RESEARCH ARTICLE

Local community attitudes and perceptions towards benefits and challenges associated with biodiversity conservation in Blouberg Nature Reserve, South Africa

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Abstract

This study assessed the benefits and challenges associated with local community involvement in biodiversity conservation in the Blouberg Nature Reserve (BNR) of South Africa. To achieve this, a descriptive research design was used in the study. Three hundred and thirty-five households from four villages scattered around the nature reserve were selected using a stratified systematic sampling procedure to participate in a household questionnaire survey. The BNR Manager was purposefully selected for an in-depth structured interview so that an overview of socio-economic benefits and challenges to the community from the park's perspective could be known. Field data collection was conducted during the month of June 2019. Descriptive and inferential statistical methods as well as thematic analysis were used to analyse the field data. The main study findings indicated that the community members do not obtain sufficient socio-economic benefits from the nature reserve. The majority of the household respondents (89.6%) were not participating in biodiversity conservation in the nature reserve, despite possessing knowledge about nature conservation. The chi-square test results showed a significant association between household respondents' conservation involvement and access to natural benefits ($p = 0.008$), and not cultural benefits ($p = 0.740$). Moreover, the chi-square test results further show no significant association between household attributes (gender and age) and knowledge of the role of nature reserve ($p > 0.05$), whereas education had a bearing on the knowledge possessed by households ($p < 0.05$). Overall, the findings indicate the need for more community involvement to support biodiversity conservation within nature reserves.

KEYWORDS
benefits, biodiversity conservation, challenges, community involvement, community-based natural resource management approach

Résumé

Cette étude a évalué les avantages et les défis associés à la participation des communautés locales à la conservation de la biodiversité dans la réserve naturelle de Blouberg (RNB) en Afrique du Sud. Pour ce faire, un modèle de recherche descriptif a été utilisé dans l'étude. Trois cent trente-cinq ménages vivant dans quatre villages dispersés autour

de la réserve naturelle ont été sélectionnés à l'aide d'une procédure d'échantillonnage systématique stratifiée pour participer à une enquête par questionnaire auprès des ménages. Le gestionnaire de la RNB a été sélectionné à dessein pour un entretien structuré approfondi afin d'obtenir une vue d'ensemble des avantages et des défis socio-économiques pour la communauté du point de vue du parc. La collecte de données sur le terrain a été réalisée au cours du mois de juin 2019. Des méthodes statistiques descriptives et inférentielles ainsi que l'analyse thématique ont été utilisées pour analyser les données de terrain. Les principaux résultats de l'étude ont indiqué que les membres de la communauté n'obtiennent pas suffisamment de bénéfices socio-économiques de la réserve naturelle. La majorité des ménages interrogés (89.6%) ne participent pas à la conservation de la biodiversité dans la réserve naturelle, bien qu'ils possèdent des connaissances sur la conservation de la nature. Les résultats du test du chi carré ont montré une association significative entre la participation des ménages interrogés à la conservation et l'accès aux avantages naturels ($p = 0.008$), mais pas aux avantages culturels ($p = 0.740$). De plus, les résultats du test du chi carré ne montrent aucune association significative entre les attributs des ménages (sexe et âge) et la connaissance du rôle de la réserve naturelle ($p > 0.05$), alors que l'éducation a une influence sur les connaissances des ménages ($p < 0.05$). Dans l'ensemble, les résultats indiquent la nécessité d'une plus grande implication de la communauté pour soutenir la conservation de la biodiversité dans les réserves naturelles.

1 | INTRODUCTION

Biodiversity plays a crucial role in sustaining human livelihoods through providing critical ecosystem goods and services, as well as nature-based solutions to climate change and problems caused by changes in the environment (Wang & Gamon, 2019). The Convention on Biological Diversity (CBD) defines biodiversity as the variability among organisms from all sources, which include terrestrial, marine and other aquatic ecosystems, as well as the ecological complexes of diversity within and between species (United Nations Environmental Programme Finance Initiative, 2008). Despite natural and human livelihood benefits, biodiversity loss remains one of the major disturbing environmental challenges (Ntshane & Gambiza, 2016; Sieber et al., 2013). For example, land use changes (Matavire et al., 2015; Ntshane & Gambiza, 2016; Seutloali et al., 2018; Sibanda et al., 2016), climate change (Khare & Ghosh, 2016; Li et al., 2018), invasive alien species (Mtengwana et al., 2020; Thamaga & Dube, 2018) and unsustainable utilisation of natural resources, as well as pollution (Gumindoga et al., 2018; Thant, 2017) are some of the threats to biodiversity existence. In addition, human activities are also a cause for concern in biodiversity conservation (Kideghesho, 2008; Slingenberg et al., 2009; Thant, 2017). The study by Biggs et al. (2008) demonstrated that cultivated areas, in the form of cropland and planted pastures for livestock fodder, are the major drivers of the projected biodiversity loss in southern Africa over the 21st Century.

