

Community-based Conservation of Red Colobus in Tana River Delta, Kenya

Amisi Nicholas ^{1*}, Ipara Hellen ¹,  Kimanzi Johnstone ¹ and
 Wanyingi Jennifer ²

¹Department of Wildlife Management, School of Environmental Sciences and Natural Resource Management, University of Eldoret, P.O Box 1125, 30100, Eldoret Kenya

²School of Field Studies, P.O. Box 358-00209, Loitoktok, Kenya

Abstract

The Tana Red colobus (*Piliocolobus rufomitratu*s) is an endangered species that is found only in a small area of 34 fragmented forests in the lower Tana Delta, Kenya, which has a total area of 60 km². Although there are measures in place for conservation, human activities still threaten this species. Just recently, the discovery of a flourishing group of Red colobus 70 km away from their known habitat and within community land was a very encouraging find. The study was conducted to reveal how local people's cultural values, attitudes, and perceptions have played a significant role in the survival of this isolated group and also how these insights can support larger conservation efforts. A descriptive design was used for data collection from 255 randomly selected community members as well as key informants such as Kenya Wildlife Service staff, chiefs, and village elders using questionnaires, interviews, and focus group discussions. Statistical methods were applied for both descriptive and inferential analysis. Among the findings it was established that communities have helped in the conservation of Red colobus through cultural beliefs, taboos, and folklore and by protecting sacred forests and burial sites. Additionally, water (66.5%), traditional plants (55.5%), wood (44.5%), fruits (42.5%), firewood (39.5%), and restricted usage of burial places (4.9%) and ceremonies (1.3%) were the main advantages of conserving these ecosystems. Male respondents benefited more than female ones from most resources, especially water (63%), timber (82%), and herbs (60%). The study indicates that the enhancement of public participation, awareness, and education on the ecological and cultural value of the Tana Delta's forests and wildlife through community forums, rallies, and mass media can help in community-driven conservation of the Red colobus and their habitats. The conservation of the Tana Red Colobus faces major challenges, including habitat loss from agricultural expansion, overgrazing, and charcoal burning, persistent human-wildlife conflict,

weak community engagement, and limited benefit-sharing mechanisms, all of which undermine local support for long-term conservation. Sustainable conservation requires a biosocial approach that prioritizes the formal integration of indigenous governance systems and the immediate implementation of equitable, gender-sensitive benefit-sharing mechanisms to convert utilitarian value into long-term community support.

Keywords: Local communities, cultural values, attitudes, Red colobus, Tana River Delta

Journal ISSN: 2960-1118

Issue DOI: <https://doi.org/10.69897/jatems.v3i3>

Correspondence: nicholasamisi@gmail.com

Copyright © 2025 Amisi et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY).

Funding: This work was funded by the University of Eldoret Annual Research Grant, Cohort 5, awarded to Dr. Johnstone Kimanzi.

Data Availability Statement: The authors confirm that the data supporting the findings of this study are available within the article [and/or] its supplementary materials or upon reasonable request.

Competing interests: The authors declare no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Introduction

The non-human primates have an ecological and evolutionary impact mainly because of their function as seed dispersers and pollinators, thus the forests are being regenerated to a great extent and the entire ecosystem's health is greatly influenced (Shook *et al.*, 2019). Furthermore, since they are very similar to humans in both behavior and biology they have been viewed as a good source of insights into the human evolution and social systems (Estrada *et al.*, 2017). Among the African species the red colobus monkeys (*Piliocolobus* spp.) are the most endangered primates because over 75% of the red colobus monkey population is at risk of extinction as a result of habitat loss, hunting, and other human activities (Linder *et al.*, 2021). The Tana River red colobus (*Piliocolobus rufomitratu*s) is the

smallest and one of the most endangered subspecies within the three main African colobus genera consisting of *Piliocolobus* (red colobus), *Procolobus* (olive colobus), and *Colobus* (black-and-white colobus) (Linder *et al.*, 2024).

The Tana River Delta (TRD) in Kenya is positioned at the mouth of the Tana River and is regarded as one of the most important wetlands in East Africa from an ecological perspective (Duvail *et al.*, 2012). The unique riverine forests supporting the delta are not only providing a very specialized habitat for the two endemics and thus endangered primates, the Tana River red colobus (*P. rufomitratu*s) and the Tana River mangabey (*Cercocebus galeritu*s), but also are making them more vulnerable due to the intense human activities around and

inside these critical areas. Among the human activities are agricultural and settlement expansion, river diversion for irrigation, charcoal production, logging, and cutting of forests for human–wildlife conflicts, which altogether have accelerated the degradation of the gallery forests (Khatun et al., 2012; Redpath et al., 2013).

The Pokomo (mostly agriculture), Orma and Wardei (pastoralist), the Delta is their home and each of them has their own unique habits and customs which in turn determine the way they treat the animals living with them (Musyoka, 2019). These tribes have inherited the same culture over centuries, and it is manifested in different forms, including taboos, storytelling, and religious beliefs, which have been the main measures for the control of natural resource use during their existence. Cultural norms determine the places of primates in the ecosystem whether as totemic or symbolic species receiving protection or as culprits that reap the benefits from the degustation of crops and land. The wildlife that is regarded as bad or good by the community members who base their judgment of the wildlife on personal experiences, socioeconomic burdens, and perceived profits these factors have a strong impact on community behavior regarding conservation (Hanel *et al.*, 2021). The involvement of the local ecological knowledge (LEK), which has been built up through constant interaction with the natural surroundings, is a necessity for the achievement of the effective conservation outcomes (Fotsing *et al.*, 2024).

The TRD has been home to a multitude of interventions over the years such as the creation of the Tana River Primate National Reserve; however, the vast majority of these were not effective because community knowledge was not considered, local livelihoods were not properly engaged and land-use priorities

were conflicting (Mulu, 2010). The existing conservation strategies have always favored biological monitoring over the consideration of socio-cultural and economic dimensions which resulted in very limited community ownership of and inconsistent protection of the forest habitats. A lot of work on the Tana River red colobus has been done focusing population trends, habitat fragmentation and ecological threats, while comparatively little attention has been given to the impact that cultural values, community attitudes and LEK have on conservation outcomes.

Community-based conservation is a promising option, as the *P. rufomitratus*' existence is largely dependent on the forest patches situated on community lands where access and protection are managed by the local authorities. The TRD is a particularly intricate socio-ecological terrain in comparison to other sites of African primate conservation, as it has a rich mix of cultures, competition for land and water resources, and the fragmented gallery forests that are the habitats of two endemic primates. Thus, it is vital to comprehend the dynamics between community cultural systems and conservation efforts in order to create sustainable and culturally-adapted as well as community-motivated conservation strategies. The present study looks into the role of cultural factors, attitudes of the community, and local ecological knowledge in the process of the community-based conservation of the Tana River red colobus in the Tana River Delta. Filling this gap is of utmost importance for developing conservation strategies that incorporate ecological needs as well as social and cultural realities, thus increasing the survival chances of this critically endangered primate in the long run.

