CONSERVATION WITHOUT BOUNDARIES: CASE STUDIES FROM THE LUBOMBO TFCA

EDITED BY
ROELIE J KLOPPERS

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The papers in this book are the result of scientific research undertaken by researchers associated, at one time or another, with the *Maputaland Conservation Based and Integrated Rural Development Programme*. Some of these papers form the basis of ongoing PhD and MSc studies. Various papers have already been published[1] or are now being prepared for submission for publication in primary scientific journals.

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[1] J.Y. Caugris, W.S. Matthews, M.W. van Rooyen and J. du P. Bothma. 2004. 'The vegetation of Tshanini Game Reserve and a comparison with equivalent units in the Tembe Elephant Park, South Africa'. *Koedoe, 41 (9-21)*
J.A. Tarr, M.W. van Rooyen and J. du P. Bothma. 2004. 'The response of Phragmites australis to harvesting pressure in the Muzi Swamp of the Tembe Elephant Park, South Africa' *International Journal of Sustainable Development and World Ecology*

Introduction: Community Conservation and the Consolidation of Transfrontier Conservation Areas.

R.J. Kloppers

Community Conservation Areas (CCAs) play a critical role in the consolidation of formal protected areas. This is especially relevant in the case of the Usuthu-Tembe-Futi Transfrontier Conservation Area (TFCA). In this TFCA, the formal protected areas of Ndumo, Tembe and the Maputo Special Reserve are separated from one another by strips of sparsely populated communal lands. Overall, these areas are typified by nutrient-poor soils and thus low agricultural potential. There is also a lack of water, and socio-economic development, which has made these areas unattractive to large scale human settlement. Despite this, a growing human population is putting increased pressure on the formal protected areas for development and subsistence.

A philosophy that is currently embraced and addressed in this book is that these communal areas must be developed as proper resources for socio-economic development. In order to achieve that, the development must be sustainable. One way in which this can be achieved is for these communal areas to become conservation corridors that link formal protected areas, thus allowing game to move freely over larger areas and creating larger tourist attractions. This will increase the tourism potential of the area and so lead to growth in an industry that can bring thousands of jobs to the local people. The long term vision is for the formal protected areas to become core conservation areas, with little or no human influence, while the community conservation areas see low-impact development through tourism. In this way communities will benefit directly from an expanding conservation area and conservation will benefit from the release of pressure on pristine and wilderness areas to act as catalysts for development.

The papers in this book address issues around Community Conservation and Transfrontier Conservation as they play out in the North-eastern corner of South Africa and Southern Mozambique, an area oftentimes referred to as Maputaland.

In his first contribution, Kloppers looks at the history of the local Tembe-Thonga people and how this history has been presented and misrepresented over centuries as the political climate of south-east Africa changed. He questions renowned political activist and anthropologist, David Webster's thesis on ethnicity in the border communities of Northern KwaZulu-Natal. Arguing that Webster failed to recognize the proximity of the Tembe people to the South Africa/ Mozambique in his analysis, Kloppers concludes that people in Northern KwaZulu-Natal who refer to themselves as Thonga, see that as a sub-Zulu identity, which differs from the meaning attributed to being Thonga north of the border. Although largely an analysis of ethnicity and identity, the paper provides a valuable overview of the history of the people of this area.

The papers by Van Eeden *et al*. and Caugris *et al*. investigate planning and management issues directly related to the Tshanini Community Conservation Area. This CCA lies directly south of Tembe Elephant Park in Northern KwaZulu-Natal. Members of the local community of KwaManqakulane decided to create a conservation area in their tribal ward as a means of bringing development to their community. Both primary authors of these two papers contributed to the design and planning of the CCA and spent substantial periods in the CCA and the surrounding communities.

Van Eeden *et al.*'s paper illustrates the large degree of spatial heterogeneity that exists between different forest patches of differing biotic groups. Through a comparison between bird assemblages in the Tembe Elephant Park and the communal areas south of the Park, Van Eeden *et al.* demonstrate the necessity of the conservation of sand forests in a variety of areas to ensure the long-term persistence of its associated biota.

Caugris *et al.* analyses plant communities in Tembe Elephant Park with similar communities in the Tshanini CCA in an effort to detect differences between protected and unprotected areas. Caugris *et al.* speculate that the differences found are the result of human and animal utilization.

Jones's analysis is situated in a local community wedged between Tembe Elephant Park and Ndumo Game Reserve. This area, sometimes referred to as the Mbangweni-corridor has been coveted by conservationists since the proclamation of Tembe Elephant Park in 1983. The Mbangweni-corridor has the potential of linking Tembe Elephant Park with Ndumo Game Reserve thus allowing Tembe's growing elephant population access to the Pongola Floodplains. However, this area has been characterized as a battleground between KwaZulu-Natal's conservation authorities and local communities. Due to a lack of trust and broken promises on both sides, the area has not yet come under conservation and, as Jones illustrates, although the people struggle to eke out a living in the corridor, they refuse to leave. Through the application of a Geographic Information System for spatial analysis of the community of Mbangweni, Jones explores the potential for conservation expansion and resettlement in the area. In her discussion, Jones paints a vivid picture of this community that extends the borders of Mozambique and South Africa, thus alluding to another reason why attempts at re-settlement have failed in the past.

In the two contributions by Tarr *et al*. a very sensitive, yet very relevant issue surrounding protected areas is addressed. That is, the potential of communal resource utilization in Protected Areas. Tarr *et al.* focus particularly on the utilization of *Phragmites* reeds in Tembe Elephant Park by neighbouring communities. Arguing that the escalating utilization of the reeds in Tembe puts unsustainable pressure on the resource, Tarr *et al*. suggest that the problem be managed pro-actively, through a winter-only harvesting period. This will leave the resource with more time to recuperate and so ease the pressure.

In his second contribution to this volume, Kloppers looks at natural resource use in the Futi-corridor, the area in Mozambique with the potential of linking Tembe Elephant Park with the Maputo Special reserve, thus creating a Transboundary or Transfrontier Conservation Area. The paper illustrates the result of colonialism and warfare in Mozambique on the people and the environment. Arguing that the local people are extremely reliant on the natural resource base for survival, Kloppers claims that it will be impossible to bring the Futi-corridor under conservation without creating alternative livelihoods for the inhabitants of the area.

BORDERLAND IDENTITIES: CITIZENSHIP AND ETHNICITY IN NORTHERN KWAZULU-NATAL

R.J. Kloppers

> If ‘identity is always mobile and processual’ (Malkki 1992:37), identity itself should hardly remain the ultimate subject of analysis. After the dangers of essentialising identities as primordial affiliations have been acknowledged, the studies of refugees and borderlands face the converse danger of exaggerating fluidity. People are often attracted by particular identities, and their capacity to change identities is a function of power relations (Ortner 1998)
>
> Englund (2002:24)

> … border studies can help to reveal the relative strength of national and ethnic identities, the gap between which may become particularly visible where closed borders reopen and vice versa.
>
> Wilson and Donnan (1998:16)

In a well-known essay, Webster’s (1991) contends that amongst the Tembe-Thonga communities living along the northern KwaZulu-Natal border, ethnic identity is structured along gender lines. Webster (1991) argues that in the social and economic realm it is profitable for men to take a Zulu identity and for women to emphasise a Thonga identity. Emphasising a Zulu identity guarantees work for men when they migrate to the cities of industrial South Africa, because white employers typify Zulu men as strong and hard workers. In the rural domestic sphere, however, he observes, women emphasise a Thonga identity, which provides them with social freedoms unknown to Zulu women.

Ngubane (1992) has already questioned Webster’s (1991) claim that Thonga women enjoy more freedom in the domestic sphere than Zulu women. In this paper, I wish to disagree with Webster's (1991) theory on another ground. Ethnicity in the 'border communities' cannot be analysed in the absence of the role that the international border plays in identity formation. Borderland identities, like other identities, are not only shaped by single factors, such as race, religion and gender. In the borderlandscape the international border fosters new identities, multiple-identities, shaped and determined by the context and side of the border people find themselves on. Taking on a Tembe-Thonga identity north of the border means something completely different from taking on a Tembe-Thonga identity south of the border. In the north Tembe-Thonga is associated with an older ethnic meaning, i.e. something that is not Zulu (Nguni). South of the border people generally view Tembe as a sub-identity of the Zulu, in the same way Mthembu and Ngubane are viewed as sub-identities within a larger Zulu identity.

Certainly, this does not always hold true due to the fluid nature of ethnicity and identity. South of the border, the Tembe-Thonga royal family and those with close ties to them deny any connection between Tembe and Zulu. They emphasise the cross-border social and kin ties of all Tembe-Thonga and the longing for a new state, free from Zulu domination. By contrast, the members of other southern Tembe-Thonga families, both men and women, highlight a Zulu identity, and an unwillingness to follow the Tembe-Thonga royal family in pursuit of an order separate from the Zulu. These people emphasise the differences between themselves and those across the border.

As stated above, one cannot explain ethnicity in the borderland by single factors (gender, 'tribal alliance', migrant labour etc.). Ethnicity, already a fluid and situational concept (Cohen 2000:1-6; Zegeye 2001:1), becomes even more fluid and contextual in borderlandscapes. In a liminal milieu that is constantly in a state of fluctuation, people are often able to shape and reshape identities to their own benefit (Anzaldua 1999:23). People manipulate their identities as they move from one side of the border to the other. Barth's (1969; 1994) argument that ethnic groups are seldom homogenous social groups with distinct bounded cultures and that ethnic boundaries are situationally invoked in different contexts becomes clear below.

The paper is divided into three parts. The first part investigates historical sources to determine what ethnicity and identity in the area was before the international border was instituted in 1875. The second part looks at the differing histories of the two sides of the borderland since 1875 and the forces that were at work which established cultural, ethnic and social differences on opposite sides of the border. I focus particularly on British and Portuguese colonial administration, Zulu influence south of the border, and on the effects of war and displacement on ethnicity and identity north of the border. The discussion here is brief and focussed primarily on ethnicity and identity before 1994. The third part of this paper examines ethnicity and identity in the borderland at present. Based on interviews I conducted over four years in the area, I hope to illustrate how people identify themselves and others at present, and the role the international border plays in shaping identities in the borderland.

Ethnicity and identity before the border (-1875)

Through time the people who live in the current borderland have been referred to as Tembe, Tonga, Thonga, Tsonga, Ronga, Maputa, Mabudu and Pongo. All these terms have been questioned. Tsonga is also the name of the language spoken by the Gaza and Hlengwe people further north; Ronga, as a term denoting an ethnic group, has fallen into disuse; Maputa is sometimes remembered as the previous name of Manguzi; while Pongo is a term that was used mainly by sugar farmers for migrant labour residing beyond the Pongola River.

At the turn of the previous century, the famous ethnographer, Henri-Alexandre Junod (1962:13-16) described the historical inhabitants of the present borderland as belonging to the Tsonga tribe. Junod distinguished six groups of Tsonga clans living south of the Sabi River in south-eastern Africa. He called the group living in the areas surrounding Maputo Bay the Ronga. Junod (1962:13-16) identified two sub-divisions of Tembe within the Ronga group, namely Matutwen and Maputu. Thus, according to Junod's interpretation, the international border that was drawn in 1875 divided the Maputa-Tembe clan, of the Ronga sub-group of the Tsonga tribe.

Junod, like other anthropologists of his time (see Hamilton & Wright 1989:50-57), used the 'boundaries of ethnic classification to bring a neat, Cartesian logic to our understanding of the peoples of southern Mozambique' (Harries 1994:1). Yet, as Felgate (1982:9) and Harries (1994:3) indicate, there never existed a bounded group or 'tribe' called the Tsonga or the Thonga. Thonga was a term used by the Gaza and the Zulu to distinguish themselves from surrounding people who did not adopt their customs. Harries (1994:3) cites St. Vincent Erskine arguing that terms like Thongas, Amathonga and BuThonga 'are not tribal appellations and one might as well try to define the limits of the 'Kafirs'. Tonga simply means something [someone] which is not Zulu'.

Furthermore, since the Gaza and Zulu used the term Thonga to distinguish them from their neighbours, it became synonymous with inferiority (Felgate 1982:9). Local people therefore rejected this appellation. Instead of identifying themselves with large 'national' units like Thonga or Ronga, people formed their identities on a smaller-scale, identifying themselves with specific chiefs and chiefdoms. In other words, a person would identify him or herself as being 'from the land' of a particular clan or chiefdom (Harries 1994:5). Information lodged in the Stuart Archives shows that people coming from the present-day borderland identified themselves as *abakwa*Mabudu, or 'people from the place of Mabudu,' the ancestor of the ruling Mabudu-Tembe lineage (Webb & Wright 1979:157). The Mabudu chiefdom was structurally, like the later Zulu state, a new type of organisation, which ultimately gave birth to a new ethnicity (see Kopytoff 1999:31). A common, shared identity thus emerged with the rise and consolidation of the Mabudu-Tembe chiefdom.

Since the early nineteenth century the strong Zulu cultural and social influence in the area had a direct impact upon identity and ethnicity, and brought about greater diversity in the Mabudu chiefdom. During the reign of Shaka (1816-1828), various individuals and groups passed through or settled in Maputaland, and introduced new languages and cultural practises to the area. Such assimilation compounded to greater ethnic diversity amongst the Mabudu (Bryant 1964:292).

As more and more people from the southern chiefdoms crossed into Maputaland, greater prestige was attached to the Zulu language, since the Zulu were politically dominant in south-east Africa. Felgate (1982) writes,

> during the reign of Shaka there was, then, a steady increase in Zulu influence in Mozambique. The Zulu were the prestige nation and Zulu became the prestige language. The men had been trading with the Nguni for a long time prior to Shaka's rise to power and when they found Zulus in their midst they had perforce to learn the language. The women, on the other hand, particularly in the southern regions, did not have the same need to speak Zulu and Junod records the fact that the women did not speak Zulu (p.11).

As the Mabudu occupied new territories, they encountered autochthonous groups, such as the Ngubane and Khumalo, who spoke Zulu and rejected Mabudu domination (Felgate 1982:11).

Trade at Delagoa Bay and migrant labour also had a tremendous effect on the manner in which people identified themselves. Felgate (1982:11) states that with the advent of trade at Delagoa Bay (around 1650) and greater contact between the people of the hinterland, Mabudu men started to identify themselves as Zulu. This gendered experience of ethnicity was further developed by men's experiences during migrant labour. In the industrial areas where they looked for work, men found it advantageous to describe themselves as Zulu to white employers who associated this ethnic group with images of power and strength.

However, despite the growing influence of Zulu, the vast majority of Maputaland residents emphasised a unique Mabudu-Tembe ethnicity (Felgate 1982:11-17). Thus, the only conclusion that can be drawn about ethnic identity in the borderland before 1875 is that the majority of people identified themselves with the Mabudu chiefs and that there was unity in identity across the area where the border was drawn. Suffice it to say, the border dissected a political community with a largely shared ethnic identity.

Colonialism and its legacy (1875-1975)

Asiwaju (1985:2-3) describes the drawing of boundaries in Africa as 'political surgery', since they cut across well-established lines of communication including, in every case, a dormant or active sense of community based on traditions concerning common ancestry, usually very strong kinship ties, shared socio-political institutions and economic resources, common customs and practises, and sometimes acceptance of common political control. He goes on to add that:

> Apart from the division which arises routinely from the mere location of boundaries, partitioned groups were further pulled apart in consequence of the

> opposing integrative processes set in motion by the different states. Such processes have tended to make the divided groups look different political, economic and social directions… Different symbols of formal status, above all citizenship, are imposed on the same people (Asiwaju 1985:1-3).

At first, the MacMahon line, which separated the Portuguese and British spheres of political control in southeast Africa, had little effect on the ability of the Mabudu chief to exercise power over the entire chiefdom. The difference between the British and Portuguese systems of colonial administration, however, soon had a significant effect on the unity of the Mabudu (Felgate 1982:18). In terms of the British system of 'indirect rule' indigenous authorities continued to exact control and colonial subjects were allowed to practice their own customs and ways of life, provided they paid homage to the British crown (Mamdani 1996:62-71). In contrast, the Portuguese administered their colonies as integral parts of the mainland (Hailey 1938:213-216). The Portuguese believed it was their God-given task to bring 'civilisation' to the peoples of Africa, by forcing them to adopt the Portuguese culture in favour of what was perceived as a 'backward' and uncivilised way of life (Smith & Nöthling 1993:288).

In terms of social identity people living on opposite sides of the international border thus underwent different experiences in the colonial era. While the British system of indirect rule fostered ethnic (tribal) consciousness (Vail 1989:12-13), the Portuguese system of colonial administration aimed to assimilate people north of the border in the Portuguese culture. Today, this is especially notable in the language of the borderland, where people north of the border mainly speak Portuguese (the language of the colonisers) and people south of the border mainly speak isiZulu and Thonga (indigenous languages). In this way colonialism disturbed the social and cultural unity that existed across the international border.

The entrenchment of Zulu identity south of the border (1897-1994)

After 1896 Britain administered the area south of the MacMahon line as British Amathongaland. AmaThongaland was subsequently divided into 'crown' and 'trust' lands. The crown lands were set aside for occupation by white farmers, while the rest of the area was put in trust for the 'Mabudu tribe' (Van Wyk 1983:62). In 1897 British Amathongaland was incorporated into the Ingwavuma district of Zululand (Harries 1983:26). Thirty-seven years later, Van Warmeloo, the government ethnologist, estimated that sixty-two per cent of the people of the Ingwavuma District, comprising half of British AmaThongaland, were under the administration of the Mabudu chiefs (Harries 1983:26). The rest were presumably of Zulu orientation (Webster 1991:248).

The Bantustan policies of Apartheid, since 1948, entrenched Zulu control over Thongaland. The area became increasingly integrated in the structures of Native and later Bantu administration. According to Webster (1986):

> the loss of independence, the splitting of the Tembe-Thonga chiefdom, the ravages of proletarianization, and various colonial practises, all took their toll on the Thonga, and their coherence as a society began to crumble. Most of the men now speak Zulu as their preferential language, and have adapted Thonga clan names to resemble Zulu ones. Thonga cultural practises such as traditional economic pursuits, rituals, and material culture still persist, and many women in the area insist on speaking Tsonga, and teaching the children to do the same (1986:615).