Due to accelerated biodiversity loss and increased risk for extinction, Protected Areas (PAs), have been introduced since 1872 to preserve critical species and ecosystems (Andrade & Rhodes, 2012; Burgess, 2012; Poirier & Ostergren, 2002). Protected Areas were established to protect biodiversity for the benefits of present and future generations (Poirier & Ostergren, 2002; West et al., 2006). According to United Nations Environment Programme - World Conservation Monitoring Centre et al. (2018), commendable strides have been made in promoting and establishment of PAs, globally. However, the majority of these PAs were administered under fortress conservation policies, whereby local communities were denied direct access to the natural resources (Andrade & Rhodes, 2012 and Ayivor et al., 2013). During the 19th Century, it was realised that this approach although effective had its own limitations, as it was not inclusive. This led to a change in policies resulting in the adoption of the Community-Based Natural Resource Management (CBNRM) approach in the 1980s (Rampheri et al., 2020; Thant, 2017; Vodouhê et al., 2010). In southern Africa, this programme was widely adopted with the sole aim of sustainably conserving biodiversity, while sustaining local community livelihoods (Mahumza & Balkwill, ; Milupi et al., 2017; Vodouhê et al., 2010).

Despite these initiatives, community involvement in nature conservation has failed to curb biodiversity loss in PAs (Rampheri & Dube, 2020). In most regions, southern Africa in particular, PAs remain exposed to illegal activities that affect biodiversity, mainly due to unfairness in sharing of benefits, whereas local communities surrounding PAs continue to experience livelihood challenges (Mutekwa & Gambiza, 2016). On the other hand, the more the community acquires more benefits than the challenges, their

perceptions and attitudes changes in a positive way, resulting in their willingness to participate in nature conservation (Rampheri & Dube, 2020). The aim of this study was, therefore, to assess benefits and challenges associated with local community involved in biodiversity conservation in PAs in the Blouberg Nature Reserve (BNR). The assessment of the benefits and challenges of involving local communities in nature conservation will help in developing future engagement strategies for local community involvement in curbing biodiversity loss.

2 | MATERIALS AND METHODS

2.1 | Study area

The study was conducted in Blouberg Nature Reserve (BNR), which is situated within latitudes of S 23° 01′ 04″ and longitudes of E 29° 04′ 09″ in Blouberg Local Municipality within Capricorn District, Municipality of Limpopo province, South Africa. Blouberg Nature Reserve covers a total area of approximately 9 348 ha. It is located south-west of the Langjan Nature Reserve (Limpopo Department of Economic Development, Environment, & Tourism, 2013). The nature

reserve was established in 1983 (Constant, 2014) and started involving local communities in biodiversity conservation in 1992, mainly training them on the importance of conservation and providing them access to plant resources, such as firewood and wildlife in a controlled manner.

Blouberg Nature Reserve is characterised by warm summer months with temperatures ranging from 16–40°C and mild winter months 12–22°C (Mostert, 2006). Daily maximum temperatures are around 40°C in October, whereas daily minimum temperature falls between 9 and 12.3 °C in May and July (Constant, 2014). The area receives an average annual rainfall of 410 mm per year with much of it received during the summer months (November–April), with an average of 93 mm per month. During the dry season, less rainfall amount is received, approximately 0.38 mm per month between July and August (Limpopo Department of Economic Development, Environment, & Tourism, 2013). The area experiences orographic rainfall due to the east west positioning of the Soutpansberg Mountain (Mostert, 2006).