Methodology

Study Area

The study was done in the Tana Delta located in Tana River County, Kenya (Figure 1). The Delta is around 38,782 km² wide and goes from the mouth of the Tana River to the Tsavo plains. It is made up of different ecological zones like savannah grasslands, riparian and gallery forests, mangroves, agricultural fields, floodplain wetlands, and areas that are only seasonally inundated (Jenkins, Warren & Price, 2021). The height of the land ranges

from 0 to 200 meters above the sea level. The alluvial soils (mainly vertisols and fluvisols) characterize the Delta and they are the ones that mainly sustain the small-scale agriculture done by the Pokomo community. There is a bimodal pattern of annual rainfall that ranges from 300 mm to 500 mm and there are also common occurrences of droughts (Uruji, 2021).

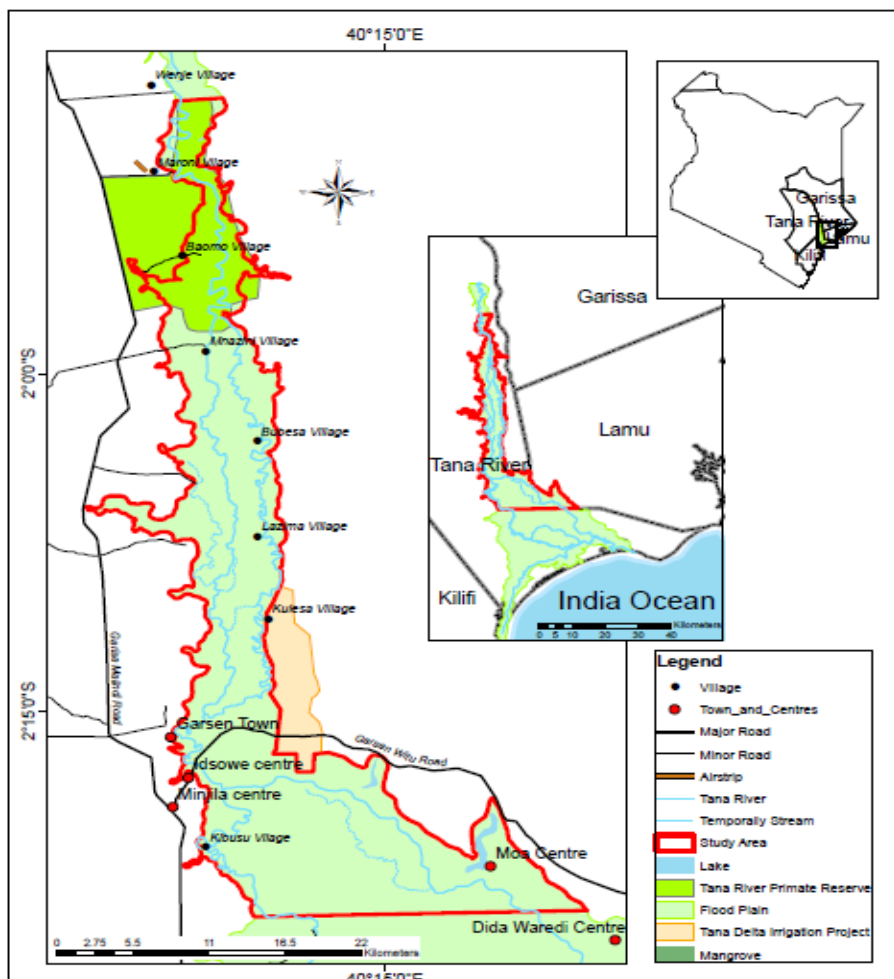


Figure 1: Location of the study area showing the lower Tana River Delta

Source: Researcher (2025)

From an ecological perspective, the Tana River Delta (TRD) is one of the

major biodiversity areas in East Africa and is home to a large number of endemic and

even some endangered species. Among them, the Tana River Red Colobus (*Piliocolobus rufomitratu*s), which is critically endangered and whose population is further fragmented through the loss of habitat, is one of the species that are highly reliant on the narrow strips of gallery forests and riverine wetlands—the only natural habitat of this species. The fragmentation of these forest patches is further aggravated by the increasing conversion of forest land to agricultural land, the incursion of livestock into the forest, and the growing skirmishes between the pastoralist Orma, Wardei, and farming Pokomo communities. These conflicts are responsible for facilitating the degradation of these forests and thus putting the survival of *P. rufomitratu*s at risk as they are totally dependent for their existence on the forested gallery areas that are intact.

Target population, Sampling techniques and Size

The study population was diverse and it included a wide range of stakeholders in the Tana Delta area, such as local people, employees of the Kenya Wildlife Service (KWS) and Kenya Forest Service (KFS) who are responsible for the Tana River Primate Reserve, village chiefs, elders, and representatives of NGOs working in conservation. A total of 255 respondents took part in the study. Out of these, 200 were community members chosen by systematic sampling. Additionally, 15 key informants' chiefs, elders, KWS and KFS officers, agricultural and land officials, and representatives from such NGOs as Nature Kenya and the Tana Pastoralist Forum—were selected based on their deep knowledge of conservation and community dynamics. Moreover, 40 people participated in four Focus Group Discussions (FGDs); each of the ten participants was from a different gender, age, occupation, and tribe background, and thus, represented a

broad range of viewpoints. The sample size of 255 was calculated based on Yamane's (1967) formula for sample size determination ($n = N / (1 + N(e)^2)$) at 95% confidence level and a 5% margin of error. This resulted in a minimum sample size of about 200 community respondents, plus a few more to be included for key informant interviews and FGDs in order to ensure the breadth of perspectives.

Data Collection and Sampling Procedures

Mixed-methods research was used, consisting of questionnaires, Focus Group Discussions (FGDs), interviews with key informants, and observation as method of data collection.

Sampling Procedures

First, the villages of Tana Delta were classified into east bank and west bank groups. The local administrative records provided a list of all the villages in each group which constituted the sampling frame. Then, out of each group, one village was picked randomly. In each village chosen, systematic sampling was applied to households' selection. The 5th household along the paths that were accessible and the main routes in the village was the one picked, this helped with logistical feasibility and also made sure there was even spatial coverage. There is acknowledgement within the study that due to the systematic sampling activity applied to the principal route systems, it is likely that households that are located in fringe areas or in more isolated places may be missing from the overall sample, which would yield a level of sample bias. To mitigate this limitation, the researcher incorporated the use of strategic key informant interviews to ensure a varied range of perspectives was included in addition to the FGDs conducted with household sampling. The FGDs included participants from the different sections of villages that were either accessible or remote. These

qualitative methods provided more information from the less-accessible areas which increased the overall dataset's representativeness and balance. Only household heads or adults aged 18 years and above were allowed to take part in the questionnaire survey.