In 1976 Thongaland became part of the self-governing Zulu Homeland of KwaZulu. In the Government census the inhabitants of the area were listed as Zulu rather than Thonga. Webster (1986:615-616) states that this fact 'need not confuse us, as the government's attempts at social engineering can change a person's ethnicity, race or nationality at the stroke of a pen.'

This was clearly illustrated in 1982 when the government, in a bid to de-nationalise a large portion of its citizens and at the same time create a buffer state with Mozambique, tried to cede the Ingwavuma district of KwaZulu to Swaziland (Van Wyk 1983:55; Omer-Cooper 1994:59-61, 269). The Ingwavuma Land Deal re-opened the debate on ethnicity and identity in Thongaland. The South African government alleged that there were strong historical and ethnic links between the inhabitants of Ingwavuma and Swaziland. Academics such as Tomlinson *et al*. (1982) and Van Wyk (1983) lend credit to this theory. A government appointed commission headed by Tomlinson asserted that the true identity of the inhabitants of Ingwavuma living west of the Pongola River was Swazi' but that inhabitants east of the river belonged to the Tembe-Thonga kingdom, which was subservient neither to the Zulu nor Swazi (Tomlinson *et al*. 1982). Van Wyk (1983:60-62) made similar conclusions, but stated that the Tembe-Thonga would be much more willing to be under the authority of the Swazi, than under the Zulu.

In Ingwavuma news about the Land Deal led to a 'paroxysm of Zulu jingoism with mass, sometimes enforced, recruitment into Inkatha' (Webster 1991:248). Successful court action by the KwaZulu and KaNgwane Homeland governments effectively brought an end to the Land Deal (Omer-Cooper 1994:269). Threats by Mangosuthu Buthelezi, the leader of Inkhata, also led to the failure of the Land Deal.

According to a local story, related to me by a member of the Tembe royal family, Piet Koornhof, the South African Minister of Cooperation and Development, visited chief Mzimba of the Mabudu and asked him if he is willing to be placed under Swazi rule. Mzimba was delighted with the idea and agreed. When asked whether he feared that the Swazis would suppress his people, Mzimba answered that no suppression could be greater than that which his people are experiencing from the

Zulu. Upon hearing of Mzimba's willingness to place his chiefdom under Swazi rule, State President P.W. Botha invited Mzimba to Pretoria to discuss the plans. However, before he left for Pretoria, Mangosuthu Buthelezi visited chief Mzimba. In Pretoria Mzimba was asked three times whether he was a Thonga or a Zulu. To the surprise of P.W. Botha and Piet Koornhof, Mzimba answered that he was a Zulu, although he hesitated a long time before he answered for the third time. Thereafter, in January 1985 chief Mzimba openly apologised to chief Buthelezi for having petitioned P.W. Botha for an independent Tonga homeland, evidently with the object of seceding from KwaZulu and being incorporated into Swaziland. Chief Mzimba asked for a representative from KwaZulu to accompany him to Pretoria to withdraw his petition, which, he admitted, had been drawn up with the help of officials from Swaziland who, he said, misled him (SAIRR 1985:286). Mzimba's actions in Pretoria angered members of the Mabudu royal family who wanted to cede from KwaZulu and nearly caused a rift. Only after he explained that his life was threatened, was Mzimba forgiven, although many members of the royal family resented him for what they perceived as cowardly behaviour.

However, in November Mzimba claimed that chief Buthelezi forced him to lie about being tricked by Swazi authorities and again petitioned the South African government to cede his chiefdom to Swaziland. This time his plea was ignored (SAIRR 1985:287). In a last attempt to free his people from what he called 'Zulu oppression', Mzimba started the Thongaland Independence Party to further his goal of a Free Thongaland, but did not attain any success. At chief Mzimba's funeral, Prince Gideon Zulu (another prominent Inkhata member) was overheard expressing his delight in the chief's death, saying that at last this 'succession business' can be laid to rest. Chief Buthelezi later blamed the deterioration of relations between late chief

Mzimba and himself on ‘manoeuvres of certain manipulators who came from within this country and also from without our borders.’ At a speech he delivered in Ingwavuma in 1992 Buthelezi made it clear that the people of KwaTembe were part of the Zulu nation and that he and his party had saved them from subordination to the Swazi king. In his speech Buthelezi stated:

> Between the KwaZulu Government and Inkatha, tens of thousands of Rands were spend to save the people of this district from having this district excised and given on a platter to Swaziland. I therefore saved your birth-right and prevented the South African government from taking away your right as South Africans.
>
> Where, I asked the South African government, would the thousands upon thousands of men in this district have been able to find work in Mbabane or Manzini? Where… would the medicine come from for Manguzi hospital? How… would the people of this district fare if they turned their back on their great ancestor, Ngwanase Tembe, and give his land away to the Swazi king? How… would the people of this district live if their ancestors folded their arms, turned their backs on their people, and looked the other way, while all manner of evil came in to destroy the people?
>
> Stop and think about these things. Stop and think about the might of the Zulu nation of which you form part. Stop and think about the founder King of KwaZulu, Shaka Kasenzazakhona. Remember how even people, who were not conquered joined King Shaka to become part of the Zulu nation, because that is where they would find support and protection (Buthelezi 1992).

The question that needs to be answered is how all these events influenced ethnicity south of the border. Did the people of Ingwavuma accept their status as a subservient chiefdom within the Zulu Kingdom? Did they adopt a Zulu identity, or, did they continue to assert their Thonga identity?

The teaching of Zulu in local schools, use of Zulu as official language of government, and the issuing of Zulu identity documents strengthened the Zulu cultural influence in Maputaland. Felgate (1982:9) and Webster (1991:254) argue that men were most inclined to adopt a Zulu identity. This choice was influenced by men’s experiences of working on South African mines and farms. Felgate (1982:9) attributed this to the fact that men have closer contact with Zulu speakers in trade and migrant labour and, because of the higher status attributed to being Zulu in these fields; men take on a Zulu identity. Similarly, Webster (1991:254) suggests that white employers held a stereotypical view of Zulus as ‘strong, masculine, militaristic and reliable, whereas most have never heard of the Thonga.’ For, Webster (1991:254), ‘migrant labour and Zulu identity have become necessary equivalents’.

In contrast to men who readily adopted a Zulu identity, Webster (1991:246) suggests that women identified themselves as Thonga. Webster (1991) asserts that people in northern KwaZulu-Natal who ‘present themselves in terms of different ethnic criteria send messages of social difference not for delimitation of ethnic boundaries, but to draw the battle lines in a struggle between the genders’ (p.246). According to Felgate (1982:9) and Webster (1991:246), women do not need to take over a Zulu identity since they have minimal contact with Zulu-speakers and do not migrate to the mines or farms where status is attributed to Zulu people.

Hence, we can conclude that in the period between 1875 and 1994, when the borderland was re-opened, people on the South African side of the borderland increasingly adopted a Zulu identity. My research, presented below, indicates that the ethnic boundary between Zulu and Thonga shifted northwards from the Mkhuze River to the international border, as people came to see the international border as an ethnic boundary between Zulu and Thonga.

War, displacement and identity north of the border (1975-1992)

At the same time as Zulu socio-political influences dominated south of the border, important changes in ethnicity and identity took place north of the border. The Portuguese colonial policies of cultural assimilation deliberately sought to erase existing ethnic loyalties and to impose a new Portuguese identity amongst the inhabitants of Portuguese East Africa (Mozambique).

In 1975 FRELIMO took over with its own agenda of social engineering. FRELIMO viewed traditional ethnic identities as 'obscurantisms' that stood in the way of nationalism (Englund 2002:8). According to West (2001) FRRELIMO aimed to dramatically transform Mozambican society and the operation of power within it. This required, the 'liberation of constituent communities and their members- in short, the decolonisation of individual minds and the creation of what FRELIMO referred to as the new man' (pp.191-121). Shortly after independence FRELIMO started to implement Marxist-Leninist principles in Mozambique. According to informants, all schools, clinics, legal practises, funeral parlours, all land, most privately owned businesses and other property were nationalised. FRELIMO also planned to do away with traditional chiefs, replacing them with Party Secretaries. The president of Mozambique, Samora Machel, triumphantly announced, 'We killed the tribe to give birth to the nation.' (Munslow 1987:160-161).

That which was left of ethnic identities after the social engineering projects of the Portuguese and FRELIMO came under attack during the Mozambican war, which commenced shortly after independence and lasted until the signing of the Rome Peace Accord in 1992. The war caused the large-scale displacement of people, turning thousands into refugees. Communities were uprooted and traditional ethnic boundaries confused. When the war ended, soldiers and ordinary people settled where they found themselves. As McGregor (1997:5, 10) states of the inhabitants of the border areas along the southern Mozambique/ South Africa border,

> they do not have historical claims, being former migrant labourers and soldiers from elsewhere in the country and people invited back by RENAMO. These people were not 'locals', did not have historical claims to land, and were involved in disputes with returnees. Some arrived during the war and stayed on;

> others were invited into the country by RENAMO after the peace agreement; still others in-migrated to the area to hunt, fish, or exploit timber or palm wine.

A large part of the ‘new’ inhabitants have recently moved into the Mozambican borderland from Maputo and areas further north. They were attracted to the area by the creation of many formal and informal employment opportunities by the tourist industry. Mozambicans who lived in South Africa during the war, as well as South Africans with no real ties to Mozambique, have also been attracted to the area by economic prospects. These people are mostly young men in their twenties. Many new migrants constantly move from South Africa to Mozambique as they are pulled by economic and social factors (see Case 1.).

Colonialism, the Marxist-Leninist policies of FRELIMO and displacement caused by the war had a dramatic effect on the ethnic landscape of Mozambique. The current inhabitants of the borderland in Mozambique are a mixture of ex-soldiers, people who stayed behind during the war, returnees, South African immigrants, work seekers from Maputo and elsewhere in Mozambique and travellers from other African countries making their way to South Africa. Although there are still people swearing allegiance to the Mabudu chiefs, inhabitants of the borderland are no longer the Mabudu people described by Bryant (1965) and Junod (1962).

War and displacement have created new identities on the northern side of the borderland in the same way that Zulu political dominance has shaped ethnicity on the southern side of the borderland. These new identities can be seen in the case study of Fernando Tembe below.

Case 1: Fernando's changing identity

During my stay at Campo Paradisomo at Ponta Malongane I employed a young man to look after my campsite during the day and to chase the monkeys away from my foodstuff. He was born in Mozambique, but grew up in South Africa. He speaks fluent Portuguese and Zulu, but not a word of Thonga. While in Mozambique he goes by the name of Fernando Tembe (a traditional Thonga identity), but in his South African Identity book his name is Jabulane Mthembu (a traditional Zulu identity).

Fernando is but one of many young men I met who change their names as they cross the border. On top of changing their names, they also hide other aspects of their identity that would give them away as belonging on the other side of the border. For instance, when I first met Fernando I tried to communicate with him in isiZulu. He acted as if he didn't understand a word, and it was only on my third stay at Campo Paradisimo that he started talking back to me in isiZulu. He later explained that in South Africa he never speaks Portuguese and introduces himself there as Jabulane Mthembu, a Zulu, South African man.

For borderlanders like Fernando the international border is almost a portal through which they move and when they come out on the other side they have changed identities. The fluid and liminal space of the borderland enables and, to some degree, forces these borderlanders to have multiple ethnic and national identities. They are forever moving from one identity to the other as the situation demands.

Ethnicity and identity after the opening of the border

Cohen (2000:1-6) has argued that studying ethnicity is similar to studying literature: one learns about a character by what he says about himself and about what others say about him. To understand how, and if, the international border shapes identity in the borderland, I conducted interviews on both sides of the border, in areas close to and removed from the border. The interviews revolved around two themes: peoples' views of their own identity; and, peoples' views of the inhabitants on the other side of the international border.

1. Views of own identity and ethnicity. Since ethnicity is situational people might identify themselves in a particular way in conversation with a white anthropologist that may differ from how they might identify themselves in other situations. Therefore, I acknowledge that the results presented in the following two tables cannot, on its own, be taken to show that people identify themselves as Thonga or Zulu. It illustrates merely the way people identified themselves to an outside researcher with the aim of understanding peoples' views of the border, themselves and of people across the border.

The results presented in the following two tables were obtained by asking people directly what ethnic group they belong to (*Ungowasiphi isiswe*?). Using a random sample I interviewed as many men as women on both sides of the border in Puza and KwaMshudu. The results presented here wrongly assume that people have single ethnic identities and do not indicate which identities are sub categories of which. At first I did not contemplate this prediction. Through open-ended interviews and participant observation it became clear to me that people had multiple identities and that South Africans who identify themselves as Tembe do not necessarily deny a larger identification with the Zulu.

Table 1: Primary ethnic identity of people at KwaMshudu (South Africa), 2002

Ethnicity	Male	Female	Total
Thonga	37	33	70
Nyembane	1	0	1
Zulu	9	14	23
Shangaan	3	2	5
Swazi	0	1	1
Total	50	50	100

Table 2: Primary ethnic identity of people at Puza (Mozambique), 2002

Ethnicity	Male	Female	Total
Thonga	37	31	68
Nyembane	1	1	2
Mulato	1	0	1
Shangaan	2	11	13
Zulu	11	5	16
Total	50	50	100

The data contained in these tables does however demonstrate that Webster's (1991) argument is incorrect in asserting that men identify themselves as Zulu whilst women adopt a Thonga identity. Webster (1991) argues that women reject a Zulu identity, not just due to a lack of contact with Zulu-speakers, but as a deliberate defence mechanism in the gender conflict. Thonga women, according to Webster (1991), have had much more freedom than Zulu women. These traditional freedoms were: 'husbands could not maltreat wives… wives had the right to sexual gratification… they had the right to luxury items… they could dissolve a marriage'

(1991:259). Webster's argument is thus that a Thonga identity affords women many benefits in the domestic sphere.

Ngubane (1992:72-73) criticises Webster's argument on two grounds. First, she argues that t Zulu women are not more oppressed than Thonga women, and enjoy similar freedoms. Second, she attacks what she perceives as technical weaknesses in Webster's argument. She disputed his conclusion that there is no point in trying to unravel the mystery of true identity of the people of Maputaland 'as if these people were born with a given identity and ethnicity… (p. 70)'

In reading Webster's (1991) thesis and Ngubane's (1992) critique, it is important to bear in mind the different political philosophies and agendas of these authors. Webster was an anti-Apartheid activist affiliated with the United Democratic Front and the African National Congress. In his argument he was determined to illustrate that ethnicity was not primordial as advocated by the South African government. Ngubane, on the other hand, was a Zulu ethnic nationalist and an IFP member of parliament who wanted to illustrate the viability of a Zulu identity.

I nonetheless agree wholeheartedly with Ngubane's (1992:72) suggestion that most of 'these [Webster's] gyrations could have been avoided by simply saying that these people are in a typical border situation with consequently ambiguous ethnic identity…' Although Webster's (1991) article is sub-titled 'Ethnicity and Gender in a KwaZulu Border Community', he gives scant regard to the influence of the border on identity formation. Felgate (1982:165) already mentioned the multiple identities of the people of the borderland who life in Mozambique, but keep South African identities to secure work in South Africa. When moving into Mozambique these men would adopt the identities of kinsmen from the area, or would act like complete strangers with no ties to the area.

My research furthermore shows that ethnicity in the borderland is not organised along gender lines as Webster (1991) argues. The vast majority of people in the borderland identify themselves as Thonga. In fact, more men than women in South Africa and Mozambique identified themselves as Thonga. Only a very small minority identified themselves as Zulu. Yet, in other situations these same people interviewed might identify themselves as Zulu. Ethnicity in the borderland is not simply determined by gender, although that may in some instances (as when men are seeking work on the mines) play a role. It is important to keep in mind however that Thonga and Tembe in South Africa is oftentimes seen as a sub-Zulu identity, in a similar manner to Ngubane and Khumalo. Tembe and Thonga identities are seen by many as a smaller identity within a larger Zulu ethnicity.

Instead of seeing the people in the borderland as adopting a single identity based on gender, age or economic status, one should rather see the existence of multiple identities. As was illustrated above in the case of Fernando (Case 1.), people in the borderland continuously shape and reshape their identities as they move from one side of the border to the other. The same person can at any one time identify himself/ herself as Thonga, Shangaan, Zulu, Mozambican or South African. People use their access to multiple identities to extract the greatest amount of social and economic benefit for themselves. In certain situations it is beneficial to emphasise the link with people across the border, while in other situations it is beneficial to emphasise the differences with people across the border.

The fact that similar customs are practised on both sides of the border enables people to move more easily from one identity to the other. These ‘cultural markers’ do not signify identity for the people themselves. A person claiming to be Zulu practises traditional Thonga customs even if some of these are considered taboo amongst the Zulu. Although it might seem trivial, fish is the most important source of protein in the borderland. Yet fish is considered an absolute taboo amongst the Zulu (Krige 1988:388; Harries 1994:40). People who eat fish in the borderland deny this taboo, claiming they are 'true Zulus', giving yet more weight to Barth's argument that ethnicity is not determined by the 'cultural stuff' found inside ethnic boundaries, but in the boundary itself (1969:15). Webster (1991:250) has gone so far as to draw a list of 'cultural markers'[1] that make the people of the borderland Thonga, although he does state that 'producing a check-list of traits is not a satisfactory means of establishing identity.'

What is puzzling in the borderland, especially south of the divide, is that whilst some people use 'Thonga' customs as markers of ethnicity, others who practise the exact same customs deny any relationship between a particular custom and Thonga identity. In other words, people can participate fully in all the customs and rituals used, sometimes aggressively, to prove Thonga identity, despite claiming adamantly to be Zulu.

This is nowhere better illustrated than during the annual first-fruits festival. The festival, called *mtayi*, revolves around the ripening of the marula (*Sclerocarya birrea*) fruit in early February. The fruit is fermented to produce an intoxicating liquid called *buganu* south of the border and *bukanye* north of the border. According to Junod (1962:399), great importance was placed on brewing marula beer in the past, not only in this area, but amongst the larger area he described as being inhabited by the Tsonga. *Mtayi* differs markedly from the first-fruits festival traditionally practised

[1] Webster (1991:250) lists the following as markers of Thonga culture in the borderland: 'place names, and names of natural phenomena (trees, soil types, fish, animals, birds and rivers) are Thonga; homestead structure is distinctive with most huts in a line (not a circle) and facing east; the cattle byre is never in the homestead, but set outside its boundaries; fish forms an important part of the diet, and hunting and gathering are important food supplements; inter-cropping, swidden-agriculture and field rotation are practised, men and women often share agricultural work and people tenaciously adhere to the tradition of planting three or four maize seeds in one hole.'

by the Zulu (Krige 1988:249-260) and should not be confused. Felgate (1982:61) recorded in the 1960s that the marula festival, which he knew as *ukuluma*, was no longer honoured. It was therefore interesting to see the revitalisation of this ritual on both sides of the border (see Figure A and B).