The major vegetation types within the nature reserve include *Commiphora* species, *Eragrostis lehmanniana* and *Phyllanthus burchellii*; *Burkea Africana*, *Cyperus angolensis*; *Acacia nilotica* and *Combretum imberbe* (Limpopo Department of Economic
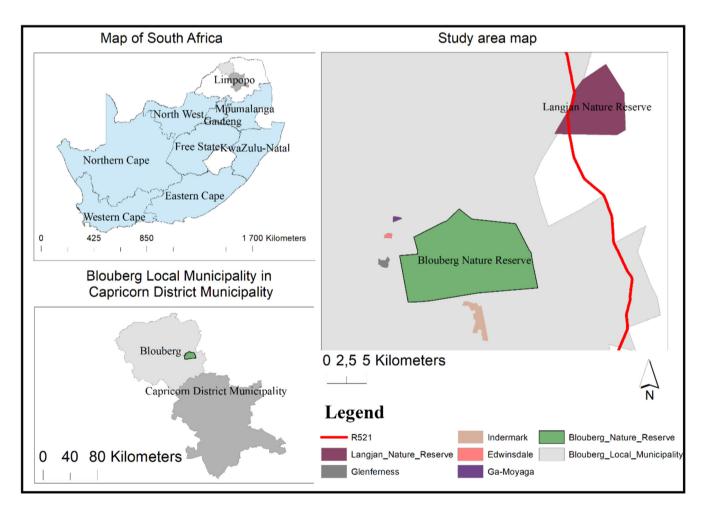

FIGURE 1 Location of Blouberg Nature Reserve and its surrounding villages in Limpopo province, South Africa

TABLE 1 Sample distribution in the four villages neighbouring Blouberg Nature Reserve

Village	Household number	Sample size per household
Endwinsdale	181	23
Indermark	2257	291
Ga-Moyaga	31	4
Glenfernes	133	17
Total	2602	335

Development, Environment, & Tourism, 2013). The nature reserve is endowed with a variety of animal species, about 50 reptiles amongst them include Bibron's Stiletto Snake and Southern African Python. The nature reserve also has about 25 species of amphibians and amongst others include Northern Pigmy Toad. Twenty-one bat species were also identified within the nature reserve (Constant, 2014; Limpopo Department of Economic Development, Environment, & Tourism, 2013). The nature reserve is rich with 128 Avifauna species, of which 16 are on the IUCN Red List of Threatened Species. For instance, the Cape Vulture (*Gyps coprotheres*) is vulnerable, Lanner Falcon (*Falco biarmicus*) is near threatened, and Saddle-billed Stork is endangered. Moreover, the BNR hosts one of the largest Cape Vulture breeding colonies in the world (Limpopo Department of Economic Development, Environment, & Tourism, 2013). The nature reserve also supports a variety of mammals including grazers, such as bushbuck (*Tragelaphus sylvaticus*), mixed feeders like Impala (*Aepyceros melampus*) and browsers such as Giraffe (*Giraffa*) (Constant, 2014).

Geologically, the area is dominated by a variety of geological formations, which in conjunction with soil type underlie the spatial distribution of vegetation. The area is associated with gneisses, metasediments and metavolcanics rocks. In the Soutpansberg Mountain Busveldock, the area is associated with rocks such as sandstone, quartzite, conglomerate, basalt and siltstone. The soils include calcrete and limestone layers in Limpopo Sweet Bushveld. The soils include acidic dystrophic to mesotrophic sandy to loamy. In the Rooderberg Bushveld, the area is associated with rocks such as sandstone, conglomerate, siltstone and shale, and mesotrophic soils, whereas rocks such as sandstone, quartzite and shale and extremely shallow, leached, acidic, coarse sand of the Glenrosa and Mispah soil occur in the Soutpansberg Summit Sourveld (Limpopo Department of Economic Development, Environment, & Tourism, 2013).

Furthermore, villages including, Edwinsdale, Indermark, Ga-Moyaga and Glenfernes surround the nature reserve (Figure 1) (Limpopo Department of Economic Development, Environment, & Tourism, 2013). According to Blouberg Municipality (2017), the majority of people (10,231) from surrounding villages were unemployed, 1578 had higher education qualification and 2036 people were uneducated. The community relied mainly on Government social grants and informal sector like buying and selling fruit and vegetables among other activities.