Questionnaires

A structured questionnaire containing both closed- and open-ended items was administered. To obtain data regarding attitudes, perceptions, beliefs, and taboos associated with the red colobus and red colobus conservation, Closed-ended Items, which included 5 Point Likert-type scales and multiple-choice categories were used. Open-ended questions elicited qualitative data related to Cultural Values and Local Ecological Knowledge (L.E.K.). The questionnaire was pretested with individuals in a neighbouring community to measure reliability and validity, as well as identify any areas of potential confusion within the questionnaire itself. Necessary adjustments were made to improve question structure and eliminate ambiguity. Reliability of Likert-scale items was checked using Cronbach's alpha.

Key Informant Interviews

Through purposive sampling, a total of 15 key informants were selected for interview based on their individual subject area expertise, specifically in conservation, local governance, land use and community norms. With expert knowledge, these informants provided insights into cultural practices, patterns of forest usage, ecology of conflict, and issues associated with conservation.

Focus Group Discussions (FGDs)

A series of four focus group discussions (each consisting of ten participants with varied demographics - including gender, age, tribe and occupation) explored the history of Tana

River, the cultural beliefs surrounding Tana River, and the general perception of Tana River and its forests among the people of Tana River. The data collected from these discussions were outlined in an effort to triangulate findings from questionnaire surveys and interview processes and the results.

Direct Observations

Through non-participant observation, the data collection process was expanded to include community interaction with the environment and use of the forest as well as what may be visually evident from the colobus habitat. The method of non-participant observation also allowed for documentation of observations of *P. rufomitratus* (visibly) in the research area, thus complementing the other forms of data collection.

Data analysis

Quantitative Analysis

Prior to any analysis, the data from the questionnaire was prepared for analysis by cleaning, coding and entering it into IBM Statistical Package for the Social Sciences (SPSS) Statistics Software version 20. To summarise the socio-demographic, cultural values, attitudes and perceptions of the respondents, descriptive statistics (i.e., Frequencies, Percentages and Means) were calculated. Inferential analysis was carried out through a Cross-tabulation to evaluate associations between the selected demographics and the selected variables.

Qualitative Analysis

Transcripts of qualitative data obtained from interviews (personal and group) were produced and coded before theme analysis was conducted on them. A Thematic Approach to analysing the data using an inductive way for themes to emerge was used. All coding and theme

development were facilitated using NVivo Qualitative Data Analysis Software. The themes that emerged were largely related to Cultural Beliefs, Taboos, Values, LEK, and practices in relation to the conservation of Red Colobus. The findings of the qualitative analysis were combined with the quantitative findings and presented in a variety of formats (i.e., tables, charts, narrative descriptions, and descriptive summaries) in order to provide a more holistic perspective.

Results and Discussion

Benefits accrued from Tana River Delta Resources

Almost all participated in this survey (97%) recognized the Tana Red Colobus in the delta forests. Reported benefits associated with conservation included tourism (65%), jobs (58%), access to research (34%), water (66.5%), herbs (55.5%), timber (44.5%), fruits (42.5%), firewood (39.5%) and cultural sites. The statistical significance of differences in resource access was confirmed ($\chi^2=277.236$, $df=9$, $p=0.001$).

The majority of the respondents (83.9%) valued the Tana Red Colobus for 39.2%, it was based on employment in the local economy, while 34.6% referenced tourism, and for 16.3%, it was an income generative value. The other 16.1% of

respondents did not value the Tana Red Colobus. Few of the respondents mentioned the aesthetic value of the Tana Red Colobus and fewer referenced any ecological value. When comparing the differences of value appreciation measure against one another, there were statistically significant differences ($\chi^2=83.094$, $df=5$, $P=0.001$).

Cultural practices, and taboos, Pokomo songs, and protection of sacred sites were a driver of conservation behavior in terms of respecting the Tana Red Colobus and its habitats. These measures of indigenous governance systems support biodiversity conservation through their associated “no-go zones” (Cocks, 2006). However, with modernization, the impacts of traditional and cultural ecological practices may be compromised, with future research recommended into the resilience of value systems of cultural practices (Colding & Folke, 2001). Furthermore, comparison against distance showed spatial variation where communities closest to the reserve reported more restrictions compared to communities further away. Sustainable forest management should strive to maintain equity around access and resource sharing in the context of social and community-based models, while integrating cultural values with formal (bio)protection (Nkem *et al.*, 2010).

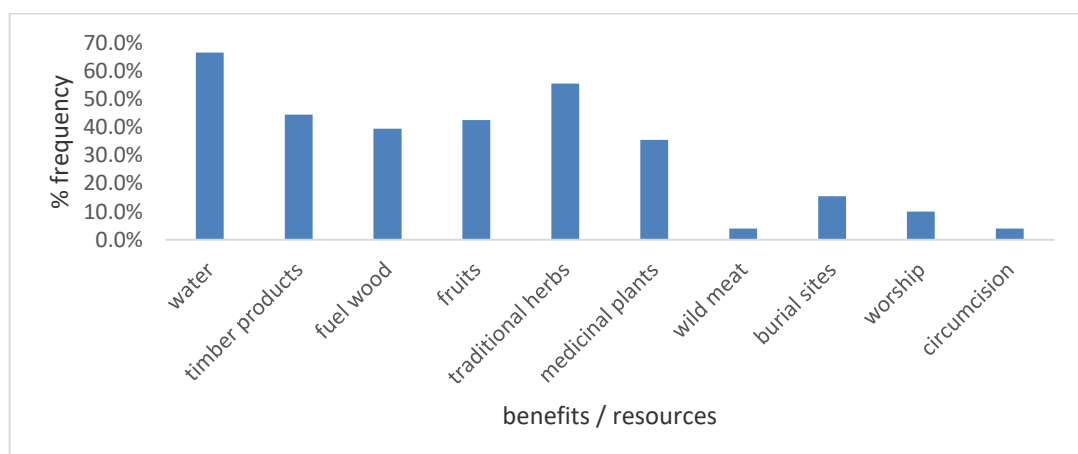


Figure 2: Benefits derived from the Tana River Delta

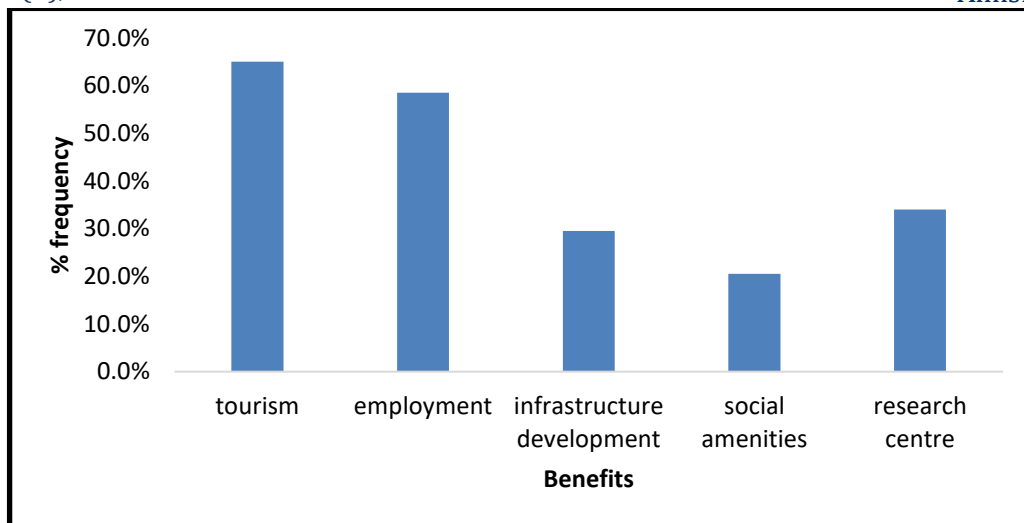


Figure 3: Benefits associated with Tana Red Colobus conservation by community in the Tana River Delta as indicated in Figure 4.