Figure A: Women bringing marula beer to the festival, February 2000

Photograph by Callie Pretorius

On the southern side of the border *mtayi* is practised in some wards, but not in others. There is also a clan wide *mtayi* where all the local headmen gather at the royal kraal. After the 'royal' festival has taken place, the headmen initiate similar rituals in their own wards. The ritual is usually accompanied with the slaughter of chickens and goats and lasts for several days. In some of the poorer wards where I attended *mtayi*, marula beer was the only item on the menu. Those who can, bring beer to the house of the headman, others, like me, pay R5. Everybody, from the oldest women to the young kids gets extremely intoxicated and, usually by around 4am the celebrations wind down.

Figure B: Dancing at Mtayi festival, February 2000

Photograph by Callie Pretorius

The revitalisation of *mtayi* is relatively recent and only started after the death of the previous chief of the Mabudu in 1999. In my conversations with them people identifying themselves as Thonga often pointed to the *mtayi* festival as a marker of their identity. They said it is Thonga and shows that they are not Zulu. Yet, at the same time others, claiming they are Zulu, participate in the ritual, and play down any connection between *mtayi* and being Thonga. This is almost similar to Jewish people celebrating Christmas.

North of the border, in the village of Zitundo I found a similar revitalisation of *mtayi*, called *chikanye* in Mozambique. There, under the leadership of the local chief, who was instituted with the help of members of the Mabudu royal family, people have started to practise this old custom once again. According to the chief, the 'people of Tembe' have always practised *chikanye*, even in the time of the Portuguese. During the war it was stopped. Now, after the war, it is the chief's responsibility to see that people remember this ritual and their own identity. The link between *chikanye* in Zitundo and the Mabudu is clearly illustrated by the fact that the ritual is held at the gravesite of Makhaza, an old Tembe chief, who died in 1952. As with *mtayi* south of the border, *chikanye* is also a veneration of the ancestors. During *mtayi* beer is poured on the ground around the *ingandelo* (shrine for venerating the ancestors). At *chikanye* in Zitundo the praise names of the old Tembe chiefs are recited, illustrating the ethnic bonds between people on both sides of the border.

The revitalisation of *mtayi* and *chikanye*, orchestrated by the Mabudu royal family, is part of an attempt of the Mabudu royal family to re-institute their authority over the traditional chiefdom in Mozambique. It is also a sort of ethnic revival, people reclaiming their traditional customs and way of life. This interpretation is not mine, but that of the many people I interviewed in the borderland. Informants present the marula festival, together with such strange things as *fonya* (thrust-basket fishing), palm wine and the fish-kraals at Kosi Bay as evidence of their Thonga identity and allegiance to the royal family. Yet, at the same time, people claiming no allegiance to the Mabudu chiefs or Thonga identity participate in all these rituals. Many of these people assert that the Tembe clan forms part of a larger Zulu nation.

2. Views of people on the opposite side of the border. My research showed that both South Africans and Mozambicans saw a difference between themselves and people on the other side of the border. They primarily defined the differences in terms of language and their economic status. My respondents only referred to ethnicity when specifically asked to define the ethnicity of those on the opposite side of the border.

Eighty-two per cent of my respondents at KwaMshudu (South Africa) and ninety-five per cent of respondents in Puza (Mozambique) believed that the border was a marker of social, physical or cultural differences.

Mozambicans would argue that South Africans differ from them because they 'use money.' South African respondents, on the other hand, would describe Mozambicans as 'subsistence farmers.' South African respondents will tell me: 'There are no cars, shops or proper houses in Mozambique', 'they [Mozambicans] have no clinics… they are poor… they don't have livestock… they wear second hand clothes.'

In general, Mozambicans are perceived as sexually less inhibited.[2] South African as well as Mozambican men described Mozambican women (or Shangaans, as they referred to them) as sexually liberated. Michael, my field-guide, who had fled from Mozambique in the 1980s and settled in Manguzi, told me that his wife in South Africa accused him of treating her like a whore when he asked for the same sexual favours he used to get from his previous Mozambican sexual partners. Other South African men complained to me that if you want to sleep with a Zulu wife you always have to do it in the dark. The man has to stay outside while the woman undresses and gets under the covers. Before he comes into the room the woman will blow out the candle and he has to stumble around in the dark before he can sleep with her. Men

[2] It is interesting to note that, in contrast to this stereotype of Mozambican women, Rodgers (2002:151) found that Mozambican women living in refugee communities on the north-eastern border between South Africa and Mozambique actually portrayed South African women as sexually more promiscuous than themselves. Mozambicans further stereotyped South African women as lazy, money-hungry fans of television soap operas. In this situation Mozambicans are seen as more traditional and pure, whereas South Africans have adopted more Westernised lifestyles. On the southern border between Mozambique and South Africa in turn, Mozambican immigrants to South Africa are often perceived as more Western and decadent, whereas local South Africans are truer to the traditional (Zulu) ways of life.

also told me that Zulu women will never have sex while men face their backs, arguing that only dogs and monkeys have sex that way. Zulu women also saw oral sex as disgusting.

Shangaan women or 'girls from Maputo' are not only perceived as far more promiscuous, but as more loving than Zulu women. South African men explained to me that Shangaan girls will allow a man to hold her hand in public or to kiss her in front of people. With Zulu girls you always have to be secretive. 'You always have to sneak around like a criminal, even just to talk to her.' Wiseman Vilane, who has two wives in Mozambique and one wife in South Africa, explained to me that he married twice in Mozambique because Thonga women 'give better sex', whereas he married his South African wife only to have children.

On the other hand, I found a strong liking for Zulu women among Mozambican men. According to one informant, Raphael Gumende, 'women in Mozambique are all sluts'. Most of them have lost their virginity, either having been raped during the war or having had sex with soldiers for money. Although Raphael has children with two different Mozambican women, he would like to marry a Zulu wife because they are more pure.

Apart from differences in sexual behaviour, many South Africans also highlight physical differences between themselves and Mozambicans. South Africans are quick to point out that Mozambicans have vaccination marks on their forearms, whereas South Africans are vaccinated on their upper-arms. They also say that when South Africans walk they always lead with their right feet, whereas Mozambicans lead with their left feet. These differences are trivial and do not in any way imply a derogatory image of Mozambicans. The following descriptions of Mozambicans, given to me by South African informants, are however extremely derogatory, 'They

(Mozambicans) are not neat', 'They do not wash themselves', They are not beautiful, they are too dark (black)', 'We are much taller than them', and, 'They are ugly'.

South Africans also use custom, language and ethnicity as identity markers between themselves and Mozambicans. South Africans responded that 'They speak Thonga, we speak Zulu'[3], 'They behave differently from us', 'We are Zulu, they are *Shangani* and *amaJapan'*, 'They are of mixed races (*mulatto*), we are all African (black)', and 'The kids don't respect their elders.'

Religion is also used as a marker of identity. Mozambicans are revered as powerful diviners and healers. It is the place where the Ndau spirit comes from and where all the best healers have been trained. It is also a place with much stronger medicine than South Africa. 'Mozambique is a place of traditional religion; South Africa is a place of churches.' Informants are quick to point out that there are no churches or temples in Mozambique for worshipping God, 'They are witches, who use the thunderstorm and we are Christians.'

Another way in which South Africans usually describe the differences between themselves and Mozambicans is by saying Mozambicans like to make war and 'Mozambique is the place of fighting.' South Africa in contrast is a place of refuge for those tired of the fighting, fleeing to safe their lives. This view is obviously the result of the war in Mozambique and the flight of refugees, many of whom settled in South Africa. For many South Africans the only contact they had with Mozambicans was with those fleeing the war in Mozambique. Therefore, they portray Mozambique as a place of war and its people as prone to warfare.

Mozambicans gave similar reasons for why people across the border were different from them, paying attention especially to economic differences between

[3] Interestingly, the informant who gave this response identified himself as Thonga in the questionnaire survey. This again alludes to the fact that Thonga is seen as a sub-Zulu identity in South Africa.

people on opposite sides of the border. Mozambicans also complained that South Africans were extremely arrogant.

When asked about the differences between them and the people across the border, Mozambicans answered that 'they have shops, electricity, development, clinics and schools'. On the other hand they will describe themselves as poor and miserable, living a life full of hardship. Mozambicans are hunters, palm wine tappers, fishermen and agriculturalist who have to work hard for their food, unlike the people in South Africa who get pension from government.

Unlike South Africans, Mozambicans did not use religion or physical appearances as markers of difference between themselves and South Africans. Whereas most South Africans tell fantastical stories about witches and spirits in Mozambique, Mozambicans do not have similar stories about South Africans. Mozambicans, however, produced more tales of sacred sprits and sacred forests in their country than in South Africa. Mozambicans also spoke much more openly about witchcraft, spirit possession and ancestor worship than South Africans. The influence of the Christian church probably has a role to play in South Africans' unwillingness to talk about these subjects or even the belief in forests where sacred spirits dwell and large snakes in sacred rivers, which Mozambicans are fascinated with.[4]

Mozambicans also highlighted cultural and ethnic differences between themselves and South Africans. 'South Africans are Zulu, we are Shangaan', 'they speak a different language from us', 'They have different customs (*amasiko*)', and,

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[4] Informants related that there are four sacred forests in the vicinity of Zitundo. They are all named after great *izinduna* who were buried there. *Mato de* Makhaza *e* Madingi literally means the bush of Makhaza and Madingi and is the place where these two leaders were buried. Mystery and ambiguity surround the forest of Makhaza and Madingi. Informants say that only the tribal elders are allowed to enter the forest. They go there to *phahla.* The elders assemble in a circular formation in the centre of the forest. If the ancestors are pleased with them, a large snake, which looks like a cobra, slithers around the group of men until it has encircled them. They then put snuff on the snake's head to calm him. If the snake calms down, it means that the ancestors will grant the requests of the men. If the snake does not calm down it is necessary to sacrifice a chicken or goat to appease the ancestors.

‘Chiefs (*amakhosi*) in South Africa are strong.’ Mozambicans would also argue that South Africans have lost their tradition, that they’ve become urbanised and that they sit the whole day and wait for ‘whites’ to help them, whereas Mozambicans do things for themselves.

Although most people did not use ethnicity as a marker to highlight the differences between themselves and people across the border, when asked specifically about it people did indicate that the international border was also the ethnic line between the Zulu and the Thonga/Shangaans. Table 3 and Table 4 illustrate peoples’ views of the identity of those on the other side of the border.

Table 3: Inhabitants of KwaMshudu’s (South Africa) ethnic classifications of people across the border, 2002

Ethnicity	Total
Thonga	86
Shangaan	54
Nyambane	8
Ndau	3
Zulu	3
Chopi	1
Total	155

Table 4: Inhabitants of Puza’s (Mozambique) ethnic classifications of people across the border, 2002.

Ethnicity	Total
Zulu	98
Thonga	4
Total	102

As can clearly be seen in these two tables, people in South Africa classify people in Mozambique as Thonga or Shangaan, while people in Mozambique classify

South Africans as Zulu. In fact, very few Mozambicans could tell me the names of other ethnic groups, beside Zulus that live in South Africa. In quite a few interviews informants were adamant that the only people found in South Africa are Zulu. When I asked whether that makes me Zulu, they laughed and said 'No, you are from America.' The figures in these tables are quite interesting when one compare them with the figures in Table 1 and Table 2, which showed that the majority of people on both sides of the border classify themselves as Thonga. This again alludes to the fact that Tembe-Thonga is seen as a sub-identity of Zulu in South Africa, while it is seen as an independent identity in Mozambique. Most people see the international border as an ethnic dividing line between Zulus in the south and Thonga/ Shangaans in the north.

Conclusion

Apartheid only ended in 1994 and Mozambique is still recovering from a long and devastating war and socialist modernisation programmes. At present there are various processes at work that emphasise a new unity in the borderland. This unity is not only drawn on shared ethnicity and history, but on a shared way of life, a borderland culture. Throughout this thesis I tried to illustrate that there are certain experiences shared by people, in various parts of the world, who live in borderlandscapes. These experiences are the result of their proximity to international borders. Borders do not only divide and unite; they also give life to a new person, a borderlander, constantly moving from one side of the border to the other. In the process the borderlander amalgamates life on one side of the border with life on the other side of the border. Similarly, the identity of the borderlander changes constantly as he moves from one side to the other, in this case being neither Mozambican nor South African, neither Zulu nor Shangaan, but none of these things, and all of these things at the same time.

Ethnic identity is ‘open-ended, fluid and constantly in a process of being constructed and reconstructed as the subject moves from one social situation to another, resulting in a self that is highly fragmented and context-dependent (Zegeye 2001:1). In the borderland, which is a place ‘in a constant state of transition’ (Anzaldua 1999:25), ethnicity becomes even more fluid as the borderlander constantly finds himself in a situation betwixt and between two states.

Furthermore, my research shows that ethnic labels have different meanings on opposite sides of the border. Whilst Tembe-Thonga is seen as a sub-Zulu identity south of the border, north of the border it is equated with an older ethnic meaning, and, even as part of a Tsonga or Shangaan identity. One thing is certain: single factors, such as gender, social status and custom cannot account for the multitude of identities in the borderlandcape. Instead, all these factors simultaneously influence the way people view themselves and people across the border.

References

Anzaldua, G. 1999. *Borderland/ La Frontera. The New Mestiza.* San Francisco: Aunt Lute Books.

Asiwaju, A. I. 1985. 'The conceptual framework.' In A. I. Asiwaju (ed) *Partitioned Africans: Ethnic Relations Across Africa's International Boundaries, 1884-1984.* Lagos: State University Press, 1-18.

Barth, F. 1969. 'Introduction.' In F. Barth (ed) *Ethnic Groups and Boundaries: The Social Organisation of Culture Difference*. London: George Allen and Unwin, 9-38.

Bryant, A. T. 1964. *A History of the Zulu and Neighbouring Tribes.* Cape Town: Struik.

Buthelezi, M. 1992. Public meeting and address to the people of the Ingwavuma District and tribute to King Shaka as founder of the Zulu nation. KwaZulu Government, Department of Natural Resources File 11/14/25/1.

Cohen, A. P. 2000. 'Discriminating relations: identity, boundary and authenticity.' In A. P. Cohen (ed) *Signifying Identities. Anthropological Perspectives on Boundaries and Contested Values.* New York: Routledge, 1-13.

Englund, H. 2002. *From War to Peace on the Mozambique-Malawi Borderland*. Edinburgh: Edinburgh University Press.

Felgate, W. S. 1982. *The Tembe Thonga of Natal and Mozambique: An Ecological Approach.* Occasional Publications Number 1. Department of African Studies. University of Natal, Durban.

Hailey, G. 1938. *An African Survey. A Study of Problems Arising in Africa South of the Sahara.* Issued by the Committee of the African Research Survey under the auspices of the Royal Institute of International Affairs. Oxford: Oxford University Press.

Harries, P. 1983. 'History, ethnicity and the Ingwavuma land deal: the Zulu northern frontier in the nineteenth century.' *Journal of Natal and Zulu History* VI, 1-27.

Harries, P. 1994. *Work, Culture and Identity. Migrant Laborers in Mozambique and South Africa, c. 1860-1910.* Johannesburg: Witwatersrand University Press.

Junod, H.A. 1962. *The Life of a South Africa Tribe*. Two Volumes. New York, University Books Inc.

Kopytoff, I. 1999. 'The internal African frontier: cultural conservatism and ethnic innovation.' In M. Rosler and T. Wendl (eds.) *Frontiers and Borderlands. Anthropological Perspectives.* Frankfurt: Peter Lang, 31-44.

Krige, E.J. 1988. *The Social System of the Zulu.* Pietermaritzburg: Shuter & Shooter.

Malkki, L. H. 1992. 'National geographic: rooting of peoples and the territorialization of national identity among scholars and refugees.' *Cultural Anthropology*, 7 (1), 24-44.

Mamdani, M. 1996. *Citizen and Subject. Contemporary Africa and the legacy of Colonialism.* Princeton: Princeton University Press.

McGregor, J. 1997. *Staking Their Claims: Land Disputes in Southern Mozambique.* LTC Paper 158. Land Tenure Centre, University of Wisconsin-Madison.

Munslow, B. 1987. *Samora Machel- An African Revolutionary.* Harare: College Press.

Ngubane, H.1992. Review article of '*Abafazi Bathonga Bafihlakala*. Ethnicity and gender in a KwaZulu border community.' *Agenda*, 13, 70-74.

Omer-Cooper, J.D. 1994. *History of Southern Africa.* London: Currey.

Ortner, S. B. 1998. 'Identities: the hidden life of class.' *Journal of Anthropological Research* 26 (1), 1-17.

South African Institute of Race Relations (SAIRR) 1985. *Race Relations Survey*. Johannesburg: SAIRR.

South African Institute of Race Relations (SAIRR) 1993/1994. Race Relations Survey. Johannesburg: SAIRR.

Smith, K. & Nöthling, F.J. 1993. *North of the Limpopo. Africa since 1800.* Pretoria:

University of South Africa.

Tomlinson, F.R., J.C. Bekker, N.E. Wiehahn, C. Hanekom, J.J. Wessels, C.V. Bothma, J.F. Preller and K. Woerner. 1982. '*Verslag van die Kommitee van Deskundiges oor die Etniese en Historiese Verbintennise van die Inwoners van Ingwavuma.'* Unpublished report. Lodged at the Ingwavuma Magistrate.

Vail, L. 1989. 'Introduction: ethnicity in Southern African history.' In L. Vail (ed) *The Creation of Tribalism in Southern Africa.* Berkeley: University of California Press, 1-19.

Van Wyk, J. J. 1983. ' Ingwavuma – 'n Etno-historiese oorsig.' *Journal of Racial Affairs,* 34 (2), 54-64.

Webb, C. and J.B. Wright (eds.) 1979. *The James Stuart Archive of Recorded Oral Evidence Relating to the History of the Zulu and Neighbouring Peoples.* Volume 2. University of Natal (Pietermaritzburg) and Killie Cambell Africana Library (Durban).

