2021	Jan. 2022	Feb. 2022	Mar. 2022	Apr. 2022	May 2022	June 2022	July 2022	Aug. 2022	Sep. 2022	Oct. 2022
1	Young leaf	31.64	25.27	30.45	29.83	75.12	76.88	70.48	76.07	77.14	76.6	20.55	28.66
2	Matured leaf	37.39	41.05	39.53	39.91	9.67	6.99	11.19	9.07	8.57	15.6	53.2	50.61
3	Fruit	17.92	18.53	11.88	15.45	6.52	8.06	8.57	6.05	6.43	0	11.19	6.91
4	Bark	4.2	5.46	6.48	5.58	0	0	0	0	0	0	5.7	4.87
5	Shoot	0.45	3.37	1.08	0.43	7.49	8.06	9.05	8.81	7.86	7.8	0	0.61
6	Flower	6.64	4.42	8.64	5.37	0	0	0	0	0	0	7.54	7.32
7	Unidentified invertebrates	1.77	1.9	1.94	3.43	1.2	0	0.74	0	0	0	1.82	1.02

Table 5(on next page)

Plant species composition

Table 5 Plant species composition along trials of study species' home range

Table 5 Plant species composition along trials of study species' home range

Family	Species	Growth form	Number of plants recorded over transects									Total
			Maze camp site (Group-1)			Domba site (Group-2)			Lemasse site (Group-3)			
			P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	
Apocynaceae	*Carissa spinarum*	Shrub	4	2	0	5	1	4	2	0	8	26
Fabaceae	*Millettia ferruginea*	Tree	3	0	4	0	3	0	4	0	1	15
Fabaceae	*Tamarindus indica*	Tree	2	5	0	0	1	0	3	2	0	13
Balanitaceae	*Balanites aegyptiaca*	Tree	0	1	3	4	1	0	1	1	0	11
Anacardiaceae	*Rhus glutinosa*	Tree	1	0	0	1	0	2	0	2	0	6
Ebenaceae	*Diospyros abyssinica*	Tree	1	0	0	2	0	1	0	1	0	5
Salicaceae	*Flacourtia indica*	Tree	0	0	2	0	4	0	1	0	0	7
Olacaceae	*Ximenia americana*	Tree	0	2	1	0	0	1	0	0	2	6
Myrtaceae	*Syzygium guineense*	Tree	4	2	0	3	1	0	2	5	1	18
Moringaceae	*Moringa stenopetala*	Tree	3	2	1	2	1	0	2	0	4	15
Fabaceae	*Piliostigma thonningii*	Tree	0	0	3	1	0	0	5	2	0	11
Meliaceae	*Trichilia emetica*	Tree	2	5	1	5	3	8	4	3	7	38
Moraceae	*Ficus sycomorus*	Tree	1	4	0	1	2	3	1	2	1	15
Rhamnaceae	*Ziziphus spina-christi*	Tree	0	3	2	0	0	2	3	1	2	13
Malvaceae	*Grewia villosa*	Shrub	3	6	1	2	5	8	7	0	2	34
Rubiaceae	*Gardenia ternifolia*	Tree	0	1	1	2	0	0	1	2	0	7
Anacardiaceae	*Sclerocarya birrea*	Tree	2	1	0	2	0	1	3	0	0	9
Combretaceae	*Terminalia brownii*	Tree	1	0	4	0	1	3	0	1	2	12
Malvaceae	*Grewia mollis*	Tree	2	1	0	2	0	2	1	0	2	10
Rutaceae	*Harrisonia abyssinica*	Tree	0	0	2	1	0	1	1	0	1	6
Fabaceae	*Acacia polyacantha*	Tree	1	3	0	0	2	4	1	2	3	16
	Sub-total		30	38	25	33	25	40	42	24	36	293
Total			93			98			102			