Results of the cross-tabulations showed that resource utilization differed by gender

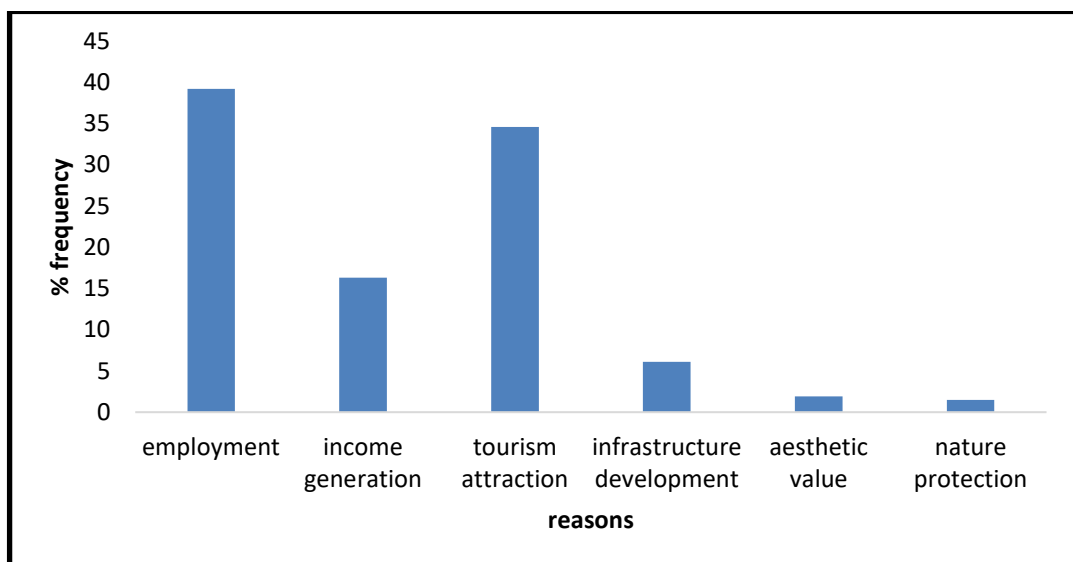


Figure 4: Reasons for appreciating the Tana Red colobus

Specifically, water access was utilized more by males (63%) than by females (37%) ($\chi^2=8.65$, $P=0.003$) which can be attributed to men's role in herding livestock and their proximity to access water (Nkem *et al.*, 2010). Timber collection was carried out more by males (82%) than females (18%) ($\chi^2=40.96$, $P=0.0033$) likely because timber consumption and timber products have more physical demands or economic

viability (Mogaka *et al.*, 2017). The collection of traditional medicines had like trends; males (60%) compared to females (40%) ($\chi^2=4.00$, $P=0.0455$) with the gendered trend based on cultural roles such as traditional healers (Ticktin & Shackleton, 2011). In contrast, the collection of fuelwood and fruit was much more prevalent by females (67%) than males (33%) ($\chi^2=11.56$, $P=0.007$). This likely has to do with women's household

duties regarding cooking and following up on household nutrition (Shackleton et al., 2011). Only males reported collecting medicinal plants and used the Delta for burial. Overall, the resource usage

patterns were a gendered division of labor, shaped by socio-economic and cultural norms (Ahenkan & Boon, 2011), and highlighted the need for gender-sensitive conservation and resource use strategies.

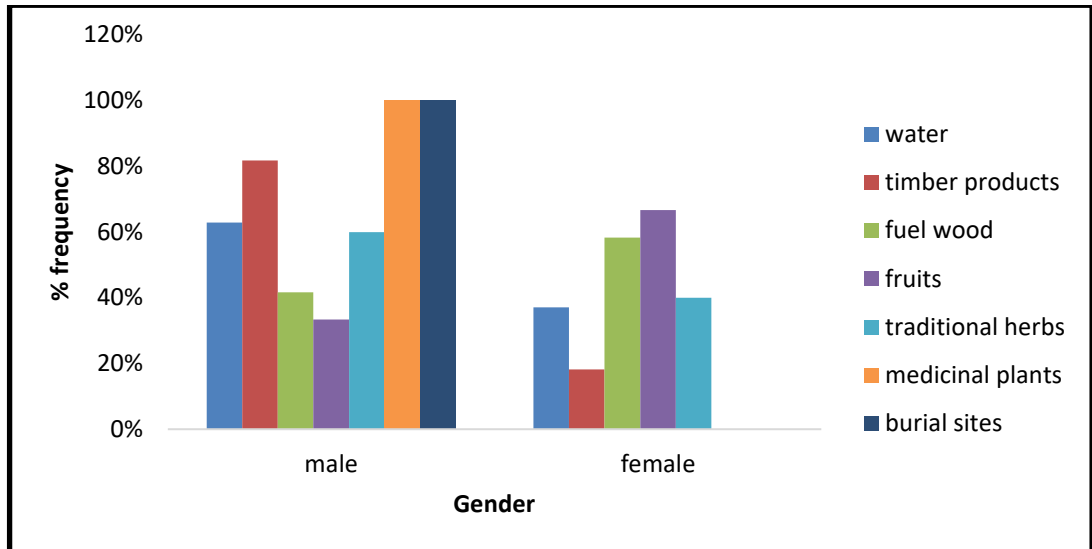


Figure 5: Types of resources obtained from Tana Delta based on gender

The analysis of the data shows that different households located at various distances from the Tana Delta experience unique psychosocial benefits based on their location relative to the forest. Interestingly, housings located at 2.5–2.9km from the forest receive most of the positive psychosocial benefits. Statistical evidence supports this finding ($\chi^2=59.113$ $df=36$ $p=0.009$). A significant study revealing no statistical difference between households at 0-400m from the forest ($\chi^2 =1.186$ $p=0.276$) only strengthens the likelihood that psychosocial gains will be seen in households within the (401-800m) ($\chi^2 =53.441$ $p=0.001$) (800-1200m) ($\chi^2 =34.562$ $p=0.001$). In addition, households located at 2500-2900m also benefited from the psychosocial benefits of the forest ($\chi^2 =12.959$ $p=0.001$). Similar findings have been reported elsewhere in Africa demonstrating that spatial proximity to forest resources is an important factor determining accessibility

and wellbeing of forest resources. (Ahenkan & Boon, 2011; Nkem et al., 2010).