Webster, D.J. 1986. 'Tembe-Thonga kinship: the marriage of Anthropology and History.' *Cahiers d'etudes Africaines,* 104, 611-632.

Webster, D.J. 1991. '*Abafazi baThonga bafihlakala.* Ethnicity and Gender in a KwaZulu border community.' In A.D. Spiegel and P.A. Mcallister (eds.), *Tradition and transition in Southern Africa: Festschrift for Phillip and Iona Mayer*. Johannesburg: Witwatersrand University Press, 243-271.

West, H. 2001. 'Sorcery of construction and socialist modernisation: ways of understanding power in postcolonial Mozambique.' *American Ethnologist*, 28 (1), 119-150.

Wilson, T.M. and H. Donnan, 1998. 'Nation, state and identity at international borders.' in T.M. Wilson and H. Donnan (eds.) *Border Identities. Nation and State at International Frontiers.* Cambridge: Cambridge University Press, 1-30.

Wright, J. & C. Hamilton 1989. 'Tradition and transformations. The Phongolo-Mzimkhulu region in the late eighteenth and early nineteenth centuries.' In A. Duminy and B Guest (eds.) *Natal and Zululand from Earliest Times to 1910. A New History.* Pietermaritzburg: University of Natal, 49-82.

Zegeye, A. 2001. 'Introduction.' In A. Zegeye (ed) *Social Identities in the New South Africa. After Apartheid – Volume 1.* Cape Town: Kwela Books, 1-23.

The value of community-based conservation in a heterogeneous landscape: a case study from the maputaland centre of plant endemism, South Africa

D.G. van Eeden[1], B.J. van Rensburg[2*], M. De Wijn[1] and J. du P. Bothma[1]

[1]*Centre for Wildlife Management, University of Pretoria, Pretoria 0002, South Africa,*

[2]*Department of Zoology and Entomology, University of Pretoria, Pretoria 0002, South Africa*

The Sand Forest habitat type shows a large degree of fine-scale spatial heterogeneity between different forest patches for various biotic groups. This indicates that the conservation of Sand Forest in a variety of areas is necessary to ensure the long-term persistence of its associated biota. One of the local communities who live adjacent to Tembe Elephant Park, the latter being the largest protected portion of Sand Forest in South Africa, recently nominated a portion of their land as a community-based natural resource management project to promote conservation in the region. The present study compared Sand Forest bird assemblages found in the communal land area with that of the Tembe Elephant Park. The communal land area demonstrated unique avian Sand Forest assemblages often characterised by more characteristic species and it had higher abundance and higher area fidelity values. This demonstrates the biological importance of the communal land for Sand Forest conservation, especially from an avian perspective. The communal land area not only has the potential to contribute significantly towards biodiversity conservation, but it also serves as an example of

* To whom correspondence should be addressed.
E-mail: bjvrensburg@zoology.up.ac.za

community-based conservation in South Africa. It is the first reserve of its kind to be established in a ward of a tribal area in the northern parts of the KwaZulu-Natal province of South Africa through the initiative taken by the local people themselves.

Key words: Maputaland Centre of Plant Endemism, community-based conservation, Sand Forest, avian assemblages, heterogeneity

INTRODUCTION

The Maputaland Centre of Plant Endemism (see Van Wyk 1994 and 1996 for its boundary definitions) is an area that is well known for its conservation importance (Moll 1977; Kirkwood & Midgley 1999; Van Wyk & Smith 2001). One reason most likely responsible for the high levels of biodiversity and endemism associated with the Maputaland Centre is that this area lies at the southern end of the tropics in Africa and many organisms reach the southernmost limit of their range there (Watkeys *et al.* 1993; Hearne & Mckenzie 2000; Matthews *et al.* 2001; Van Wyk & Smith 2001). The region therefore is a biogeographical transitional zone between the tropics to the north and the subtropics to the south, and is characterised by a diverse array of biomes. Consequently, several species pools that cover large parts of continents and are characterised by a variety of vegetation types and climatic conditions, may therefore act as reservoirs to enhance species diversity at the smaller regional scale such as the Maputaland Centre (see e.g. bird richness patterns - Maddock & Benn 2000).

Although several conservation activities have been, and currently still are, taking place in the Maputaland Centre, there are still several conservation concerns within the region. A case in point is the conservation of the Sand Forest habitat type, a distinctive habitat type in southern Africa. The Sand Forest is characterised by a unique combination of plant and animal species and has the highest diversity of woody plant species in the region, with a significant number of these being endemic to the Maputaland Centre (Everard *et al.* 1994; Matthews *et al.* 2001). Quantitative evidence suggests that most of the endemic vertebrate species in the Maputaland Centre are likewise restricted to this habitat type (Van Wyk 1996; Van Rensburg *et al.* 2000a). Although Sand Forest is considered the smallest habitat type in South Africa, covering only 0.03% of the region's total land surface area, *circa* 45% of this habitat type has already been transformed due to anthropogenic activities and only small portions of the remainder are currently being formally protected (Low & Rebelo 1996). Even within some of these protected areas, Sand Forest conservation is also under pressure. For example, Tembe Elephant Park contains the largest protected portion of Sand Forest in South Africa (Van Rensburg *et al.* 1999), but although elephants *Loxodonta africana* prefer plant species from woodland habitats, they are increasingly utilising Sand Forest plant species within the park (Matthews *et al.* 2001). To date no reversion to the original habitat structure has been recorded for disturbed Sand Forest patches even after extensive protection (Van Rensburg *et al.* 1999).

Another facet that conservation strategies have to take into account in order to integrate Sand Forest conservation requirements more carefully into future land-use planning is local scale heterogeneity. Several investigations examining the nature of fine-scale spatial heterogeneity in communities or assemblages have shown a large degree of such heterogeneity between different Sand Forest patches for dung beetles (Van Rensburg *et al.* 1999), birds (Van Rensburg *et al.* 2000a) and plants (Matthews *et al.* 2001; Gaugris *et al.* 2004). This heterogeneity is most likely coupled with the biogeographical complexity of the area and indicates that conservation efforts in a variety of habitat patches are necessary to ensure the long-term persistence of its associated biota. This conclusion is particularly important given the increased utilisation, and hence destruction, of Sand Forest in Tembe Elephant Park (Van Rensburg *et al.* 1999, 2000a).

One of the local communities who live adjacent to Tembe Elephant Park recently nominated a part of their ward, namely the Tshanini Community Conservation Area, as a community-based natural resource management project to serve as a possible conservation area in the region. The purpose of the area is to establish a nature reserve in the Manqakulani Ward of the Tembe Tribal Authority. The reserve is to be managed as an economic sustainable wildlife ranching and eco-culture tourism venture through the sustainable utilisation of renewable natural resources, but especially those resources that are associated with Sand Forest ecosystems. The aim of the present study was to describe and compare the Sand Forest bird assemblage that is found in the Tshanini Community Conservation Area, which is characterised by low levels of human utilisation, with those characterised by wildlife utilisation such as Tembe Elephant Park. This approach is to be used as a point of departure to determine the biological importance of this community area in contributing towards the conservation of the rare Sand Forest habitat type. If the avifaunal diversity of such an unprotected area compare well with that of a protected area, or it contribute towards the conservation of Sand Forest and its associated fauna in this heterogeneous landscape, then one should emphasize the important role of such a community-based conservation initiative.

METHODS

The field work was done 5 km south of Tembe Elephant Park (27° 01'S; 32° 24'E), hereafter referred to as Tembe, in the Tshanini Community Conservation Area, hereafter referred to as Tshanini. It is found on the southern Mozambique Coastal Plain of the northern parts of the KwaZulu-Natal province in South Africa (Fig. 1). Similar to Tembe, there are two distinct, clearly bounded habitat types in Tshanini, namely Sand Forest and Mixed Woodland.

In a previous study, Van Rensburg *et al.* (2000a) investigated the habitat-associated heterogeneity and endemism of avian assemblages within and between Sand Forest patches and the savanna-like Mixed Woodland matrix that surrounds it. They collected bimonthly data for 12 months within the Tembe and Sileza Nature Reserves that are *circa* 20 km apart and concluded that the relevant bird assemblages differed between habitats both within a given reserve and between reserves and also between reserves for a given habitat. No significant difference was, however, found between bird assemblages from different sample sites within the same habitat type within a particular reserve. For the present analysis, we used the basic data of Van Rensburg *et al.* (2000a) on Tembe as a measure of avian assemblage structure as being representative of the Sand Forest and Mixed Woodland in a protected area and compared it with that of the Sand Forest and Mixed Woodland assemblages on unprotected communal land in Tshanini.

Visual and auditory bird surveys were done monthly in the Tshanini area between 1 July and 31 December 2002 and therefore include data only for the austral winter and summer months. Because this area is not characterised by four distinctive seasons but rather mostly by two (i.e. summer and winter) due to the nature of the climatic conditions associated with the region (Schulze 1982; Matthews *et al.* 2001), this temporal extent during which time surveys were conducted was considered appropriate. Only one breeding migratory bird species present in Tembe from the Van Rensburg *et al.* (2000a) study was not recorded in the present study, while five breeding and four non-breeding migratory bird species not recorded in the Tembe study were recorded in the present study.

We followed the same bird surveying protocol as Van Rensburg *et al.* (2000a, b) in Tembe, except that only a single Sand Forest and Mixed Woodland site each were surveyed in Tshanini as opposed to two replicated sites of each habitat type in Tembe. This was mainly done due to the small geographical size of Tshanini (*circa* 2 420 ha) and the lack of continuous Sand Forest habitat due to its patchy nature and previous human utilisation, leading to limited space for the placement of more replicated sites without increasing potential edge or pseudoreplication effects. However, knowing that bird assemblages from several study areas within the region showed no significant differences within a given habitat when replicated sites were compared within a small geographical space (Van Rensburg *et al.* 2000a), this approach should not greatly effect the outcome of the present study. Also, seeing that the present study focused more on the potential role of a community-based conservation initiative based on the description of a bird assemblages in an area with proportionally few Sand Forest, as opposed to further understand the local scale heterogeneity dynamics or making inferences about the birds of Sand Forests in general, this limitation, although not ideal, should be negligible.

Each survey site comprised 16 randomly selected fixed survey points as determined originally by Van Rensburg *et al.* (2000a) following the method of Buckland *et al.* (1994). To minimise the probability of double detection, to ensure data independence and to provide suitable replicates for the present study, the distances between the 16 survey points within a site and between the different sites were at least 200 and 500 m respectively. Bird surveys were done using point sampling as discussed by Buckland *et al.* (1994). The 16 survey points from a single site representing a given habitat type, were surveyed in one morning, taking 10 minutes per survey point. Each of the two sites was surveyed four times per month (i.e. 24 times over the six month sampling period). We varied the order in which the survey points was visited to ensure that each point was surveyed at different times during different mornings. The surveys were not done during rain that exceeded a light drizzle or during periods of strong winds.

The number of individuals of each species observed over the course of each sampling period in Tembe by Van Rensburg *et al.* (2000a) and during the present study was summed for each survey point within each site. Multivariate community analysis of the absolute bird species abundance data was then made by using PRIMER v 5.2 (Clark & Warwick 1994). Cluster analysis, using group averaging and Bray Curtis similarity measures (Bray & Curtis 1957) was used to examine the relationships between habitat types both within and between study areas, and within a given habitat type between study areas. These data were double square root transformed prior to analysis so as to weight the common and rare species equally (Clark & Warwick 1994). Analyses of similarity were used to establish the significance of differences in bird assemblages between and within habitats. In this procedure a significant global R-statistic of close to 1 indicates distinct differences between the assemblages or habitats compared (Clark 1993). Non-metric multi-dimensional scaling was used to display the relationship between the survey sites in a two-dimensional ordination analysis.

To further describe and compare the bird assemblage that is found in Tshanini with those in Tembe, the degree of variation between the bio-indicator species that were identified for the different habitat types was calculated. Characteristic bird species (indicator species) were identified for each habitat type using the Indicator Value Method (Dufrêne & Legendre 1997). This assesses the degree (expressed as a percentage) to which each species fulfils the criteria of specificity (uniqueness to a particular site) and fidelity (frequency within that habitat type) for each habitat cluster compared with all other habitats. The higher the percentage IndVal (indicator value) obtained, the higher the specificity and fidelity values for that species, and the more representative the species is of that particular habitat.

The species abundance matrix from each survey site was used to identify the indicator species. The following comparisons were made: Tshanini Sand Forest versus Tshanini Mixed Woodland, Tembe Sand Forest versus Tembe Mixed Woodland, Tshanini Sand Forest versus Tembe Sand Forest, Tshanini Mixed Woodland versus Tembe Mixed Woodland, and Tshanini versus Tembe. Dufrêne and Legendre's (1997) random re-allocation procedure of sites among site groups was used to test the significance of the *IndVal* measures for each species. Those species with significant *IndVals* > 70% (a subjective benchmark) were then regarded as indicator species for the habitat in question (Van Rensburg *et al.* 1999; McGeoch *et al.* 2002).

The identification of rare species on a local scale seems unlikely to provide insight into the conservation requirements of the species involved unless information on their regional distribution and abundance elsewhere is taken into account (Van Rensburg *et al.* 1999). To assess whether such diffusive rarity occurs between habitat types at a fine spatial scale and/or nationally at a broad spatial scale, rare bird species were identified for each habitat type and each study area. This part of the study was done by using the proportion of species method of Gaston (1994) that defines rare species as the 25% least abundant species in a sample area.

RESULTS

During the two study periods (1995 to 1996 and 2002) a total of 11 296 observations were made representing 121 bird species (Appendix 1). Significant differences in species richness (*S*) and abundance (*N*) values were found between the unprotected Tshanini area and the protected Tembe area, both values being higher in the former area (Table 1). As for Tembe (Van Rensburg *et al*. 2000b), the species accumulation curve for Tshanini reached an asymptote within the sample size used indicating representative bird data for the area of interest (Fig. 2).

Analysis of similarity indicated significant differences in bird assemblages between habitat types within and between study areas (Fig. 3). This was also true between study areas within a given habitat type. Of all the possible habitat type comparisons, the bird assemblages of the Mixed Woodland and Sand Forest habitats in Tshanini showed the lowest degree of dissimilarity (Fig. 3). In contrast, bird assemblages showed the highest degree of dissimilarity between Tembe and Tshanini Sand Forest sites and between Tshanini Mixed Woodland and Tembe Sand Forest sites (Fig. 3). Clearly, from an avian point of view, these results suggest marked differences between the Tembe and Tshanini avian assemblages, and these differences seem to be more intense within the Sand Forest habitat than in the Mixed Woodland one. The apparent high habitat-associated heterogeneity between the two study areas is also supported by the different levels of habitat specific bird species that occurred consistently within a given habitat type for a particular study area (Table 2). Furthermore, Tshanini had a more even spread of indicator values and more species reaching higher absolute indicator values than Tembe, indicating a larger complex of more characteristic species in Tshanini than in Tembe (Fig. 4).

Of the habitat-specific birds, three species and five subspecies are endemic to the Maputaland Centre (Table 2). Of the endemic species, Neergaard's sunbird *Cinnyris neergaardi* (100.0%) and Woodward's batis *Batis fratrum* (84.6%) were indicators of Tembe Sand Forest and the pink-throated twinspot *Hypargos margaritatus* (75.6%) as an indicator of Tembe Mixed Woodland. Neergaard's sunbird was absent from the Tembe Mixed Woodland areas but was relatively abundant in all the other habitat types, reaching its highest densities in the two Sand Forest habitats. Woodward's batis was present in all four of the habitat types but was consistently more abundant in the two Sand Forest ones. The pink-throated twinspot was also present in all four the habitat types but it was more abundant in the Mixed Woodland habitat and rare in the Tshanini Sand Forest (Appendix 1).

Of the endemic subspecies, the brown scrub-robin *Cercotrichas signata tongensis* (96.8%) and southern boubou *Laniarius ferrugineus tongensis* (86.5%) were indicators of the Tembe Sand Forest and the neddicky *Cisticola fulvicapilla lebombo* (87.5%) and white-browed scrub-robin *Cercotrichas leucophrys simulator* (70.0%) of the Tembe Mixed Woodland. The red-fronted tinkerbird *Pogoniulus pusillus niethammeri* (74.0%) was an indicator of the Tshanini Mixed Woodland. The brown scrub-robin was present in all four the habitat types, but it was consistently more abundant in the two Sand Forest ones compared to the Mixed Woodland ones, and it was rare in the Tembe Mixed Woodland. Although present in all four the habitat types, the southern boubou was more abundant in those associated with Tshanini than the Tembe ones. It was not rare in any habitat type but the lowest numbers were found in the Tembe Mixed Woodland. The neddicky was considered rare in the Tshanini Mixed Woodland and was absent from both the Sand Forest habitat types, reaching its highest numbers in the Tembe Mixed Woodland. The white-browed scrub-robin was also present in all four the habitat types and was not considered rare in any one of them. It was, however, consistently more abundant in the Mixed Woodland. The red-fronted tinkerbird was rare in the Tembe Mixed Woodland, was absent from the Tembe Sand Forest, and reached its highest numbers in the Tshanini Mixed Woodland (Appendix 1).

A total of 65 bird species and 5 subspecies were rare in at least one of the habitat types, varying from 17 to 28 species and subspecies per locality (Appendix 1). Of these, 14 species each were restricted to Tshanini and Tembe respectively. None of these rare and restricted species was endemic to the Maputaland Centre, or was identified as an indicator species for any given habitat type within the study area. However, of the 14 species that were considered to be rare and restricted to Tshanini, six were classified as red data species based on Baillie and Groombridge (1996) and Barnes (2000). None of these species was considered rare in South Africa (Harrison *et al*. 1997) and none of the 14 rare and Tembe restricted species was classified as a red data species. The plain-backed sunbird *Anthreptes reichenowi* is, however, rare in South Africa (Harrison *et al.* 1997).

Of the 51 species or subspecies considered to be common in this study area, 11 and 8 of the species were restricted to Tshanini and Tembe, respectively. Of these 51 species or subspecies, none was endemic to the Maputaland Centre or rare in South Africa. The blue waxbill *Uraeginthus angolensis* (93.8% IndVal) was an indicator species for the Tembe Mixed Woodland, the barn swallow *Hirundo rustica* (84.4% IndVal) for the Tshanini habitat as a whole and Klaas's cuckoo *Chrysococcyx klaas* (77.3% IndVal) for the Tshanini Mixed Woodland. Of the species considered common and restricted to Tshanini, only the African goshawk *Accipiter tachiro* was classified as a red data species (Baillie & Groombridge 1996; Barnes 2000). None of the eight common species that were restricted to Tembe was classified as a red data species.