2.2 | Data collection and sampling strategy

The study adopted a descriptive research design, utilising elements of quantitative and qualitative research methodologies. Four villages located within a radius of 3 km around the BNR were purposefully selected for study. These villages were located within the 3 km radius from the reserve perimeter. Each of the villages had similar access and involvement to the reserve. The four villages had 2602 households. Data were collected from a sample size of 335 households across all the four villages. The sample size was determined using the Raosoft method (Mukeshimana & Nkosi, 2014). Household statistics were obtained from Statistics South Africa (StatsSA, 2011). The stratified systematic sampling technique was used to select the household sample for household questionnaires (Table 1). The four villages formed the sampling strata and the systematic sampling technique was used to select the proportional sample from each village (Table 1). The sampling interval in each village was determined by dividing the total number of households by the calculated sample size. For instance, in Endwinsdale village, the sampling interval was rounded off to eight after dividing 181 households by the calculated proportional sample size of 23 households (Table 1). Basing on the village's households register, the first household representing the sample, was randomly selected using the Microsoft Excel random function and the subsequent remaining households were selected at an interval of 8. This sampling procedure was replicated in the other three villages, Indermark, Ga-Moyaga and Glenfernes. Systematic sampling ensured that each household had an equal probability of being chosen in the sample since the starting point for sample selection in each village was not arbitrary determined but followed proven scientific methods of randomisation. Field data collection was conducted during the month of June 2019.

A self-administered household questionnaire (Supplementary Material S1 – questionnaire tool) was used to obtain data from household heads, and in their absence, any adult member who was willing to participate in the study was considered. The household questionnaire was drafted in English and translated into the local language, Sepedi, for easy interpretation by household participants. The participants' age ranged between 16 and 60 years. This age category was chosen because according to le Roux-Kemp (2013) some of South African households are child-headed. Those with age groups around 60 years were considered to have vast indigenous knowledge and experience on nature conservation (Davies & Campbell, 2008).

The household questionnaire questions were mostly close-ended, but a few questions were open-ended. According to Naidoo (2017), closed-ended questions offer an opportunity to compare responses between participants and conduct quantitative analyses of the responses. On the other hand, open-ended questions allow household members to speak of their experience in their own terms and words that had not been expected by the researchers but giving an input to the matter being investigated. Therefore, open-ended questions gave the community members an opportunity to express themselves and to provide detailed responses. We asked household participants about their involvement in nature reserve activities, the

benefits and challenges they obtain from the nature reserve, as well as their perceptions on the nature reserve management. In some cases, the household respondents were requested to score the extent to which they agreed with a given statement, by rating their responses on a five-point Likert scale. For instance, households were asked to rate how good the relationship between the nature reserve management and the community was. They were supposed to select from the option responses - strongly agree, agree, neutral, disagree or strongly disagree. Moreover, the household questionnaire captured information on the personal profiles of the participants.

An in-depth structured interview was conducted with the purposefully chosen BNR manager to acquire information on community involvement in the nature reserve. A template with questions guided the interview and this helped to gather information on the benefits and challenges of involving local communities in biodiversity conservation within the nature reserve. The Nature Reserve Manager was selected because of his position, responsibility, experience and knowledge in the management of the nature reserve. During field data collection, all the participants were first briefed about the project's aim and thereafter the consent of each participant was sought. In order to ensure anonymity and confidentiality, the names of the respondents were not recorded. In addition, no recording devices were used. Ethical approval was sought from the University board before data collection began.

2.3 | Data analysis

Generated information from the community members gathered through a household questionnaire survey were coded and analysed using the common statistical tool, IBM SPSS Statistics 25. Descriptive statistics were used to demonstrate the frequencies in percentage of respondents (per household) for selected variables. In addition, the chi-square test was used, at 95% confidence interval, to establish the association between households' demographic characteristics and selected variables, such as conservation knowledge, community involvement as well as the known benefits and challenges. Qualitative data obtained from the key informant interview and open-ended questions in the household questionnaire were analysed using the thematic analysis (Braun & Clarke, 2006), whereby the emerging themes from the responses were reported as shown in the results section.

3 | RESULTS

3.1 | Socio-demographic characteristics of household respondents

Demographic results based on gender distribution indicated that the community household respondents were somehow balanced, as 43.6% ($n = 146$) were males and 56.4% ($n = 189$) were females. Household questionnaire survey results show that the population

TABLE 2 The chi-square test results on the association between households' demographic characteristics and knowledge of the role of nature reserve

Attribute	*p*-value
Gender	0.00
Age	0.39
Education	0.01

within the area is relatively middle to old age. The average age for the household respondents was 45 years with the majority of the household respondents being between 21 and 30 (20.9%) ($n = 70$) and 31 – 40 (23.0%) ($n = 77$) years followed by elders being greater than 60 (17.6%) ($n = 59$). Thus, those around 16 years represented a very small portion of 2.1% ($n = 7$), followed by youths between 17 and 20 (8.1%) ($n = 27$), then middle age ranging between 41 and 50 (10.7%) ($n = 36$).