Patterns of access vary with respect to distance. Households who live near forests have experienced significantly stricter conservation regulations than those located farther away, yet they tend to exhibit more positive attitudes towards conservation and greater attachment to the forest's culture and heritage, as well as a greater reliance on sacred areas and sites than distant households. The aforementioned findings corroborate prior research in three sub-Saharan Africa countries (Kenya, Ghana, and Zimbabwe) that show near-forest communities derive significant cultural, spiritual and identity-based value from forests (Maundu et al., 2009; Chidumayo & Gumbo, 2013). Conversely, households farther away from forests reported participating more frequently in higher value extraction activities (i.e., timber poles and construction materials),

which ultimately resulted in lower psychosocial benefits and more pronounced economic dependencies; these findings are consistent with what has been found in Ethiopian and Cameroonian forest economies (Tadesse, 2019).

When it comes to how resources are used and conflicts arise, gendered roles play a significant role. The majority of the resources that women rely on come from moderate access zones (401-800 m), where women's ability to collect firewood, herbs, and water to care for their households is not interrupted by restrictions on resource use. In places like Tanzania and Ghana, it has also been found that women are at increased risk of conflict during resource gathering due to access restrictions (Jaggernath, 2014). Men tend to engage in the most resource-based conflicts at greater distances than women do, as men's livelihood activities involve extracting high-value resources (timber, livestock) and thus policies against them are primarily enforced in areas of still economic significance. The different pressures faced by women and men demonstrate the necessity of gender-responsive conservation strategies.

Indigenous systems of governance and other cultural practices continue to play a crucial role in shaping the relationship between forests and communities across the Tana Delta. Clan elders, custodians of rites, and traditional taboos have for many generations controlled and restricted access to forests, giving rise to rules and penalties related to unsustainable harvesting activities. These same mechanisms have been found to exist in sacred groves across West Africa, coastal communities in Kenya, and the customary institutions of forest management of Ethiopia (Agrawal & Chhatre, 2007). The persistence of these systems among households in close proximity to forests may explain why they

exhibit more positive attitudes toward conservation even in the face of more stringent regulations enforced through formal conservation law. Incorporating indigenous governance systems into formal conservation frameworks has been shown in many areas throughout Africa to enhance compliance with laws governing conservation practices, reduce potential conflict over forest resources, and create a framework that facilitates sustainable resource management into the future (Maundu et al., 2009).

In summary, spatial access, gender-specific labour roles, and Indigenous governance all constrain the mental and physical wellbeing that results from using forests and forest resources. In order to address these constraints, effective interventions will need to target the area that is mid-distance from both men's and women's homes, as this is where women's use of forests is greatest, and also to target areas that are located furthest from these homes, as this is where most men's extraction of forest resources creates conflict. Furthermore, combining the use of legal requirements with culturally appropriate institutions will provide the most appropriate method for managing forest resources in a fair and sustainable manner. The mental wellbeing benefits that encompass a person's connection to forest environments are expressed in terms of emotional, cultural, and social benefits; namely, the relationship a person shares with their cultural identity, continuity, and spirituality, as well as social support, community cohesion, and an increased feeling of belonging and security within the community. These non-physical benefits play a crucial role in enhancing the health of communities that depend on the forest for their livelihoods and, as a result, they are being increasingly recognised as significant components of the relationship between a person and the environment (Shackleton et al., 2015).

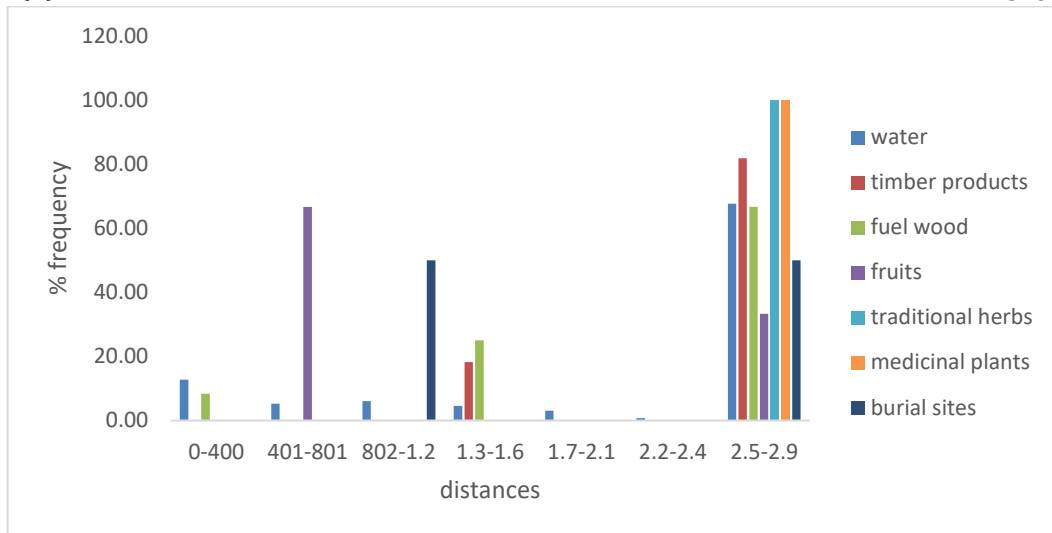


Figure 6: Relation between resource extractions and distance from Tana National Reserve boundary

Chi-square analysis indicated a statistically significant association between education level and benefits from Tana Delta and Red Colobus conservation according to the $\chi^2 = 49.1214$, $df = 2$, $p = 0.0001$). According to the study, individuals with secondary education (45%) received the most benefit from the experience of holding a job with the research center and engaging in tourism ventures. Individuals with primary education gained most benefit from conservation jobs (45%) and tourism (42%), with no significant difference in benefits according to $\chi^2 (0.103)$, $p = 0.7477$. Similarly, most respondents with tertiary

education (90%) benefited from holding jobs, with a small number of respondents (4%) receiving benefit from tourism ($\chi^2 = 0.923$, $p = 0.1655$). Uneducated respondents only received benefit through tourism. These findings were similar to Van den Berg & Koole (2006) and Sayer et al. (2013), and showed that individuals with a standard education would be better positioned for employment opportunities associated with conservation and tourism. However, as noted in Thakholi & B scher (2024), little of the economic gain was going to support the local community relative to external stakeholders.