DISCUSSION

This study demonstrated the biological importance of the Tshanini Community Conservation Area to further Sand Forest conservation, especially from an avian perspective. When compared with Tembe, Tshanini contained an unique avian Sand Forest assemblage that is often characterised by more characteristic species and subspecies that shows higher abundance and higher area fidelity values. Moreover, when compared to the different habitat comparisons, reliable indicator species and subspecies were identified at the study area scale after comparing Tshanini with Tembe as a whole. Because the two study areas were sampled in different years (1995/96 and 2002), a component (albeit probably small) of the differences between study areas may have been due to temporal variation in populations and communities.

Differences in local avian assemblages, especially those in forests, are often a function of the physical structure of a plant community, showing how the foliage is distributed vertically, as opposed to the actual composition of plant species (Rotenberry & Wiens 1980; Van Rensburg *et al.* 2000a). In a recent study by Gaugris *et al.* (2004), comparisons were made between the plant communities of Tshanini and similar vegetation units in Tembe. Although their results indicated a high degree of floristic similarity between the two areas, values representing plant physiognomy showed significant differences. For example, within the Sand Forest habitat the vegetation community in Tshanini had a significantly higher mean cover value per species than its equivalent in Tembe. Such structural differences in the vegetation between the two areas most likely contributed most towards the observed differences found in the Sand Forest avian assemblages (see also Van Rensburg *et al.* 2000a).

Owing to the high degree of biological heterogeneity in the Maputaland Centre, previous studies recommended that a comprehensive representation of different Sand Forest patches be incorporated into the region's conservation network. Most of these recommendations were based on studies that were done in the region during the late 1990's (e.g.: Van Rensburg *et al.* 1999, 2000a,b; Matthews *et al.* 2001; McGeoch *et al.* 2002). Nevertheless, when comparing the conservation network in South Africa in 1997 (World Conservation Monitoring Centre 1997) with that of 2004 (WDPA Consortium 2004), no additional reserves containing pure Sand Forest plant communities have been added since 1997. This is true regardless of the more than 155 000 ha of land that has been added to the terrestrial protected-area system in South Africa from 1994 to 2002 (Wynberg 2002).

In a complex endemic zone like the Maputaland Centre, one can expect to find a large number of range-restricted species (Poynton 1961). Because these species are part of those most effected by anthropogenic activities, and therefore of most conservation concern (Balmford *et al.* 2001), emphasis should be placed on the extent to which current and future conservation areas within the Maputaland Centre contribute towards conserving endemic species. Indeed, in a recent study on the effectiveness of the global protected area network in representing species diversity, it was indicated that the areas most in need of conservation are often those with high levels of endemism (Rodriques *et al.* 2004). This was true even for endemic areas where the conservation network already captured a large percentage of the land surface area. This conclusion raises the question of Tshanini's value to enhance the conservation of endemic species. Although the majority of bird species and subspecies that are endemic to the Maputaland Centre achieve their greatest abundance within Tembe when compared with Tshanini, none of these species or subspecies was restricted to Tembe. Moreover, one of these, the red-fronted tinker barbet, was identified as being reliably habitat specific for the Tshanini Mixed Woodland (Table 2). Tshanini can therefore contribute towards the conservation of endemic species and subspecies being represented in as many as possible areas, an important feature for the long-term persistence of wildlife, particularly those with strict habitat requirements (Rodriques *et al.* 2004). Because 43% of the avian species or subspecies that were only recorded in Tshanini are also red data species or subspecies (Baillie & Groombridge 1996; Barnes 2000), Tshanini will further regional conservation efforts and contribute towards national ones.

As is the case in most countries, conservation: human conflicts will likely escalate in southern Africa in the future. Therefore an integrated approach incorporating both conservation and human development needs is required. Such an approach should emphasise the value of existing conservation areas and view parks as a central component of conservation strategies (Bruner *et al.* 2001; McKinney 2002), from which to promote the sustainable development of rural communal areas surrounding these sites (Editorial 2003), while establishing buffer zones around protected areas. Since the eradication of poverty is an indispensable requirement for sustainable development (UNDP 2003), the alleviation of poverty in areas surrounding protected areas will contribute largely towards the required future integrated approach. The present study has shown that the Tshanini Community Conservation Area not only has the potential to contribute significantly towards biodiversity conservation, but that it will also serve as an example for conservation-based community development in South Africa. It is the first reserve of its kind to be established in a ward of a tribal area in the northern parts of the KwaZulu-Natal province of South Africa through the initiative taken by the local people themselves. This is a huge step forward for conservation in South Africa, given the current negative attitude of the rural people towards conservation. However, the success of such ventures will require structures to promote initiatives that will support their establishment and maintain their long-term sustainability. We can ill afford to lose any chance to promote conservation in South Africa where the highest known concentration of threatened plants and the highest extinction estimates for any area in the world are found (Wynberg 2002).

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REFERENCES

BAILLIE, J. & GROOMBRIDGE, B. 1996. IUCN red data list of threatened animals. Gland, Switzerland, IUCN.

BALMFORD, A., MOORE, J.L., BROOKS, T., BURGESS, N., HANSEN, L.A., WILLIAMS, P. & RAHBEK, C. 2001. Conservation Conflicts Across Africa. *Science* 291: 2616-2619.

BARNES, K.N. 2000. The Eskom red data book of birds of South Africa, Lesotho and Swaziland. BirdLife South Africa, Johannesburg.

BRAY, J.R. & CURTIS, J.T. 1957. An ordination of the upland forest communities of southern Wisconsin. *Ecol. Monogr.* 27**:** 325-349.

BRUNER, A.G., GULLISON, R.E., RICE, R.E. & DE FONSECA, G.A.B. 2001. Effectiveness of Parks in Protecting Tropical Biodiversity. *Science* 291**:** 125-128.

BUCKLAND, S.T., ANDERSON, D.R., BURNHAM, K.P. & LAAKE, J.L. 1994. Distance sampling estimating abundance of biological populations. Chapman & Hall, London.

CINCOTTA, R.P., WISNEWSKI, J. & ENGELMAN, R. 2000. Human population in the biodiversity hotspots. *Nature* 404**:** 990-992.

CLANCY, P.A. 1996. The birds of southern Mozambique. African Bird Book Publishing, KwaZulu-Natal.

CLARK, K.R. 1993. Non-parametric multivariate analysis of change in community structure. *Aust. J. Ecol.* 18**:** 117-143.

CLARK, K.R., & WARWICK, R.M. 1994. Change in Marine Communities: An Approach to Statistical Analysis and Interpretation. Natural Environmental Research Council, UK.

DUFRÊNE, M. & LEGENDRE, P. 1997. Species assemblages and indicator species: the need for a flexible asymmetrical approach. *Ecol. Monogr.* 67**:** 345-366.

EDITORIAL 2003. Introduction to systematic conservation planning in the Cape Floristic Region. *Biol. Conserv.* 112: 1-13.

ELS, H. 2002. Rural development and game ranch management. In: J. du P. BOTHMA (Ed.), Game Ranch Management, Fourth edition (pp. 676 – 686). Van Schaik, Pretoria.

EVERARD, D.A., VAN WYK, G.F. & MIDGLEY, J.J. 1994. Disturbance and the diversity of forests in Natal, South Africa: lessons for their utilization. *Strelitzia* 1**:** 275-285.

GASTON, K.J. 1994. Rarity. Chapman & Hall, London.

GAUGRIS, J.Y., MATTHEWS, M., VAN ROOYEN, M.W. & BOTHMA, J. Du P. 2004. The vegetation of Tshanini Game Reserve and a comparison with equivalent units in the Tembe Elephant Park in Maputaland, South Africa. *Koedoe* 47**:** 9-29.

GELDENHUYS, C.J. & MACDEVETTE, D.R. 1989. Conservation status of coastal and montane evergreen forest. In: B.J. HUNTLEY (Ed) Biotic diversity in southern Africa; concepts and conservation (pp. 224-238). Oxford, Cape Town, South Africa.

HARRISON, J.A., ALLAN, D.G., UNDERHILL, L.G., HERREMANS, M., TREE, A.J., PARKER, V. & BROWN, C.J. 1997. The Atlas of Southern African Birds, 1. Birdlife South Africa, Johannesburg.

HEARNE, J. & MCKENZIE, M. 2000. Compelling reasons for game ranching in Maputaland. In: H.H.T. PRINS (Ed) Wildlife Conservation by Sustainable use (pp. 417-438). Kluwer Academic Publishers, Boston.

IMHOFF, M.L., BOUNOUA, L., RICKETTS, T., LOUCKS, C., HARRISS, R. & LAWRENCE, T. 2004. Global patterns in human consumption of net primary production. *Nature* 429**:** 870-873.

KERR, J.T. & CURRIE, D.J. 1995. Effects of human activity on global extinction risk. *Conserv. Biol.* 9**:** 1528-1538.

KIRKWOOD, D. & MIDGLEY, J.J. 1999. The floristics of Sand Forest in northern KwaZulu-Natal, South Africa. *Bothalia* 29**:** 293-304.

LOW, A.B. & REBELO, A.G. (Eds) 1996. Vegetation of South Africa, Lesotho and Swaziland. Dept. Environmental Affairs and Tourism, Pretoria, South Africa.

MADDOCK, A. & BENN, G.A. 2000. Identification of Conservation-Worthy Areas in Northern Zululand, South Africa. *Conserv. Biol.* 14**:** 155-166.

MATTHEWS, W.S., VAN WYK, A.E., VAN ROOYEN, N. & BOTHA, G.A. 2001. Vegetation of the Tembe Elephant Park, Maputaland, South Africa. *S. Afr. J. Bot.* 67**:** 573-594.

MCGEOCH, M.A., VAN RENSBURG, B.J. & BOTES, A. 2002. The verification and application of bioindicators: a case study of dung beetles in a savanna ecosystem. *J. Appl. Ecol.* 39: 661-672.

MCKINNEY, M.L. 2002. Effects of national conservation spending and amount of protected area on species threat rates. *Biol. Conserv.* 16: 539-543.

MOLL, E.J. 1977. The vegetation of Maputaland: a preliminary report on the plant communities and their present and future conservation status. *Trees S. Afr.* 29**:** 31-58.

POYNTON, J.C. 1961. Biogeography of south-east Africa. *Nature* 189: 801-803.

PRESSEY, R.L. 1994. Ad hoc reservations: forward or backward steps in developing representative reserve systems? *Conserv. Biol.* 8**:** 662-668.

RODRIGUES, A.S.L., ANDELMAN, S.J., BAKARR, M.I., BOITANI, L., BROOKS, T.M., COWLING, R.M., FISHPOOL, L.D.C., DA FONSECA, G.A.B., GASTON, K.J., HOFFMANN, M., LONG, J.S., MARQUET, P.A., PILGRIM, J.D., PRESSEY, R.L., SCHIPPER, J., SECHREST, W., STUART, S.N., UNDERHILL, L.G., WALLER, R.W., WATTS, M.E.J. & YAN, X. 2004. Effectiveness of the global protected area network in representing species diversity. *Nature* 428: 640-643.

ROTENBERRY, J.T. & WIENS, J.A. 1980. Habitat structure, patchiness, and avian communities in north American steppe vegetation: A multivariate analysis. *Ecology* 61**:** 1228-1250.

SCHULZE, R.E. 1982. Agrohydrology and agroclimatology of Natal. Agricultural catchments Research Unit, Report 14. University of Natal, Pietermaritzburg, South Africa.

UNDP. 2003. South Africa Human Development Report 2003. Oxford University Press, Oxford.

VAN RENSBURG, B.J., CHOWN, S.L., VAN JAARSVELD, A.S. & MCGEOCH, M.A. 2000a. Spatial variation and biogeography of sand forest avian assemblages in South Africa. *J. Biogeogr.* 27: 1385-1401.

VAN RENSBURG, B.J., MCGEOCH, M.A., CHOWN, S.L. & VAN JAARSVELD, A.S. 1999. Conservation of heterogeneity among dung beetles in the Maputaland Centre of Endemism, South Africa. *Biol. Conserv.* 88**:** 145-153.

VAN RENSBURG, B.J., MCGEOCH, M.A., MATTHEWS, W., CHOWN, S.L. & VAN JAARSVELD, A.S. 2000b. Testing generalities in the shape of patch occupancy frequency distributions. *Ecology* 81**:** 3163-3177.

VAN WYK, A.E. 1994. Maputaland-Pondoland region. In: S.D. DAVIS, V.H. HEYWOOD & A.C. HAMILTON (Eds) Centres of plant diversity: a guide and strategy for their conservation (pp. 227-235). Oxford University Press, Oxford.

VAN WYK A. E. (1996) Biodiversity of the Maputaland Centre. In: L.J.G. VAN DER MAESEN, X.M. VAN DER BURGT, & J.M. VAN MEDENBACH DE ROOY (Eds) The biodiversity in African savannahs (pp. 198-207). Kluwer Academic Publishers, Dordrecht.

VAN WYK, A.E., & SMITH, G.F. 2001. Regions of Floristic Endemism in Southern Africa: a review with emphasis on succulents. UMDAUS Press, Hatfield.

WATKEYS, M.K., MASON, T.R. & GOODMAN, P.S. 1993. The role of geology in the development of Maputaland, South Africa. *J. Afr. Earth Sci.* 16**:** 205-221.

WORLD CONSERVATION MONITORING CENTRE 1997. United Nations list of protected areas for South Africa. http://www.unep-wcmc.org/protected_areas/data/un_97_list.html

WDPA CONSORTIUM 2004. World Database on Protected Areas. Copyright World Conservation Union (IUCN) and UNEP-World Conservation Monitoring Centre (UNEP-WCMC).

WYNBERG, R. 2002. A decade of biodiversity conservation and use in South Africa: tracking progress from the Rio Earth Summit to the Johannesburg World Summit on Sustainable Development. *S. Afr. J. Sci.* 98: 233-243.

FIGURE LEGENDS

Fig. 1. The location of (1) the Maputaland Centre of Plant Endemism and (2) the study area within the Maputaland Centre of Plant Endemism in South Africa.

Fig. 2. Species accumulation curve for bird assemblages in the Tshanini Community Conservation Area, South Africa from 1 July to 31 December 2002. Each point on the curve represents the mean of five randomly selected survey points from the full data set of survey points.

Fig. 3. Non-metric ordination of four habitat sites in the Maputaland Centre of Plant Endemism, South Africa based on multidimensional scaling to indicate the degree of similarity of the abundances of bird species and subspecies in each assemblage where: A = Tshanini Mixed Woodland, B = Tembe Mixed Woodland, C = Tshanini Sand Forest and D = Tembe Sand Forest. The R – statistic is a measure of the similarity of assemblages. If R is significantly different from zero, then there are significant differences between assemblages. The data were captured between May 1995 and April 1996, and between July and December 2002.

Fig. 4. Bird indicator species value distributions for (a) Tshanini Sand Forest versus Tembe Sand Forest, (b) Tshanini Mixed Woodland versus Tembe Mixed Woodland and (c) the entire Tshanini versus the entire Tembe in the Maputaland Centre of Plant Endemism, South Africa. The data were captured between May 1995 and April 1996, and between July and December 2002.

Table 1. Species richness and abundance values of birds surveyed in Tembe Elephant Park and the Tshanini Communal Area, South Africa between May 1995 to April 1996, and between July to December 2002 respectively. Significance was calculated at $P \leq 0.05$.

Site	Mean species richness ± Standard error. ($F_{1,62} = 1.294$, $P < 0.01$)	Mean species abundance ± Standard error. ($F_{1,62} = 7.679$, $P < 0.01$)	Number of sampling sites (n)	Total species richness (S)	Total species abundance (N)
Tshanini	41.06 ± 1.2	260.03 ± 8.9	32	99	8321
Tembe	31.81 ± 1.1	93.0 ± 3.2	32	96	2975

Table 2. Percentage indicator values (*IndVal* > 70%) of bird species and subspecies for three different study area comparisons in the Maputaland Centre of Plant Endemism, South Africa from 1 July to 31 December 2002. Only significant ($P \leq 0.05$) values were included.

Sand Forest	% IndVal	Mixed Woodland	% IndVal	Combined	% IndVal
TEMBE					
Neergaard's sunbird†	100.0	Blue waxbill	93.8	Black-bellied starling	77.4
Brown scrub-robin‡	96.8	Rattling cisticola	93.8		
Southern boubou‡	86.6	Dark-capped bulbul	91.2		
Woodward’s batis†	84.6	Chinspot batis	88.9		
Blue-mantled crested flycatcher	83.7	Southern black tit	88.1		
Eastern nicator	71.1	Neddicky‡	87.5		
		Black-crowned tchagra	78.2		
		Pink-throated twinspot†	75.6		
		Golden-breasted bunting	75.0		
		Brown-crowned tchagra	74.1		
		White-browed scrub-robin‡	70.0		

Table 2 *continued*

Sand Forest	% IndVal	Mixed Woodland	% IndVal	Combined	% IndVal
TSHANINI					
Square-tailed drongo	93.8	Fork-tailed drongo	91.3	Red-eyed dove	99.2
		White-bellied sunbird	85.5	Purple-crested turaco	96.1
		Black-headed oriole	83.7	Orange-breasted bush-shrike	95.5
		Chinspot batis	82.25	Gorgeous bush-shrike	93.9
		Klaas's cuckoo	77.27	Red-chested cuckoo	92.4
		Purple-crested turaco	70.45	African broadbill	83.0
		Yellow-rumped tinkerbird	76.47	Southern boubou	91.8
		Crowned hornbill	74.63	Sombre greenbull	86.0
		Red-fronted tinkerbird‡	74.04	Eastern nicator	84.4
		Cardinal woodpecker	72.79	Barn swallow	84.4
		Crested francolin	71.43	Emerald-spotted wood-dove	83.2
				Black-backed puffback	73.3
				Grey-headed bush-shrike	71.2

† Species and ‡ subspecies endemic to the Maputaland Centre of Plant Endemism.