The majority of the household respondents from the four villages had attained formal education level, that is, Grade 12 (27.8%) ($n = 93$), Secondary (25.7%) ($n = 86$); College certificate (12.5%) ($n = 42$), Diploma (9.6%) ($n = 32$), Primary (9.0%) ($n = 30$), Undergraduate (1.5%) ($n = 5$) and Postgraduate (1.2%) ($n = 4$), whereas the minority had no formal education, which accounted for 12.8% ($n = 43$) of the household respondents. Overall, these findings revealed that most of the people from the four selected communities are educated. About 22.4% ($n = 75$) of the household respondents were formally employed, 4.2% ($n = 14$) were self-employed (informal sector) and 73.4% ($n = 246$) were unemployed Mahumuza and Balkwill, 2013. However, out of the 73.4% ($n = 246$) that were unemployed, 55.8% ($n = 187$) were economically active, whereas 17.6% ($n = 59$) were not.

3.2 | Local community knowledge on the importance of biodiversity conservation

About 69.8% ($n = 233$) of the household respondents demonstrated an understanding of the importance of biodiversity conservation. Further 3.6% ($n = 12$) indicated that biodiversity conservation is important as it contributed towards employment creation and sustaining livelihoods. About 19.1% ($n = 64$) of the respondents demonstrated lack of understanding of the importance of conservation issues. However, with regard to reserve management roles, all the respondents demonstrated lack of knowledge.

When asked about the reasons to conserve nature, the majority (64.2%) ($n = 215$) of the household respondents reported that they were doing it for future generations, followed by 26.9% ($n = 90$) who did not know and 6.6% ($n = 22$) who wanted to ensure continuous functioning of the ecosystem. The remaining 8% ($n = 27$) mentioned other reasons, such as education, to keep animals away from the neighbouring communities, save animals and plants, to have more animals and plants, to keep animals safe, to make money from visitors and to save important animals. Overall, 68.7% ($n = 230$) of the household respondents have conservation knowledge, whereas the other 31.3% ($n = 105$) did not have knowledge on conservation.

The findings of the study revealed that both females and males had the knowledge on the role of the nature reserve, particularly emphasising on the need to protect wildlife. However, females had slightly more knowledge than male respondents. The chi-square test results show that there was no significant association between gender and knowledge of the role of nature reserve ($p = 0.20$). The age of the household respondents also had a role on the conservation knowledge, where the majority of 21–50 and above 60 had more conservation knowledge than age groups below 20 years and 51–60 years. However, the chi-square test results show that there was no significant association between age and conservation knowledge ($p = 0.39$) (Table 2). The study further found that there was significant association between the households' level of education and knowledge of the role of nature reserve ($p = 0.01$) (Table 2). Majority of those that had conservation knowledge had attained secondary-level education (Secondary and Grade 12), followed by higher-level education (e.g. college certificate and Diploma), then no formal education (No schooling) and lastly formal education level (University postgraduate and undergraduate).

3.3 | Benefits accrued by local communities from the nature reserve

Perceived natural, cultural and economic benefits associated with the nature reserve were investigated. For natural resources, only 13.4% ($n = 45$) of the household respondents agreed that they had been receiving benefits, whereas majority of the household respondents (86.6%) ($n = 290$), had never received any benefits from the nature reserve. Most of the benefits received by local communities from the BNR were nonmonetary. Fuelwood (9.9%) ($n = 33$), bush meat (1.2%) ($n = 4$) and water (0.6%) ($n = 2$) are the main benefits acquired by the local community.

Further, although some household respondents indicated that they accrued benefits from their involvement in the BNR, the majority of them (94.6%) ($n = 317$) demonstrated dissatisfaction with services accrued. Household questionnaire survey results show that about 3.6% ($n = 12$) of the households indicated that they did not know any benefits obtained from the nature reserve and 0.9% ($n = 3$) were not sure. However, about 0.6% of the household respondents also indicated that the nature reserve often donate to
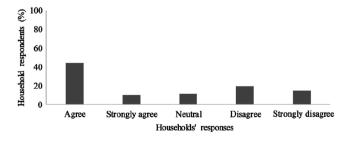
FIGURE 2 Households' responses to the statement 'The relationship between the nature reserve management and your community is good'

local schools furniture (0.3%) ($n = 77$), soccer kit for the community team (0.3%) ($n = 1$) and lastly (0.3%) ($n = 1$) aerial network.

In responding to the question of employment, almost all the household respondents (99.4%) ($n = 333$) said that there is no one working in the nature reserve from their families, whereas only 0.3% ($n = 1$) indicated that there is one working, as a field ranger and another 0.3% ($n = 1$) working as environmental cleaner. The Nature Reserve Manager also indicated that, although employment opportunities were limited, they give local community members job opportunity when they are available.