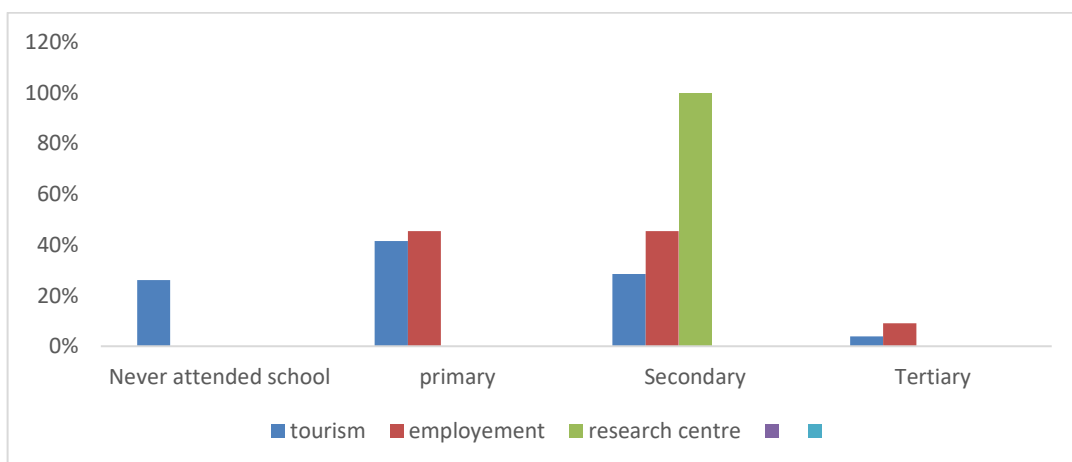


Figure 7: Relationship between benefits obtained from Tana National Reserve and education level of the respondents

Challenges to community-based conservation of the Tana Red colobus and their habitats

The questionnaire identified habitat loss (77%) and human-Colobus conflict (40.7%). The KIIs confirmed agricultural expansion (85.7%) as the main driver, destruction of mango (25.5%), and cutting of trees (14.5%) due to forest clearing, with statistically significant differences ($\chi^2=89.87$, $df=6$, $p=0.0000$). There were also issues with forest fire (0.7%) and unsustainable usage of resources (1.4%). The main conflicts were deforestation for farming and illegal logging, with 75% of focus group participants reporting these conflicts,

corroborating the trend noted globally (Wunder, 2001). In addition, these actions created more opportunities for human-wildlife conflicts, as animals ventured into farmland and other agricultural areas. Collaborative management is an option that can reduce human-wildlife conflicts (Adams & Hutton, 2007). Crop damage due to wildlife is common in other areas (Naughton-Treves *et al.*, 2005). The use of compensation, barriers, and buffer crops (Nyhus *et al.*, 2003) along with community-based forest management and awareness programs can create a space for coexistence while conserving biodiversity sustainably.

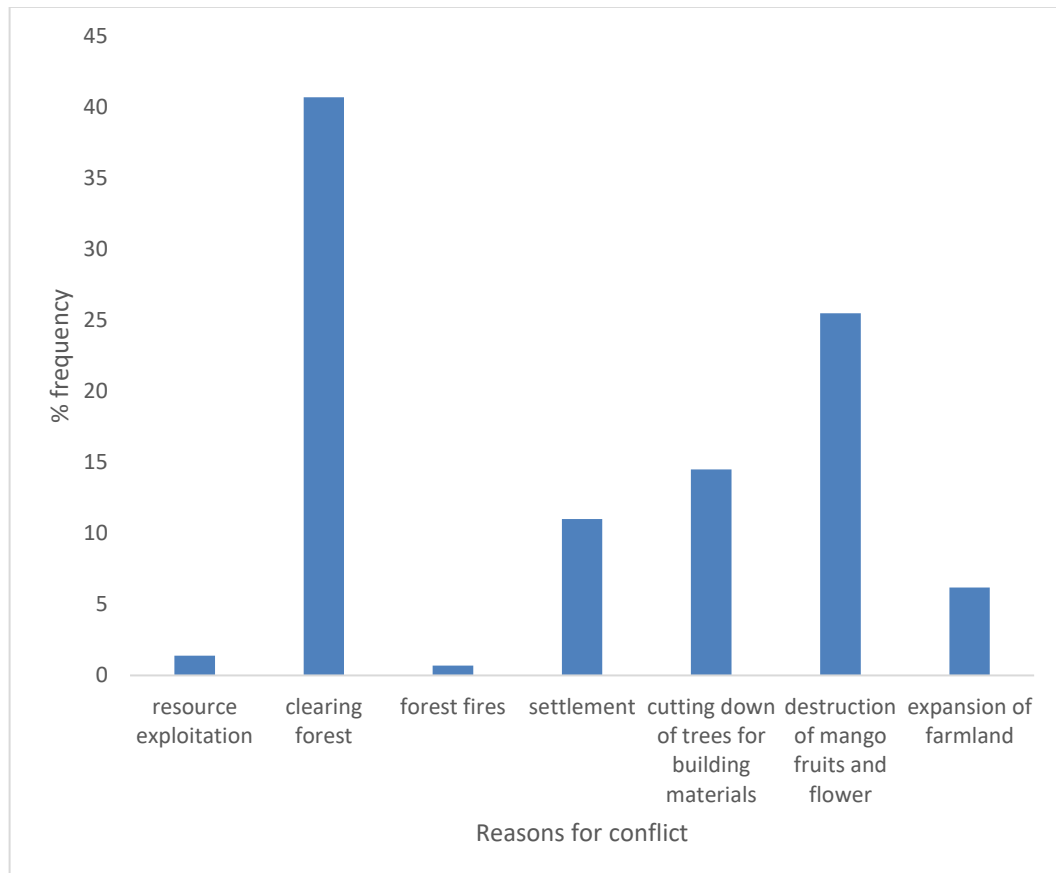


Figure 8: Reasons for conflict between Tana Red Colobus and the community

To mitigate the foregoing challenges, various measures have been put in place by the community and the county government among them

promotion of active conservation of the Red Colobus (47.9%), and enforcement of traditional conservation laws (26.0%) (Figure 9).