Appendix 1. The total number of individual birds, bird species and subspecies recorded in the Tembe Elephant Park and the Tshanini Community Conservation Area Sand Forest and Mixed Woodland habitats. Bold values denote rare species or subspecies, defined as the 25% least-abundant birds in each of the four habitat types. SUM *r* = sum of the habitat types in which a species or subspecies was classified as rare.

			Mixed Woodland		Sand Forest	
Common name	Scientific name	Sum *r*	Tshanini	Tembe	Tshanini	Tembe
Taxa rare in one or more habitats						
African crowned eagle	*Stephanoaetus coronatus* §	1	1	0	0	0
African dusky flycatcher	*Muscicapa adusta*	2	2	5	1	0
African green-pigeon	*Treron calvus*	1	15	6	1	0
African hoopoe	*Upupa africana*	1	1	0	0	0
African paradise flycatcher	*Terpsiphone viridis*	3	3	2	0	1
African yellow white-eye	*Zosterops senegalensis*	3	1	2	1	0
Amethyst sunbird	*Chalcomitra amethystine*	2	3	1	0	0
Ashy flycatcher	*Muscicapa caerulescens*	3	2	2	0	1
Bearded scrub-robin	*Cercotrichas quadrivirgata wilsoni* ‡	1	13	3	22	3
Black kite	*Milvus migrans* §	1	0	0	3	0
Black-chested snake-eagle	*Circaetus pectoralis* §	1	1	0	0	0
Black-crowned tchagra	*Tchagra senegalus*	1	4	26	6	1
Blue-mantled crested flycatcher	*Trochocercus cyanomelas*	1	1	6	17	50
Brimstone canary	*Serinus sulphuratus*	1	1	0	0	0
Brown scrub-robin	*Cercotrichas signata tongensis*‡	1	5	3	28	90
Brown-hooded kingfisher	*Halcyon albiventris*	2	2	11	0	1
Brubru	*Nilaus afer*	2	24	1	7	1
Cardinal woodpecker	*Dendropicos fuscescens*	1	43	9	5	1
Collared sunbird	*Hedydipna collaris*	1	5	15	2	5
Crested francolin	*Peliperdix sephaena*	1	60	4	24	1
Crested guineafowl	*Guttera edouardi*	2	2	2	9	7
Diederick cuckoo	*Chrysococcyx caprius*	1	1	0	0	0
Eastern olive sunbird	*Cyanomitra olivacea*	2	2	1	0	0
European bee-eater	*Merops apiaster*	2	2	0	1	0
Fiscal flycatcher	*Sigelus silens*	1	0	2	0	2

Appendix 1 *continued*

Common name	Scientific name	Sum *r*	Mixed Woodland		Sand Forest	
			Tshanini	Tembe	Tshanini	Tembe
Fork-tailed drongo	*Dicrurus adsimilis*	1	136	2	13	0
Golden-breasted bunting	*Emberiza flaviventris*	1	1	21	0	0
Gorgeous bush-shrike	*Telophorus quadricolor*	1	174	3	229	23
Greater honeyguide	*Indicator indicator*	1	1	4	0	0
Green twinspot	*Mandingoa nitidula*	1	0	1	0	0
Green-winged pytilia	*Pytilia melba*	1	0	3	0	0
Grey sunbird	*Cyanomitra veroxii*	2	3	17	3	38
Grey waxbill	*Estrilda perreini*	1	0	0	1	0
Grey-headed bush-shrike	*Malaconotus blanchoti*	1	29	1	22	4
Hadeda ibis	*Bostrychia hagedash*	2	19	0	3	1
Jacobin cuckoo	*Oxylophus jacobinus*	1	1	0	0	0
Kurrichane thrush	*Turdus libonyanus*	1	16	0	1	4
Levaillant’s cuckoo	*Oxylophus levaillantii*	1	0	0	0	1
Martial eagle	*Polemaetus bellicosus*§	2	1	0	1	0
Narina trogon	*Apaloderma narina*	1	11	3	24	14
Neddicky	*Cisticola fulvicapilla lebombo* ‡	1	1	29	0	0
Orange-breasted bush-shrike	*Telophorus sulfureopectus*	1	227	16	135	1
Pale flycatcher	*Bradornis pallidus sibilans* ‡	2	6	3	1	0
Pink-throated twinspot	*Hypargos margaritatus* †	1	8	38	2	6
Plain-backed sunbird	*Anthreptes reichenowi*	1	0	0	0	1
Purple-banded sunbird	*Cinnyris bifasciatus*	1	14	18	3	21
Purple-crested turaco	*Musophaga porphyreolopha*	1	174	9	73	1
Red-eyed dove	*Streptopelia semitorquata*	1	285	1	210	3
Red-faced cisticola	*Cisticola erythrops*	1	0	2	0	0
Red-faced mousebird	*Urocolius indicus*	2	3	0	2	0
Red-fronted tinkerbird	*Pogoniulus pusillus niethammeri* ‡	1	33	1	6	0
Retz’s helmet-shrike	*Prionops retzii*	2	3	9	1	11
Rudd's apalis	*Apalis ruddi* †	1	6	10	1	2
Rufous-naped lark	*Mirafra africana*	1	0	3	0	0
Rufous-winged cisticola	*Cisticola galactotes*	1	0	3	0	0
Sabota lark	*Calendulauda sabota*	1	0	9	0	1
Southern black flycatcher	*Melaenornis pammelaina*	2	0	3	1	0
Steppe buzzard	*Buteo vulpinus* §	2	1	0	1	0
Striped kingfisher	*Halcyon chelicuti*	1	0	1	0	0

Appendix 1 *continued*

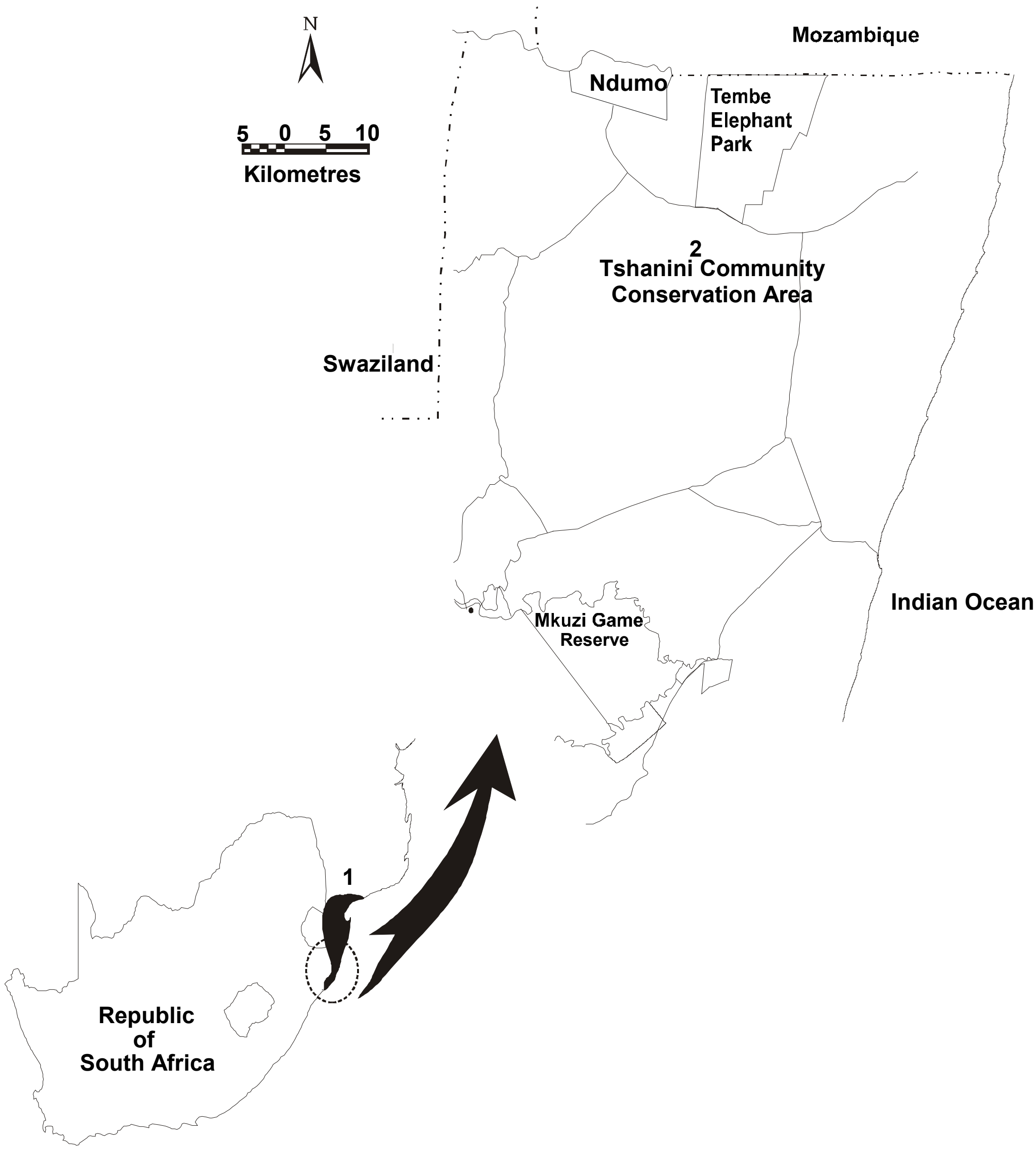
Common name	Scientific name	Sum *r*	Mixed Woodland		Sand Forest	
			Tshanini	Tembe	Tshanini	Tembe
Tambourine dove	*Turtur tympanistria*	1	0	0	2	15
Tawny-flanked prinia	*Prinia subflava*	1	14	22	0	1
Violet-backed starling	*Cinnyricinclus leucogaster*	1	2	0	5	0
White-starred robin	*Pogonocichla stellata*	2	0	1	0	1
White-throated robin-chat	*Cossypha humeralis*	3	0	2	1	1
Yellow-bellied eremomela	*Eremomela icteropygialis*	1	0	1	0	0
Yellow-fronted canary	*Serinus mozambicus*	2	1	18	1	0
Yellow-rumped tinkerbird	*Pogoniulus bilineatus*	1	48	4	3	2
Zitting cisticola	*Cisticola juncidis*	1	0	5	0	1
Taxa common in all habitats recorded						
African broadbill	*Smithornis capensis*		56	0	76	22
African emerald cuckoo	*Chrysococcyx cupreus*		28	0	23	0
African goshawk	*Accipiter tachiro* §		7	0	7	0
Barn swallow	*Hirundo rustica*		55	0	39	0
Bearded woodpecker	*Dendropicos namaquus*		5	0	0	0
Black cuckoo	*Cuculus clamosus*		31	0	8	0
Black cuckooshrike	*Campephaga flava*		14	0	0	4
Black-backed puffback	*Dryoscopus cubla*		227	80	207	78
Black-bellied starling	*Lamprotornis corruscus*		0	29	10	82
Black-collared barbet	*Lybius torquatus*		17	0	0	0
Black-headed oriole	*Oriolus larvatus*		82	14	16	14
Blue waxbill	*Uraeginthus angolensis*		0	36	0	0
Brown-crowned tchagra	*Tchagra australis*		24	31	14	3
Burchell's coucal	*Centropus burchelli*		37	0	10	0
Cape turtle-dove	*Streptopelia capicola*		16	18	0	21
Cape white-eye	*Zosterops capensis*		0	0	0	2
Chinspot batis	*Batis molitor molitor*		139	55	30	3
Croaking cisticola	*Cisticola natalensis*		0	4	0	0
Crowned hornbill	*Tockus alboterminatus*		50	20	17	14
Dark-backed weaver	*Ploceus bicolor sclateri* ‡		105	35	131	70
Dark-capped bulbul	*Pycnonotus tricolor*		242	83	106	8
Grey tit-flycatcher	*Myioparus plumbeus*		0	7	0	0
Jameson's firefinch	*Lagonosticta rhodopareia*		0	4	0	0

Appendix 1 *continued*

			Mixed Woodland		Sand Forest	
Common name	Scientific name	Sum *r*	Tshanini	Tembe	Tshanini	Tembe
Klaas's cuckoo	*Chrysococcyx klaas*		68	0	20	0
Long-billed crombec	*Sylvietta rufescens*		39	6	4	0
Marico sunbird	*Cinnyris mariquensis*		4	0	0	0
Neergaard's sunbird	*Cinnyris neergaardi* †		23	0	29	82
Rattling cisticola	*Cisticola chiniana*		24	112	4	0
Red-capped robin-chat	*Cossypha natalensis*		17	8	19	11
Red-chested cuckoo	*Cuculus solitarius*		110	5	170	18
Scaly-throated honeyguide	*Indicator variegatus*		30	0	20	18
Sombre greenbull	*Andropadus importunus*		369	67	288	40
Southern black tit	*Parus niger*		13	31	6	2
Southern boubou	*Laniarius ferrugineus tongensis* ‡		366	5	365	60
Speckled mousebird	*Colius striatus*		4	0	0	0
Spectacled weaver	*Ploceus ocularis*		7	0	0	0
Square-tailed drongo	*Dicrurus ludwigii*		0	71	101	109
Terrestrial brownbull	*Phyllastrephus terrestris*		30	57	34	62
White-bellied sunbird	*Cinnyris talatala*		134	8	13	0
White-browed robin-chat	*Cossypha heuglini*		0	0	0	3
White-browed scrub-robin	*Cercotrichas leucophrys simulator* ‡		29	32	16	8
White-crested helmet-shrike	*Prionops plumatus*		0	5	0	0
Woodward's batis	*Batis fratrum* †		4	5	10	46
Yellow-bellied greenbull	*Chlorocichla flaviventris*		329	58	286	132
Yellow-breasted apalis	*Apalis flavida*		161	101	167	129
Species richness			**92**	**85**	**76**	**66**
Total number of individuals			**4805**	**1492**	**3516**	**1483**

† Species and ‡ subspecies endemic to the Maputaland Centre of Plant Endemism.

§ Red data species or subspecies restricted to a given study area.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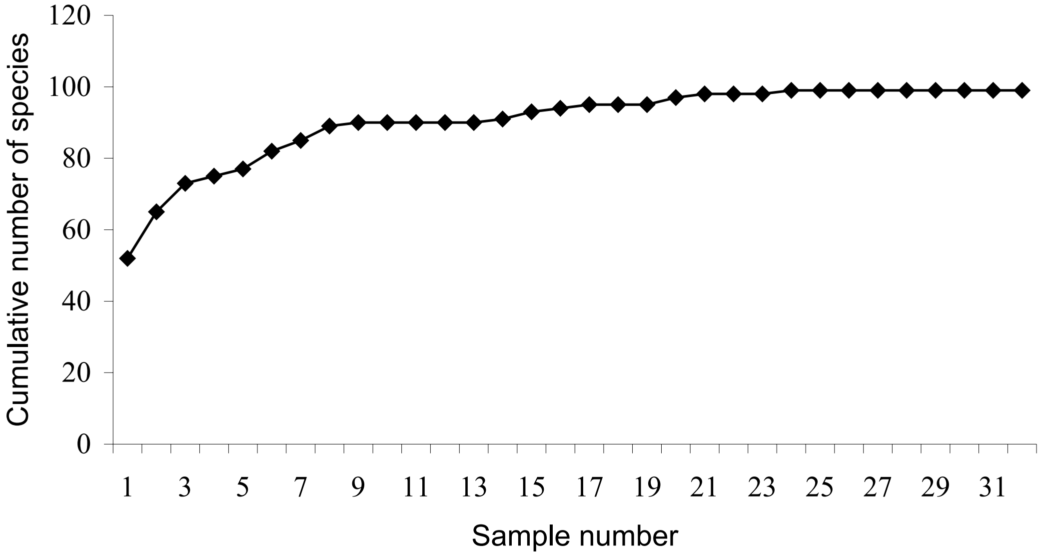

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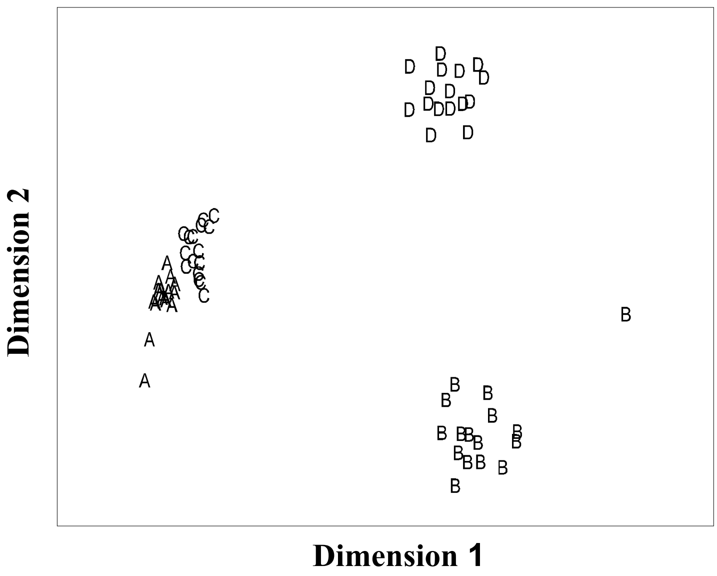
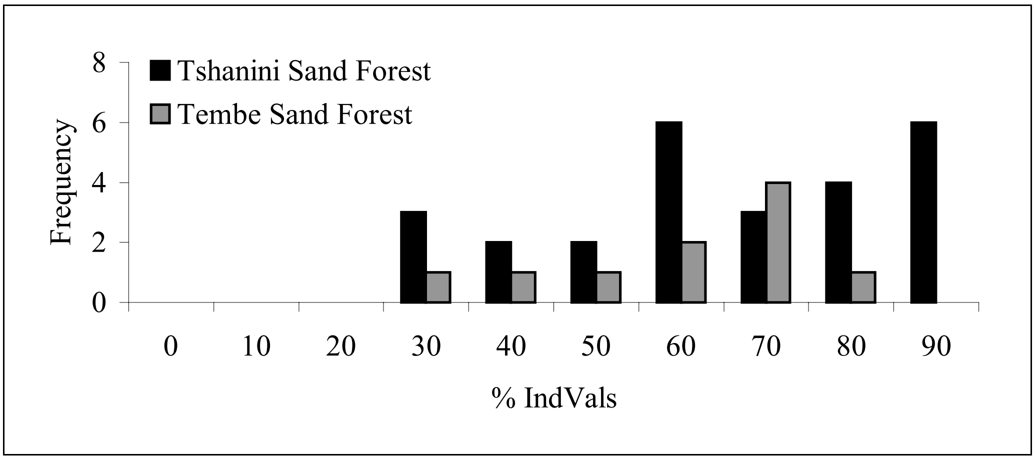


Tshanini Mixed Woodland	vs	Tembe Mixed Woodland	*R* = 0.998 (*P* = 0.001)
Tshanini Mixed Woodland	vs	Tshanini Sand Forest	*R* = 0.782 (*P* = 0.001)
Tshanini Mixed Woodland	vs	Tembe Sand Forest	*R* = 1.000 (*P* = 0.001)
Tembe Mixed Woodland	vs	Tshanini Sand Forest	*R* = 0.995 (*P* = 0.001)
Tembe Mixed Woodland	vs	Tembe Sand Forest	*R* = 0.974 (*P* = 0.001)
Tshanini Sand Forest	vs	Tembe Sand Forest	*R* = 1.000 (*P* = 0.001)

a.