3.4 | The social and ecological challenges of the nature reserve

The relocation of local people due to the establishment of the nature reserve was investigated. The study findings showed that only 1.5% ($n = 5$) of the household respondents' family members had been relocated for the establishment of the nature reserve, whereas 98.5% ($n = 330$) indicated no relocation. Thus, crop raiding was reported to be one of the challenges with the highest percentage (96.1%) ($n = 322$) compared to other challenges accounting for 3.3% ($n = 11$) followed by destruction of their fences, which accounts for 0.6%. Furthermore, no single household respondent reported injuries from wildlife.

Further, some respondents indicated that they always reported problem animals to authorities (3.3%) ($n = 11$) some indicated that they were chasing them away (0.3%) ($n = 1$), while others mentioned that they had to quit farming (0.3%) ($n = 1$). No single respondent indicated the killing of the animals responsible for the crop damage. However, the BNR Manager reported illegal activities such as wildlife poaching and limited illegal harvesting of trees for fuel-wood. Poaching was reported to be rife as evidenced by the presence of the snares around the nature reserve. These illegal activities were reported to be managed through counter poaching patrols and operations. The findings of the study reveals that only 10.4% ($n = 35$) of the household respondents confirmed their involvement in biodiversity conservation within the BNR and larger percentage of 89.6% ($n = 300$) stated that they were not involved.

According to the Nature Reserve Manager, community members participated freely in the nature conservation within the reserve. The chi-square test results show that there was a significant association between household respondents' conservation involvement and access to natural benefits ($p = 0.008$) and cultural benefits ($p = 0.74$). However, there was no significant association between households' involvement in nature conservation and age ($p = 0.089$), gender ($p = 0.040$) and education level ($p = 0.64$).

3.5 | Relationship between the community and nature reserve management

The study showed that the relationship between community members and nature reserve management was generally good as indicated

by at least 54.2% (*n* = 182) (Figure 2). The household respondents who disagreed with the view that the relationship between the community and the nature reserve management was good indicated that they were not given job opportunities (80.7% (*n* = 270)), 50.1% (*n* = 168) complained of poor communication, while 0.9% (*n* = 3) lamented poor responses from the nature reserve management, especially when they reported escaped animals. Moreover, 1.5% (*n* = 5) stated that their children did not benefit through scholarships, whereas 3.6% (*n* = 12) indicated that the BNR management failed to empower local communities. Local communities had restricted access to the reserve (1.8%) (*n* = 6), loss of livelihoods (0.9%) (*n* = 3) and community members no longer had enough land for grazing and farming (1.8%) (*n* = 6).

3.6 | Views, attitudes and perceptions of the local community members towards nature reserve management

The community expressed mixed feeling towards their involvement in biodiversity conservation. For instance, 78.2% (*n* = 77) of the household respondents said they reported poaching activities to the reserve management, whereas 21.2% (*n* = 77) decided not to report. About 0.3% (*n* = 77) stated that they would always help poachers to kill animals or harvest plants. In the event of seeing a fence of the nature reserve in a bad condition, majority of the household respondents (87.5%) (*n* = 77) stated that they would report to the authorities while 9.3% (*n* = 77) preferred to keep quiet. Only 2.7% (*n* = 77) indicated that they would encourage the community to fix it but the remaining 0.6% (*n* = 77) preferred to keep quiet, as it was not clear on where such matters could be reported. In addition, the household respondents recommended that different actions should be taken by both the local community members and nature reserve management to conserve nature. For example, 46.3% (*n* = 77) indicated that the nature reserve management should embark on community outreach programmes, introduce more rangers and durable and strong fencing.

4 | DISCUSSION

This work assessed benefits and challenges associated with local community involvement in biodiversity conservation. The study revealed that majority of the household respondents had knowledge on conservation, particularly the role of the nature reserve and purpose of conserving nature. However, the majority the household respondents indicated lack of knowledge on the role of the reserve management. Further, it was noted that female respondents had more conservation knowledge than the males. This might be attributed to the fact that females are dominant in the Blouberg Local Municipality (Blouberg Municipality, 2017; Kellert & Berry, 1987). However, this observation is different from study findings by Thant (2017) who found that males had better knowledge about the PA's