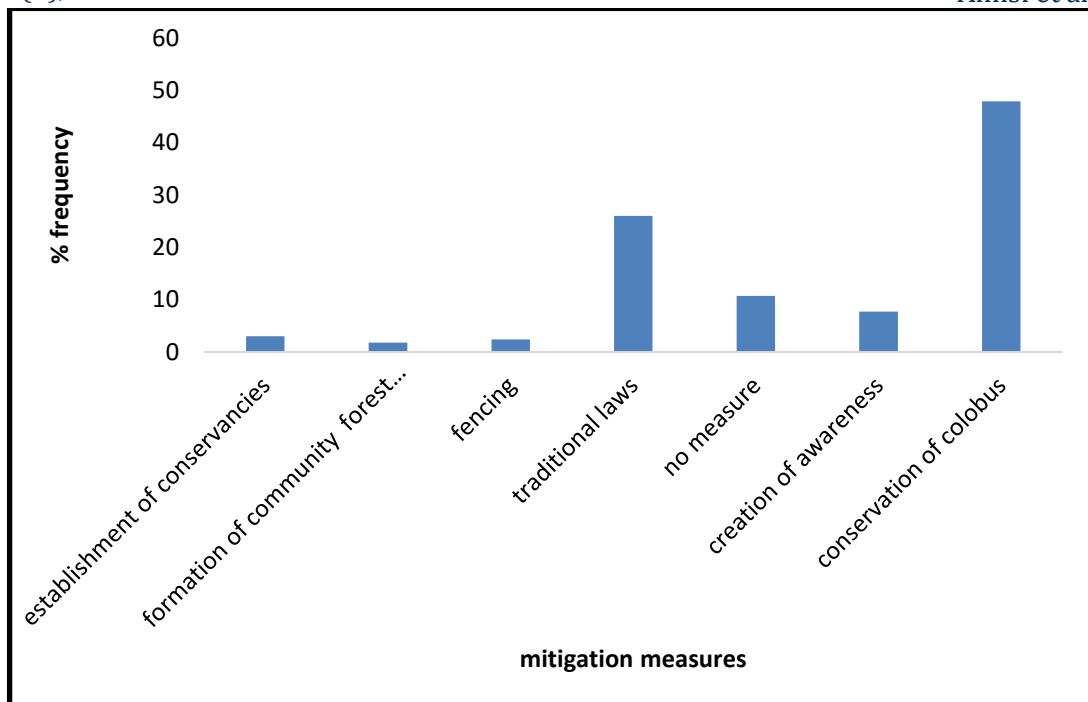


Figure 9: Measures implemented by the government and the community to mitigate challenges faced

Integrated Thematic Synthesis of Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs) Findings

A qualitative component of both key informant and community focus groups' responses found a high degree of awareness of Tana Red Colobus, with all respondents indicating familiarity with the species. The majority of key informants viewed the population of Tana Red Colobus as in decline, primarily due to the expansion of agricultural lands, charcoal production, and overgrazing. In addition to these threats, other significant factors contributing to the decline of Tana Red Colobus include human-wildlife conflict, climate change, and illegal logging; therefore, Tana Red Colobus is subject to a variety of ecological and anthropogenic factors affecting their survival. In general, it is the opinion of government officials and conservationists that conservation efforts to protect Tana Red Colobus have focused on establishing protected areas (including Tana River Primate Reserve) and conducting community-based

awareness campaigns aimed at conserving Tana Red Colobus habitat and encouraging coexistence between Tana Red Colobus and local communities.

Community members exhibited conflicting views regarding their attitudes toward the conservation of the Red Colobus monkey despite the introduction of numerous conservation initiatives aimed at improving attitudes toward the species. Increased awareness has created a greater appreciation for the monkey by some but other individuals resisted the initiatives due to restrictions placed on access to forest products that are essential to their livelihood on a daily basis. Some participants of this study expressed empathy towards the Red Colobus monkey, while others felt they created problems, particularly when they damage crops, such as mangoes. Community responses to these types of conflicts tended to be passive and primarily reactive, ranging from attempts to scare off the monkeys to completely ignoring the problem, reflecting a lack of

formal conflict management strategies at the household level.

According to participants in the Focus Group Discussions (FGDs), the Tana River Delta's greatest benefits to them come primarily from fertile agricultural land/grazing territory, rather than from the conservation of the Red Colobus. Current resources used include growing maize/rice and grazing livestock. Participants in these discussions did not report material benefits directly resulting from conserving the Red Colobus; instead, they indicated that their cultural and ecological significance do exist. The cultural value associated with the Red Colobus includes traditional songs, dance, and burial practices related to regions with forest (displays how cultural identity is strongly intertwined with the gallery forests in which the Red Colobus lives).

Through Key Informant Interviews (KIs), as well as through FGDs, many participants mentioned that conservation organizations, such as Nature Kenya and the Tana River Primate Reserve (TRPR), raised community awareness, engaged with community members, and have shown commitment to supporting/carrying out conservation activities. However, community members expressed that these efforts have not yet resulted in tangible household benefits, which has further perpetuated the idea of unequal distribution of both the gains and burdens of conservation. In general, qualitative results reveal that the awareness of Tana Red Colobus is high, yet significant livelihood pressures and a combination of positive and negative attitudes towards conservation exist alongside limited participation in locally based means of reducing conflict. Cultural and traditional influences on conservation perception remain present, but without ongoing community incentive and effective governance, local support for conserving Red Colobus may continue to be tenuous at best.

Conclusion and Recommendation

Cultural mechanisms such as taboos, beliefs, and folktales have a strong influence on community-based conservation of the Tana Red Colobus through their informal governance of forests. Despite the fact that nearly all of the community members had positive attitudes towards conservation efforts, pockets of resistance due to inequitable distribution of benefits may threaten the long-term sustainability of these efforts. Gender roles, education levels, and physical distance from the reserve all influenced people's perceptions and resource use, indicating the complexity of socio-cultural dynamics in conservation. Therefore, the long-term sustainability of the Tana River Red Colobus conservation centers on transitioning from a purely utilitarian value system to one that formally integrates local cultural structures while urgently addressing socio-economic equity and resource conflict drivers. Officially integrate the community elders and traditional leaders responsible for enforcing taboos and protecting sacred sites into the formal management structure of the Tana River Primate Reserve (TRPR). Design new conservation benefit-sharing programs that decouple benefits from formal education levels. These programs should prioritize direct, targeted support (e.g., grants for alternative livelihoods, community social projects) for uneducated community members and households located in the buffer zone/fringe communities that experience the greatest conservation restrictions.

Acknowledgment

The authors express gratitude to research assistants Said Omar and Omar Bahatisha for their support in this study.