Tshanini Sand Forest
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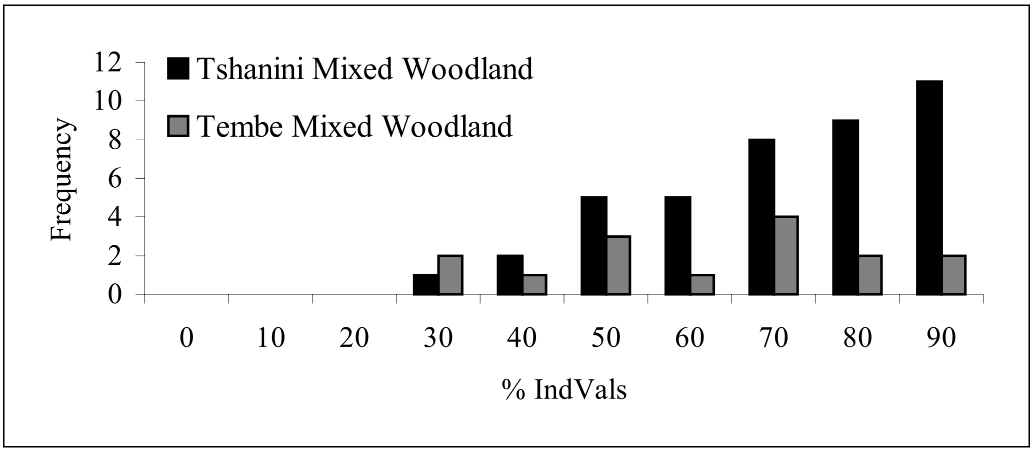
Tshanini Mixed Woodland
Tembe Mixed Woodland
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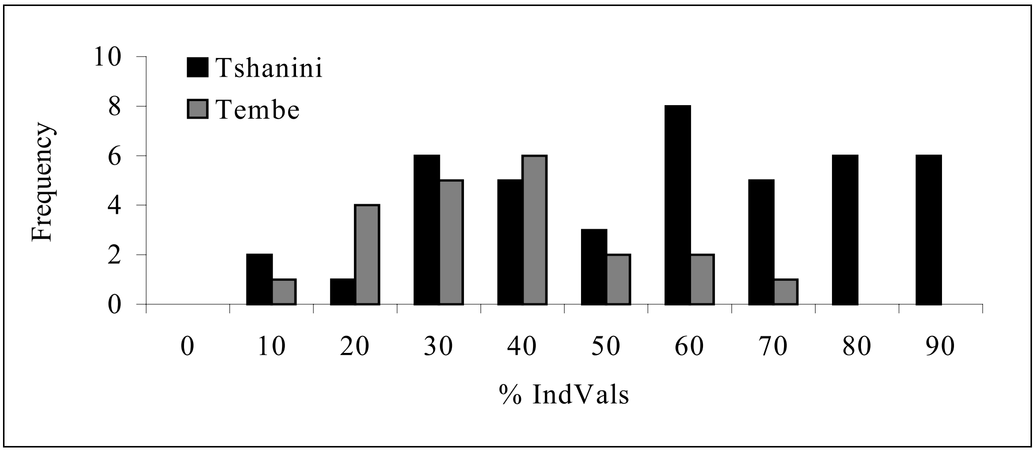
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Modeling Conservation-induced Resettlement in Mbangweni, South Africa

Jennifer L. Jones

Centre for Environmental Studies
Geography Building 2-1
University of Pretoria
Pretoria 0002
South Africa
jenleejones@gmail.com

Summary

Research on resettlement has traditionally focused on economic implications of involuntary displacement resulting from large-scale development projects (i.e. dams). In Southern Africa, resettling households in exchange for community development has been proposed to ensure the sustainability of biodiversity conservation areas. However, minimal research exists on the costs and benefits to local residents. I used Geographic Information Systems for spatial analysis of the community of Mbangweni, South Africa, before and after potential conservation expansion and resettlement. To explore livelihood implications, results were qualified using Cernea's Impoverishment Risks and Reconstruction model. In addition to disruption of economic livelihoods, the project is likely to have significant social implications for the community and throughout the entire region.

Introduction

Biodiversity conservation and protected area management in South Africa have moved from historical forced removals of local people to participatory schemes with enhanced equity for local people. During the country's colonial and Apartheid eras, communities were forcibly evicted from traditional lands and involuntarily resettled elsewhere, often without compensation, to make way for 'fortress' parks. Post 1994 democracy, new land reform legislation allowed displaced communities to seek restitution. Land claims against parks resulted in local communities receiving reparation for past injustices. In parts of national parks, title was restored to local communities, although the land was still used for conservation (Robins, 2001; Ramutsindela, 2002). However, communities were empowered with increased benefit sharing and decision making powers.

In addition to biodiversity, current South African conservation focuses on protected areas as tools for rural poverty alleviation. Nature-based tourism is cited as an engine for economic development via community-based initiatives. Community projects are promoted as win-win: local economic stimulus from tourism-related jobs and biodiversity protection by communities whose new livelihoods are dependent on a healthy resource. Community nature-based tourism has been heavily endorsed in South Africa by government and multilateral development agencies, but there have been few successes. Criticisms of their efficacy include questionable long-term economic sustainability, negligible biodiversity protection, revenue leakage away from local communities, heavy dependence on a fickle tourism industry, and a trend to focus on ecology rather than affected communities (Loon & Polakow, 2001; Mulholland & Eagles, 2002; Adams & Infield, 2003; Kiss, 2004).

The case study presented here analyzes a priori potential voluntary resettlement of a community from part of their land to make way for expanded conservation. In exchange for ceding land to conservation, the community could potentially receive access to agricultural land currently located inside a park, increased jobs and revenue sharing from future nature-based tourism enterprises, funding for basic development (schools, water taps, etc), and a co-management agreement over the new conservation area. The community would not give up title to the land, but would concede rights to access, settle, develop, or otherwise use the land in a manner unsupportive of conservation. To explore the implications of expanded conservation and resettling households, a multi-disciplinary approach was used to examine both quantitative and qualitative impacts. The approach and results presented here differ from most literature in that the analyses were conducted before the completion of resettlement negotiations and implementation; the conclusions presented are predictive and not just an a posteriori summary. First, spatial analyses using Geographic Information System (GIS) were conducted on the locations of households, community infrastructure, and livelihood resources before and after potential resettlement. Cernea's Impoverishment Risks and Reconstruction Model was then used to explore potential social and economic impacts of resettlement on households, the community as a whole, and the larger study region. I begin by presenting a brief review of resettlement research.

Perspectives on community resettlement research

Most resettlement literature concerns involuntary or forced displacement resulting from large-scale development programs (e.g. dams and mining). Displacement schemes often lead to an increased risk of impoverishment stemming from altered livelihoods, lost natural resource access, and disruption of cultural and social services (Cernea, 1997). Research of development-induced resettlement has traditionally focused on the economic benefits of large-scale projects and the cost effectiveness of acquiring new land for community relocation. In the late 1990s multilateral institutions began conducting a priori social impact assessments to appraise noneconomic impacts on local communities. Building on extensive research at The World Bank, Cernea (1997) developed the Impoverishment Risks and Reconstruction (IRR) model. The model differs from most development related exercises by exploring the collective and cumulative social impacts of displacement and reconstructions on local communities; it is not a simplified cost-benefit analysis. The IRR model examines eight major resettlement risks: landlessness, joblessness, homelessness, marginalization, increased morbidity and mortality, food insecurity, lost access to common property resources, and social disarticulation. It attempts to qualify impoverishment risks in a predictive, diagnostic, problem-resolution, or research capacity (Cernea, 2002). While the IRR model was designed for The World Bank to analyze involuntary resettlement resulting from large-scale development programs, it has since been used to examine other involuntary resettlement schemes.

Resettlement that is either voluntary or conservation-related remains poorly investigated. Research in Central Africa focused on involuntary displacement from pristine natural areas to create new national parks (Schmidt-Soltau, 2003; Cernea &

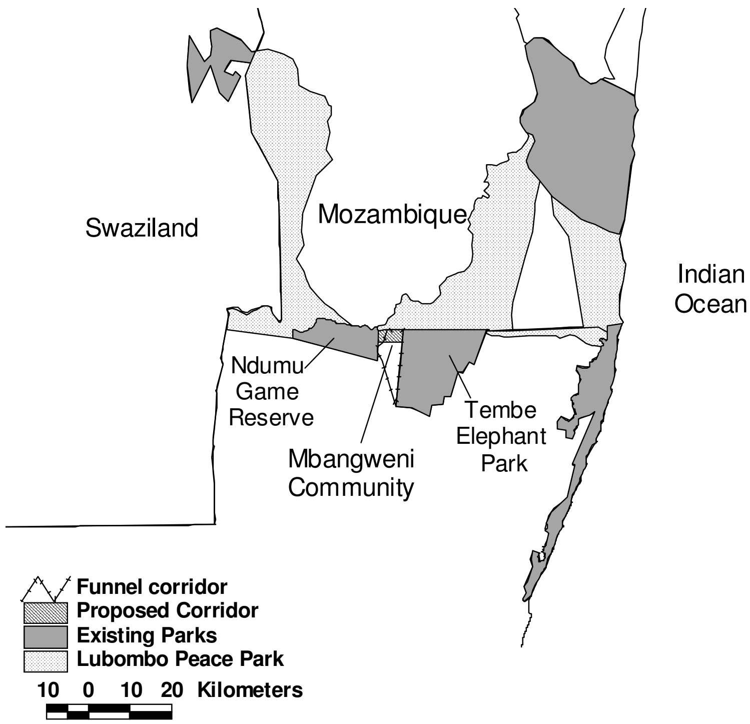
Schmidt-Soltau, in press). However, those resettlement efforts were similar to large-scale development projects in that local people did not support the end goal. While nature reserves and parks are thought of as wild places, the conservation of resources via protected areas is increasingly marketed in South Africa as a tool for local economic development. Conservation-induced resettlement enticements are similar to large development projects such as dams: its good for the majority (biodiversity protection), while the resettled minority will be provided direct benefits (job, co-management, revenue sharing). Thus, research on voluntary resettlement is needed as conservation-induced displacement is expected to grow in Southern Africa with the development of international transboundary parks that require resettling large numbers of people (Bice, 2004).

The study area

The community of Mbangweni is situated in northern KwaZulu-Natal, South Africa (Figure 1). Mbangweni is part of the Tembe Traditional Authority (successor to the Tembe Kingdom) that historically encompassed people on both sides of the South African-Mozambique border, stretching from the Lubombo Mountains to the Indian Ocean. Today Mbangweni encompasses an area of $46km^2$ bordered on three sides by Ndumu Game Reserve, Tembe Elephant Park, and Mozambique. The international border is officially demarcated and fenced but remains porous with people and goods flowing in both directions in support of shared kinship, cultures, and co-dependent livelihoods.

Most of the 118 households (677 residents) in Mbangweni pursue livelihoods dependent on subsistence agriculture, the sale of locally harvested natural resources,

Figure 1. Northeastern KwaZulu-Natal and the Lubombo Peace Park.



government grants (pension and childcare), and remittances from family member working in urban centers. Household cash is spent on basic foodstuffs, transportation, healthcare (including traditional medicine), and school fees. There are no natural water sources, piped water, electricity mains, sanitation, or healthcare facilities in the community. Households typically have a small dry land agricultural plot at their homestead, but yields are low due to water scarcity and poor sandy soils. Wild fruit and trees supplement nutritional requirements as well as provide income through the production of wild products (Cunningham, 1988). Energy needs are met by local fuelwood collection and homesteads are constructed using traditional materials and methods. The community is accessed by a single-track dirt road that runs 22 km south to the main regional tar road. The prevalence of HIV/AIDS throughout the region is estimated around 38%, one of the highest in the country (Hlongwe, 2003).

Yearly population growth in Mbangweni between 1996 and 2001 (extrapolated from government censuses) was 2.87%, well above the South African average of 2.01%. New households are growing at an annual rate of 6.8%, partly due to a decline in the average number of persons per household from 6.7 to 5.4 (-4.22% per year). A decline of people per household results in decreased resource use efficiency as land for homesteads, materials for building, and wood for cooking, and heating are partitioned among fewer household members (Liu, Daily, Ehrlich & Luck, 2003). It is difficult to model future population trends due to the massive prevalence of HIV/AIDS. Understanding local demography is complicated by the underreporting of mortality due to the epidemic and unknown effects of future prevention/treatment strategies (Statistics South Africa, 2005).

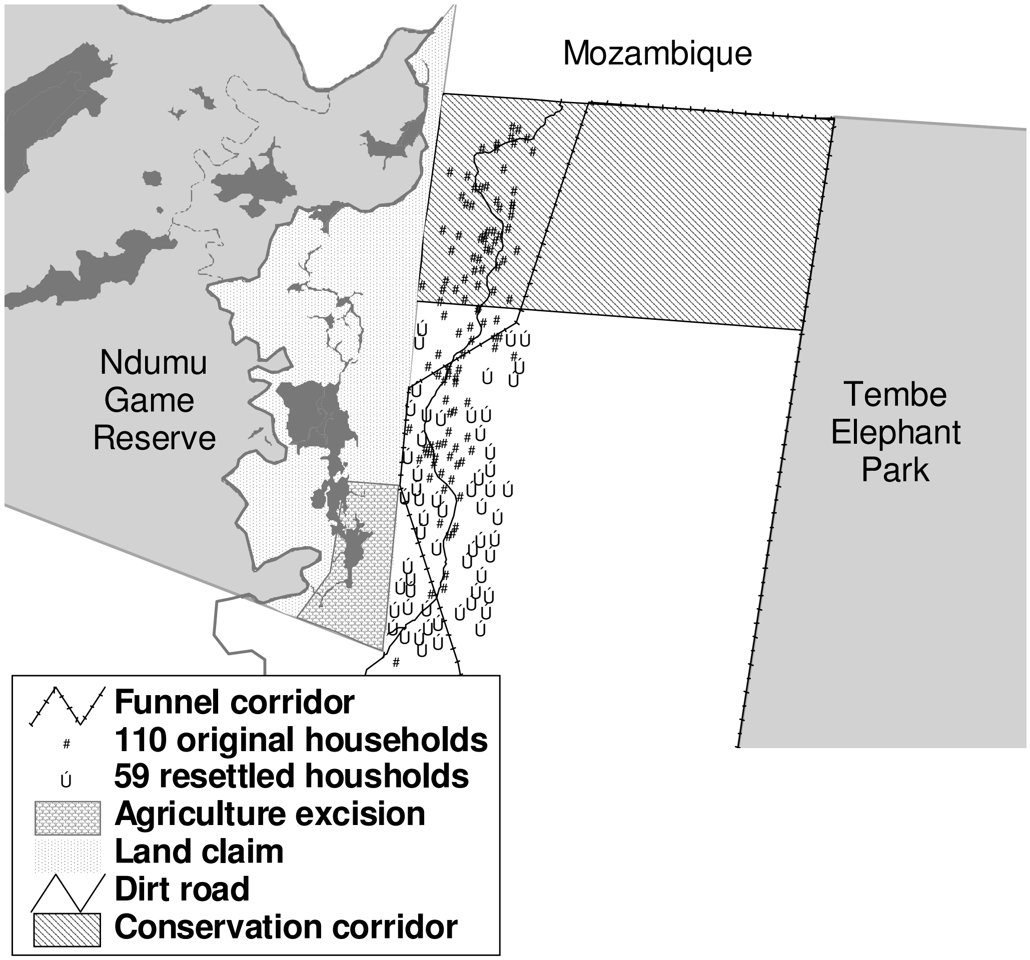
Mbangweni is likely to experience significant decline in yearly population growth, but real numbers and the growth rate are not anticipated to be negative.

Mbangweni's social, nutritional, and economic livelihoods are directly linked to neighboring Mozambique (Jones, 2005). Many households have an additional agricultural plot on productive floodplain land located several kilometers inside Mozambique. Bush meat is actively traded throughout the region, most of which probably comes from southern Mozambique. Women from Mozambique sell wild fish to Mbangweni women, who resell it at South African markets. The fish trade also supports the informal South African taxi economy, which transports the women and fish along the 22km² dirt road to regional markets located along the tar road. Informal markets located on the border provide access to goods and service for both countries in lieu of formal shops. Taxis transport South Africans to the border market and Mozambicans from the border to other shops, healthcare, and services located in South Africa. Residents routinely cross the porous border in both directions to visit friends and family. More than 26% of Mbangweni households regularly conduct social visits to Mozambique (Jones, 2005).

Conservation Conflict: past injustices and the path to future equity

Members of Mbangweni historically resided on land that is now inside Ndumu Game Reserve (Figure 2) (Jones, 2005). Established in 1924, the state-owned park invoked racially discriminatory laws and practices between the 1940s and 1960s to forcibly remove local people (Tong, n.d.). In contrast, Tembe Elephant Park was created during the late 1980s in consultation with the Tembe tribal authorities who agreed for

Figure 2. Mbangweni settlement pattern before and after resettlement.



some residents in the southern portion of the park to resettle outside the soon to be fenced park. After democratization in 1994, and subsequent land restitution legislation, the Mbangweni community filed a land claim against Ndumu Game Reserve for all land east of the Pongola River inside the park. The community maintained that not only did they regularly access the land for natural resources, but some community members and/or their ancestors had resided on the land. The managing conservation agency, Ezemvelo KwaZulu-Natal Wildlife, agreed that Mbangweni livelihoods were dependent on floodplain resources inside the park, but denied that community members ever resided on Ndumu land. The Department of Land Affairs settled the land claim in 2000. The settlement acknowledged the Mbangweni community as rightful owners of the land, and restored full tenure and ownership to the community. However, the settlement required the land to continue to be fenced for conversation under the management of Ezemvelo KwaZulu-Natal Wildlife (Tong, n.d.). The parties agreed to negotiate a separate management agreement to determine future access rights, revenue sharing, and possible co-management. The community was also afforded the right to pursue the excision of a small piece of land from Ndumu Game Reserve to convert to agriculture in exchange for a portion of community land to become conservation. This land exchange could require household resettlement and is the focus of this study.