operations than females in Chatthin Wildlife Sanctuary in Myanmar. The lack of significant association between conservation knowledge and gender and age might be attributed to the willingness of an individual to participate in nature conservation. Furthermore, Kellert and Berry (1987) also indicated gender as one of the demographic factors determining attitudes towards nature. According to Makindi (2016), adequate information and knowledge in conservation related concepts is one of the factors that can ensure long-term effectiveness of the participation in nature conservation. Likewise, Htun et al. (2012) and Chowdhury et al. (2014) further confirmed that local people's perceptions and attitudes towards PAs is determined amongst others by their knowledge of the management of PAs. The majority of the household respondents in our case are not involved in biodiversity conservation in the BNR, even though they have adequate conservation knowledge. This may be ascribed by the benefits and the challenges they acquire and face from the reserve respectively. Thus, our study contradicts with other studies, which observed that the majority of the household respondents who have nature conservation knowledge were being involved in nature conservation (Makindi, 2016).

Literature indicates that it is generally believed that local communities are more likely to support conservation initiatives when they receive direct benefits (Bajracharya et al., 2006). The results of the study showed that local communities get limited natural resources. For instance, they do not get easy access to fuel-wood since they indicated that they only get fuel-wood occasionally like during funerals. Contrary to observation by Bajracharya et al. (2006) in Annapurna Conservation Area, an overwhelming majority of the respondents indicated that they had easy access to fuel-wood and fodder. When compared to the findings of the present study, some local communities receive benefits but are restricted on access to natural resources in their nearest PAs (Kideghesho et al., 2007; Mojo et al., 2018; Vodouhê et al., 2010). These natural resources are amongst the most crucial resources for subsistence use by local communities. However, the sampled households from the four villages did not mention any building development for the community and this is unlike other studies (Dabo, 2017; Mahumuza & Balkwill, 2013; StatsSA, 2011; Secretariat of the Convention on Biological Diversity, 2008). For instance, Dabo (2017) indicated that Community Forest Management Areas scheme in Pete, Zanzibar helped the community to build schools for their children, supply households in the village with electricity and build a mosque.

A key aspect when looking at communities and biodiversity efforts is employment opportunities in PAs. However, in the present study, out of three hundred and thirty-five household respondents, only two household respondents accounting for 0.3%, mentioned that some members of their households were working at the reserve, as environmental cleaners and field rangers respectively. This illustrate that the nature reserve is still lacking on employment creation. Thus, the findings of the study correspond with Mugisha (2002) who found that the majority of their respondents (93.9%) indicated that PAs (Kibale National Park, Lake Mburo National Park and the southern part of Mt. Elgon National Park) in Uganda did not employ

them except for a small percentage (1.1%). However, the result of the study, contradict with other studies (Bajracharya et al., 2006; Dabo, 2017; Makindi, 2016; Mbaiwa, 2004). For example, Makindi (2016) found that half of their respondents indicated that a member of the household was working in Kimana Community Wildlife Sanctuary in Kenya. In another study, Dabo (2017) on the other hand found that the majority of the respondents were employed in the Community Forest Management Areas in Pete, Zanzibar. Moreover, Bajracharya et al. (2006) found that Annapurna Conservation Area has provided direct 242 employment opportunities in which almost half of them (49.6%) are local staff from the area.

This study thus deduces that most of the benefits received by local communities were nonmonetary. Furthermore, they are not similar to other areas where local communities were receiving benefits, including monetary benefits (Bajracharya et al., 2006; Mbaiwa, 2004; Vodouhê et al., 2010; Weladji & Tchamba, 2003). In other cases, local people were given money for infrastructural development, such as through the Integrated Conservation and Development Initiative in Korup National Park in Cameroon (Weladji & Tchamba, 2003). For example, in Pendjari National Park in Benin, local communities were often given a percentage of revenue generated from tourism activities in the park (Vodouhê et al., 2010). Furthermore, our study indicated that almost all of the respondents who did not get access to resources within the nature reserve indicated that they were restricted, whereas few claimed that they never bothered.

Despite the little social and economic benefits of PAs, local communities also experience a number of challenges of being involved in conservation. Relocation was one of the challenges, where minority of the household respondents in this study experienced relocation from the nature reserve. Majority were not affected because they started living in their communities after the nature reserve was established. Findings from this study correspond with the study by Méndez-López et al. (2014) who established that one of their study communities, La Mancolona, had suffered two forced displacements resulting from the establishment of two Biosphere Reserves, Montes Azules and Calakmul where their livelihoods were disrupted since they were far from their social network. In agreement, Kideghesho et al. (2007) and Dabo (2017) emphasised that the process of relocation had terminated most cultural and traditional practices land in the name of conservation.