References

- Adams, W. M., & Hutton, J. (2007). People, parks, and poverty: Political ecology and biodiversity conservation. *Conservation and Society*, 5(2), 147-183. https://journals.lww.com/coas/fulltext/2007/05020/People_Parks_and_Poverty_Political_Ecology_and.1.aspx
- Agrawal, A., & Chhatre, A. (2007). State involvement and forest co-governance: evidence from the Indian Himalayas. *Studies in Comparative International Development*, 42(1), 67-86. <https://doi.org/10.1007/s12116-007-9004-6>
- Ahenkan, A., & Boon, E. (2011). Non-timber forest products (NTFPs): Clearing the confusion in semantics. *Journal of Human Ecology*, 33(1), 1-9. https://www.researchgate.net/publication/228431397_Non-Timber_Forest_Products_NTFPs_Clearing_the_Confusion_in_Semantics
- Chidumayo, E. N., & Gumbo, D. J. (2013). The environmental impacts of charcoal production in tropical ecosystems of the world: A synthesis. *Energy for Sustainable Development*, 17(2), 86-94. <https://doi.org/10.1016/j.esd.2012.07.004>
- Cocks, M. (2006). Biocultural diversity: Moving beyond the realm of 'indigenous' and 'local' people. *Human Ecology*, 34(2), 185-200. <https://doi.org/10.1007/s10745-006-9013-5>
- Colding, J., & Folke, C. (2001). Social taboos: "Invisible" systems of local resource management and biological conservation. *Ecological Applications*, 11(2), 584-600. [https://doi.org/10.1890/1051-0761\(2001\)011\[0584:STISOL\]2.0.CO;2](https://doi.org/10.1890/1051-0761(2001)011[0584:STISOL]2.0.CO;2)
- Duvail, S., Médard, C., Hamerlynck, O., & Nyngi, D. W. (2012). Land and water grabbing in an East African coastal wetland: The case of the Tana delta. *Water alternatives*, 5, 322-343. <https://www.water-alternatives.org/index.php/allabs/172-a5-2-8/file>
- Estrada, A., Garber, P. A., Rylands, A. B., Roos, C., Fernandez-Duque, E., Di Fiore, A., ... & Li, B. (2017). Impending extinction crisis of the world's primates: Why primates matter. *Science Advances*, 3(1), e1600946. <https://doi.org/10.1126/sciadv.1600946>
- Fotsing, E. D., Kamkeng, M. M., & Zinner, D. (2024). Opinions, attitudes, and perceptions of local people towards conserving Nigeria-Cameroon chimpanzees in Mpem-Djim National Park, central Cameroon. *People and Nature*. <https://doi.org/10.1002/pan3.10621>
- Hanel, P. H., Foad, C., & Maio, G. R. (2021). Attitudes and values. 411-426. <https://repository.essex.ac.uk/36645/>
- Jaggernath, J. (2014). Women, climate change and environmentally-induced conflicts in Africa. *Agenda*, 28(3), 90-101. <https://doi.org/10.1080/10130950.2014.939837>
- Jenkins, R. L., Warren, R. F., & Price, J. T. (2021). Addressing risks to biodiversity arising from a changing climate: the need for ecosystem restoration in the Tana River Basin, Kenya. *PLoS One*, 16(7), e0254879. <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0254879>
- Linder, J. M., Cronin, D. T., Ting, N., Abwe, E. E., Aghomo, F., Davenport, T. R., ... & Struhsaker, T. T. (2024). To conserve African tropical forests, invest in protecting its most endangered group of monkeys, red colobus. *Conservation Letters*, 17(3), e13014. <https://doi.org/10.1111/conl.13014>
- Linder, J. M., Cronin, D. T., Ting, N., Abwe, E. E., Davenport, T. R., Detwiler, K., ... & Struhsaker, T. T. (2021). Red colobus (*Piliocolobus*) conservation action plan 2021–2026. <https://portals.iucn.org/library/site/library/files/documents/2021-015-En.pdf>
- Maundu, P., Kibet, S., Morimoto, Y., Imbumi, M., & Adeka, R. (2009). Impact of *Prosopis juliflora* on Kenya's semi-arid and arid ecosystems and local livelihoods. *Biodiversity*, 10(2-3), 33-50. <https://doi.org/10.1080/14888386.2009.9712842>
- Mulu, K. S. (2010). Are the endemic and endangered Tana River primates culprits of crop raiding? Evaluating Human–Nonhuman primate conflict status around Tana River Primate Reserve, in Kenya. https://rufford.org.s3.amazonaws.com/media/project_reports/26.02.09%20Detailed%20Final%20Report.pdf
- Musyoka, V. V. (2019). *Agro-pastoral conflicts and cooperation in Kenya: The case of Orma and Pokomo in Tana Delta, 1992-2017* (Doctoral dissertation, University of Nairobi). <https://erepository.uonbi.ac.ke/handle/11295/109798>
- Naughton-Treves, L., Buck Holland, M., & Brandon, K. (2005). The role of protected areas in conserving biodiversity and sustaining

- local livelihoods. *Annual Review of Environment and Resources*, 30(1), 219-252.
<https://doi.org/10.1146/annurev.energy.30.050504.164507>
- Nkem, J., Kalame, F. B., Idinoba, M. E., Somorin, O. A., Ndoye, O., & Awono, A. (2010). Shaping forest safety nets with markets: Adaptation to climate change under changing roles of tropical forests in the Congo Basin. *Environmental Science & Policy*, 13(6), 498-508.
<https://doi.org/10.1016/j.envsci.2010.06.004>
- Nyhus, P. J., Fischer, H., Madden, F., & Osofsky, S. A. (2003). Taking the bite out of wildlife damage: The challenges of wildlife compensation schemes. *Conservation in Practice*, 6(2), 37-43.
https://digitalcommons.colby.edu/cgi/viewcontent.cgi?article=1015&context=faculty_scholarship
- Sayer, J., Sunderland, T., Ghazoul, J., Pfund, J. L., Sheil, D., Meijaard, E., ... & Buck, L. E. (2013). Ten principles for a landscape approach to reconciling agriculture, conservation, and other competing land uses. *Proceedings of the national academy of sciences*, 110(21), 8349-8356.
<https://doi.org/10.1073/pnas.1210595110>
- Shackleton, C., Shackleton, S., & Shanley, P. (2011). Building a holistic picture: An integrative analysis of current and future prospects for non-timber forest products in a changing world. In *Non-timber forest products in the global context* (pp. 255-280). Berlin, Heidelberg: Springer Berlin Heidelberg.
https://link.springer.com/chapter/10.1007/978-3-642-17983-9_12
- Tadesse, A. (2019). Economic implications of non-timber forest products/benefits/to livelihood improvement in terms of income and determinants of household participation in ntfps collection: a case study of mecha woreda, amhara region.
<https://www.iiste.org/Journals/index.php/JEDS/article/view/46133>
- Thakholi, L., & Büscher, B. (2024). Conserving inequality: How private conservation and property developers 'fix'spatial injustice in South Africa. *Environment and planning E: Nature and Space*, 7(1), 87-103.
<https://doi.org/10.1177/25148486211066388>
- Uruji, R. M. (2021). *Impact of Damming River Tana on Floodplain Livelihoods of the Pokomo Community in Kenya* (Doctoral dissertation, Kenyatta University).
<https://ir-library.ku.ac.ke/server/api/core/bitstreams/1b9c601b-2c80-41b2-b1f8-c0ffe7a4397a/content>
- Van den Berg, A. E., & Koole, S. L. (2006). New wilderness in the Netherlands: An investigation of visual preferences for nature development landscapes. *Landscape and urban planning*, 78(4), 362-372.
<https://doi.org/10.1016/j.landurbplan.2005.11.006>
- Wunder, S. (2001). Poverty alleviation and tropical forests—what scope for synergies?. *World development*, 29(11), 1817-1833.
[https://doi.org/10.1016/S0305-750X\(01\)00070-5](https://doi.org/10.1016/S0305-750X(01)00070-5)