Further, no reported injuries from the household respondents, this might be attributed to the fact that there were few dangerous animals in the nature reserve. In general, the incidence of crop damage or losses appeared to be less experienced. Nevertheless, incidences of crop raiding by wildlife are few, but those whose crops are their staple food are greatly affected. Most studies reported crop damage around PAs elsewhere, varying in extent and intensity (Bajracharya et al., 2006; Dar et al., 2009; Gandiwa et al., 2013; Long et al., 2020; Makindi, 2016; Mugisha, 2002; Seifu & Beyene, 2014; Thant, 2017; Weladji & Tchamba, 2003). In addition, crop damage by wild animals is one of the main reasons for park-people conflicts and negative attitude towards conservation even though they receive benefits from conservation.

Strategies used by affected local communities surrounding BNR to respond to damages from animals from BNR are similar to other studies (Thant, 2017). However, from the study by Thant (2017), respondents specified that they were chasing the animals that caused damages by shouting. Moreover, some of the studies found that not only herbivores are responsible for crop damages (Thant, 2017). For instance, pests such as birds and rabbits were reported amongst the crop raiders in Chatthin Wildlife Sanctuary in Myanmar (Thant, 2017). The study by Seifu and Beyene (2014) on the other hand reported that elephants were the main animals causing crop damage in Babile Elephant Sanctuary in Ethiopia. No single respondent from the present study indicated the killing of the animals responsible for the crop damage. This shows that local communities did not develop negative attitude towards conservation due to their crop loss. The findings of the present study also illustrated the lowest number of participants in conservation of biodiversity in BNR. These results are consistent with other previous studies like Méndez-López et al. (2014) and Odour (2020). Méndez-López et al. (2014) study that found out that overall involvement of local people in formalised conservation initiatives in six communities in Southeast Mexico reaches only about 25%. A growing body of research explains low levels of local participation in PAs.

In this study, majority of the respondents indicated that they strongly disagreed that the relationship between the community and nature reserve management was commendable. This finding is similar to Thant (2017) who observed that nearly 70% of their respondents indicated that they did not see or meet with the staff in Chatthin Wildlife Sanctuary. Similar to the study by Mugisha (2002) it was noted that 49.2% expressed being denied access to natural resources. Poor communication and lack of job opportunities were the major indicated reasons for poor relationship between the nature reserve management and local communities. This could potentially be the major source of resentment and conflict between local communities and BNR management in the future, if it is not properly addressed.

Local people's perceptions on the nature reserve management influenced the way they interacted with PAs (Andrade & Rhodes, 2012; Chowdhury et al., 2014; Vodouhê et al., 2010). Most of the household respondents indicated that they would report to the authorities if they saw a poacher, whereas few opted to remain quiet or they will help the poacher to kill the animals and harvest plants. Meanwhile, those who indicated that they would keep quite feared that poachers would harm or threaten them. On the other hand, those who claimed to help poachers would do that because the nature reserve was doing nothing for the community. Roe (2015) recommended that collaboration between local people with law enforcement organisations would be a crucial strategy to successful combat poaching. Additionally, it was suggested by the local people that there should be a reward system for people who contribute towards antipoaching activities (Thant, 2017). Literature shows that the more local communities receive benefits, the more they likely to develop positive attitudes towards conservation (Lepetu et al., 2008). However, findings from this present study showed that local

people held positive attitudes towards nature conservation in BNR even though limited benefits were accrued. This is similar to the study by Mojo et al. (2018) and confirms Chowdhury et al. (2014)'s observation that local people's needs, perceptions and attitudes are always hinged with their personal attributes.

5 | CONCLUSION

Local people reported that they do not receive sufficient support from the nature reserve but still held positive attitudes towards PA. The results of this study contradict with the paradox that people living close to or in the PAs get more benefits and bear most of the challenges from crop damage. However, the household respondents' behaviour remained unchanged in terms of involving in illegal activities, since illegal activities particularly poaching still occurred in the nature reserve and their support to conservation remained low since majority are not participating in conserving nature. Overall, the community-based approach towards biodiversity conservation in the BNR has, therefore, not helped to improve the living standards of local communities in the vicinity. These findings, therefore, underscore the need to increase local people's access to benefits from the PAs and more involvement in conservation of natural resource in order to enhance their support for conservation and sustainability of the PAs.

CONFLICT OF INTEREST

Authors would like to declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon request.

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