An alternative to the settlement would be to excise 200 ha (2%) of highly productive riverfront agricultural land from the south east corner of the Ndumu Game Reserve; in return, Mbangweni would allow 1650 ha (36%) of its communal land to be managed as a fenced conservation corridor linking Ndumu Game Reserve and Tembe Elephant Park (Felton & Hanekom, 2000). Ezemvelo KwaZulu-Natal Wildlife wants to join the two parks to allow the overstocked elephant population in Tembe to disperse to Ndumu. The joined Tembe-Ndumu complex would also drop its northern fences to become part of the transboundary Lubombo Peace Park linking reserves in South Africa, Mozambique and Swaziland (Figure 1). The goal of the mega-park is to enhance biodiversity conservation, provide for elephant migration, and support economic development in neighboring communities. The Mbangweni conservation corridor linking Tembe and Ndumu could be administered by a co-management agreement or as a community conservation project. Ezemvelo KwaZulu-Natal Wildlife would probably provide ecological management, but the community could be granted rights to pursue nature-based tourism inside the corridor. The exact size, shape, and location of a potential corridor must still be negotiated, but two proposed alternatives are examined here. Both of these options require a portion of Mbangweni households to be resettled so that a conservation corridor devoid of human settlement could be created.

An Integrated Approach to Resettlement Research

Most resettlement research and use of the Impoverishment Risks and Reconstruction model has focused on involuntarily resettlement. Here a complimentary approach is used to quantitatively and qualitatively analyze potential voluntary resettlement of the Mbangweni community. First, spatial analyses were conducted in a Geographic Information System (GIS), including comparisons of pre and post resettlement distances to natural, social, and economic resources. Global Positioning System (GPS) coordinates were obtained for all 118 households in Mbangweni. Of these, eight households were excluded form analyses because they were situated outside recognized community boundaries. Distances were calculated from each household to other households, the nearest gate into Ndumu Game Reserve, the nearest route to Mozambican border, the possible agricultural excision, the dirt road through the community, the main tar road south of the community, the Pongola River, and the existing school and shop. The spatial analyses were then qualified using the Impoverishment Risks and Reconstruction Model. Each of the IRR risks was examined for Mbangweni residents, neighboring communities, conservation interests, and other local actors.

In the case of conservation corridors, research is lacking on determining viable minimum dimensions, but bigger is thought to be better for elephants and general biodiversity conservation (R. Guldemond, personal communication, 1 October 2004). To conduct a modeling exercise two likely options were identified. The first alternative, proposed in an initial Ezemvelo KwaZulu-Natal Wildlife assessment, is a 1650 ha rectangle bounded by the Mozambique border to the north (Figure 2) (Felton & Hanekom, 2000). The second alternative, from an initial Peace Parks Foundation proposal, identified a large funnel shape with a narrow funnel mouth starting at Ndumu Game Reserve and widening to a large base encompassing the entire western boundary of Tembe Elephant Park (Figure 2) (PPF, 2002). The funnel's narrow mouth would join to Ndumu Game Reserve south of most Mbangweni households, therefore requiring little or no resettlement. However, several obstacles are inherent in this alternative. Such a large corridor would require incorporating land from other communities and complicate negotiations. In Mbangweni, the funnel would divide the community in two; the narrow mouth would be bordered on the north and south by human settlements that might disrupt animal migration. Lastly, the extensive north/south human and vehicle traffic along the dirt road stretching from the tar road all the way into Mozambique would be disrupted. Solutions to the human traffic issue would have to support or substitute the social and economic flows without impairing the ecological functions of the funnel mouth. Comparing the two alternatives, the rectangular corridor proposed by Ezemvelo KwaZulu-Natal Wildlife or a similar variant, seems the most likely of the alternatives to succeed and was, thus, used for analysis.

Modeling resettlement in GIS: quantitative impacts of resettlement

Past Mbangweni settlement patterns have been influenced by access to infrastructure, primarily roads and water, which explains why there is no settlement in the eastern region bordering Tembe Elephant Park. Of the 110 households analyzed in Mbangweni, 59 (54%) would require resettlement out of the potential rectangular conservation corridor. These were modeled for resettlement around the remaining 51 fixed households not requiring resettlement. An average of 148 meters between households was computed by calculating the distance from each household to its nearest neighbor, then taking then mean of these minimum distances. Assuming circular homesteads, the average radius, including a vegetation buffer, was 74 meters (half the distance to the nearest households). To calculate homestead area, the 74-meter radius was used to create non-overlapping homestead perimeters in ArcView (Thiessen polygons). Areas were calculated based on each homestead's unique perimeter, and then the mean was calculated for all 110 households resulting in an average parcel size of 1.38 ha. Buffers of 74-meters were created around the 51 fixed households so that resettled households would not overlap with existing homesteads. Next, the 59 resettled household locations were randomly generated around the existing homesteads within the following criteria: the new resettled households also had a 74 meter buffer which could not overlap the fixed homesteads, and new homesteads had a maximum distance of 930 meters to the dirt road (based on the average of 110 households before resettlement). Distance to the road was used since current settlement pattern has clearly grown organically adjacent the road. These spatial criteria provide a conservative resettlement pattern since they use previous averages to generate new minimum distances.

Once all 110 households were distributed in the community, possible impacts were examined, based on new proximities from households to other features by comparing average distances before and after resettlement. Averages linear distances were calculated from the 110 households to the dirt road running through the community, the existing primary school and shop (neither lie within the potential conservation corridor), the most direct route to the Mozambique border, the nearest access gate into Ndumu Game Reserve (of three existing gates), the Pongola River inside Ndumu River (calculated as the sum of the distance from homesteads to an Ndumu gate and the distance from that gate to the river), the most direct route to the possible agricultural excision, and the regional tar road south of the community. For post resettlement analysis, the distance to a Ndumu gate and Pongola River access were measured from homesteads to the site of a likely new access gate from the excision into the park. Table 1 compares the distances before and after resettlement.

By modeling future household locations based on past settlement patterns the modeling exercise provided a plausible scenario of community settlement. However, this

Table 1. Average distance in meters to community features before and after resettlement.

	Before	After
Nearest neighboring household	148	170
Dirt road	210	310
School/shop	1454	2176
Mozambique border	3009	5425
Nearest Ndumu Game reserve gate	1146	1134*
Pongola River	2024	2040*
Agriculture excision	na	1134
Tar road	15,554	14,725

* This assumes new access into Ndumu constructed at the excision.

did not include the influence of new community infrastructure negotiated as a product of the land exchange. New schools, water taps, shops, and roads could alter new settlement patterns as households voluntarily settle in proximity to new features. But rather than modeling future homestead settlement around new infrastructure, these results could be used to decide where to place new infrastructure based on historic settlement patterns. Building on the spatial analyses, the IRR model was used to qualify resettlement impacts.

Qualifying the human factor of resettlement: the IRR model

Resettlement will most directly impact the residents of Mbangweni, but other South African communities and Mozambicans north of the border will be impacted. Here the focus is on Cernea's (1997) eight risks for all potentially affected people. Building on the IRR assessment, a ninth locally relevant risk was incorporated that will affect the outcome of any resettlement and conservation project, namely, the collateral impact of HIV/AIDS.

Landlessness (including the social and spiritual value of land)

The existing settlement pattern developed in accordance with local cultural and social traditions, natural resource access, and infrastructure limitations. Most homesteads are located in a north/south pattern, with the dirt road as the main attractor. Homesteads cover approximately 1.38 ha and are separated from each other by trees and vegetation, allowing for privacy. Residents have noted an increase in the number of new households, which was accompanied by a perception of crowding in the community, but not a fear of resource scarcity due to the increased population (Jones, 2005). The 110 homesteads currently occupy 3.2% of the community's land, and would consume 4.8% of the communal land after the 1650 ha corridor is ceded to conservation.

The land exchange would result in a loss of approximately 1650 ha (34%) of Mbangweni land in exchange for 200 ha of productive agriculture land excised form Ndumu Game Reserve, a net loss of 31% of Mbangweni land. Depending on negotiations, the community would not lose title to the land, but forfeit certain access and development rights in favor of conservation. Land for homesteads has not been a limiting factor in Mbangweni development, nor does it appear to be a serious risk after resettlement. Spatial analyses demonstrated that the 59 resettled homesteads would easily fit within modeling parameters. Based on current settlement and demographic patterns, land availability for homesteads would not be a limiting factor. For the social, cultural, and spiritual value of land, a participatory corridor planning exercise would help identify significant sites (i.e. ancestor's graves, rain making areas), which would either need to be excluded from the corridor or concessions granted to visit and conduct traditional ceremonies at sites that might become fenced.

Joblessness (including loss of income and subsistence activities)

The proposed conservation corridor would divide South African and Mozambican communities and disrupt important economic activities on both sides of the border. Some people would benefit from access to increased jobs, income, and economic opportunities; others will have decreased or lost access. Women in both countries dependent on the fish trade suffer lost opportunities. Taxis that service the fish trade and provide transport to residents in both directions would lose part of their customer base. If a formal transport system was established through the corridor to service local needs, the taxis could benefit from an authorized route through the corridor to and from the border. However, residents have historically walked across the border and paying for taxi transport through the conservation corridor might cause increased financial hardship.

During the late 1990s, Mbangweni was a well-known hotspot of criminal cross-border smuggling. A joint 2000-2001 military and police task force on both sides of the border helped stem the flow of stolen vehicles from South African and illegal firearms left over from the Mozambique civil war. More recently, anti-smuggling efforts have targeted counterfeit clothing, cigarettes, and illegal drugs. The participation of Mbangweni residents in illegal border activities is unknown, but it is likely some community members, particularly taxi operators, benefit by approving and/or facilitating the smuggling. Aside from legal and ethical implications, disruption to all economic activities needs to be addressed and incorporated into resettlement plans.

Nature-based tourism could provide much needed jobs for the community and a positive economic multiplier effect for other local households. However, the economic sustainability of nature-based tourism, particularly community-based ventures, is questionable (Adams & Infield, 2003; Kiss, 2004). Recently a prominent nature-based enterprise operating in Ndumu shut down after failing to make a profit during its 10-year operation (Poultney & Spenceley, 2001). Ezemvelo KwaZulu-Natal Wildlife acknowledged that many of the community-based nature-based tourism in the region have not achieved long-term sustainability, but attributed the failure to indigenous social, cultural and economic organization (Goodman, James & Carlisle, 2002). If not addressed, a priori, differing epistemologies between the community and conservation authorities could contribute to hostility and interfere with negotiations and project success.

The 200ha agricultural excision could provide an additional source of income from products sold at regional markets. An economic assessment of the excision determined that each if household utilized 0.8 ha (based on regional averages), they could earn R3,500 per year (Moodley, n.d.). A lack of reliable data on Mbangweni's household incomes makes it difficult to determine the contribution this would add to household livelihoods. The South African Poverty Fact Sheet suggests that 70-80% of households in the region have a yearly income of approximately R21,672 (Fenske, 2004). Without including forgone economic opportunities listed above, the agriculture excision could provide a 16 % increase in household income.

Homelessness

Homelessness is not a major risk faced by Mbangweni households. Negotiations would probably include compensation for resettled households. Additionally, most homesteads are constructed from natural materials that are readily available on the communal land. There could be a risk of conflict if the compensation for resettled households allows them to construct superior homesteads (i.e permanent brick structures), if existing households receive no direct benefit.

Marginalization (including the loss of traditional rights and status)

The risk of marginalization stemming directly from resettlement is mixed. All homesteads would continue to reside on Mbangweni land. No household would be resettled in external communities, often a source of marginalization. One possible source of risk would be the arrival of new settlers attracted by increased development and economic opportunities. Immigrants who bring along social, economic, or other sources of power and influence could disrupt the existing structure.

The greatest risk of marginalization might come from a co-management agreement with conservation authorities. Equitable co-management arrangements are meant to share power, responsibilities, and benefits in an on-going adaptive manner. However, other co-management agreements throughout the world have tended to prioritize conservation goals over local socio-economic needs (Whande, Kepe & Murphree, 2003). While Ezemvelo KwaZulu-Natal Wildlife has shown a willingness to increase partnerships with local stakeholders in the past, results have varied. A Local Conservation Board was previously created for the Tembe-Ndumu Complex to increase local partnerships, devolve conservation decision-making, and to help administer levy benefits (collected from gate entrance fees) mandated for community development. However, conservation authorities have bypassed the board's decisions at will and acted unilaterally on previous occasions (Luckett, Mkhize & Potter, 2003).

Food insecurity

There is minimal risk for increased food insecurity for Mbangweni residents, but disrupted or increased risk for other local people. The agricultural excision could increase Mbangweni's food security by direct benefits, as well as increased income from selling excess agricultural products at regional markets. Access to clean drinking water will improve if negotiations include a network of communal taps. The cost of purchasing water from communal taps is unlikely to be a major limiting factor since the distance of carrying water from taps to households has limited consumption in the region, not cost (M. Nxumalo, personal communication, 11 Feb 03). Access to water for agriculture would increase due to the excision's proximity to the Pongola River floodplain. Mbangweni would lose access to some forest products, particularly wild fruits, which would be fenced inside the corridor. Although two thirds of the forest would remain, an ecological assessment is needed to quantify the impact of lost fruit tress to nutrition and income. A disruption to the bush meat trade across the Mozambique border would impact local diets and the livelihoods of Mozambican traders dependent on the meat and income. The conservation corridor could disrupt the trade of fish from Mozambique to South Africa. This is an important source of cheap protein and income for the region on both sides of the border. Mozambique residents would also lose access to South African foodstuffs sold in shops and at the border market.

Loss of access to common property resources

Under the land exchange presented here, the community would lose open access to more than one third of its land. Negotiations might include some community access to the land after it becomes fenced conservation, particularly for culturally important areas. Natural resource utilization in the conservation corridor would probably be highly regulated with minimal resource harvesting allowed. Residents would be dependent on resources within the remaining two thirds of the community. It is difficult to quantify the ability of the remaining communal land to provide resources for the community. Access to wild fruits and the meat of wild birds would be diminished, but the communal area would provide adequate land for homesteads and fuelwood for current and future growth patterns. A decrease in grazing land would affect Mbangweni livestock owners, as well as outsiders who are granted permission to graze on the communal land.

Increased morbidity and mortality

Resettlement negotiations could help decrease morbidity and mortality for Mbangweni residents, but cause an increase for others. Development and infrastructure benefits in Mbangweni could include improved sanitation, clean drinking water, increased visits by mobile health clinics, and improved nutrition from expanded agriculture and raised incomes. If a nonporous conservation corridor were developed, Mozambicans would lose access to health facilities in South Africa, as well as income from selling fish and bush meat and trading at local markets.

Social disarticulation (including changes in community structure by age, gender, language, etc.)

The risk of social disarticulation would directly result from resettlement of households and indirectly from inequitable benefit sharing. The conservation corridor might sever social linkages between Mbangweni and Mozambique and the resettlement of 59 households could disrupt social patterns. Women are most at risk as the local culture and planners reinforce patriarchal systems that impact women, including: resettlement compensation paid to male heads of households, male control over expanded agricultural income, strengthening of men's control over resources, and the fragmentation of social units felt mostly by women (de Wet, 2005).

Existing unequal power structures often result in the inequitable distribution of conservation benefits. Residents with traditional political power (i.e the chief and his council) and those with economic power (i.e. local taxi drivers) are able to control access to new jobs, household placement, and resource access after resettlement. Community nature-based tourism projects often produce minimal cash benefits, and these are accrued by the local power elite (Berkes, 2004; Kiss, 2004). Other residents with skills relevant to the nature-tourism industry, such as fluency in English, will have a competitive advantage. Language skills have usually been acquired by households with enough money or power to educate their children in secondary schools located outside of the community. Individuals with driver's license, expensive due to training and permit fees, will also be well placed for tourism jobs. Thus, current social patterns could be influenced by access to and distribution of benefits.

The Collateral Impact of HIV/AIDS

HIV/AIDS will not directly affect a resettlement scheme, but it will have major impacts on the success and long-term sustainability of all resettlement components. The prevalence rate for the Maputaland region is estimated to be one of the highest in the country, and is probably above national South African estimates that range between 18.5% and 37.5% (Dorrington, Bradshaw & Budlender, 2003; Hlongwe, 2003; Rehle & Shishana, 2003; UNAIDS, 2004). The links between HIV/AIDS and poverty are well documented. Poverty increases the risk of acquiring HIV/AIDS and the disease in turn increases poverty at the household level (Pirot, 2001; Fenton, 2004; Singh, 2004). Households lose income as sick or deceased family members no longer work, collect pensions, or send remittances (HSRC, 2002). Limited household resources are diverted to healthcare, including traditional medicine, and expensive burial services. Natural resource exploitation results from over harvesting of medical plants, wood for coffins, and increased poaching (Mauambeta, 2003; Sitoe, Kayambazinthu, Barany & Anyonge, 2004). The resource base is threatened by deepening household dependence on local resources that are increasable harvested unsustainably due to lost agricultural and ecological knowledge (Oglethorpe & Gelman, 2004; Sitoe et al., 2004). Changes in household size and composition result in increased dependency ratios, lost family labor for subsistence activities, and increased numbers of orphans (Gillespie & Kadiyala, 2005).

The impact of HIV/AIDS on individuals and households will accrue to the viability of community participation in nature-based tourism operations and com-management arrangements. Capacity building and training for community members to work in conservation-related positions will be continually lost due to high attrition. Traditional leadership and community boards will also suffer lost capacity. Ezemvelo KwaZulu-Natal Wildlife is currently struggling with the impact of the disease that has resulted in 16-fold increase in staff disability and death between 1999 and 2003 (Mauambeta, 2003). As community members are unable to fill conservation and tourism jobs, there is a risk of attracting outsiders, which increases the risk of community disarticulation and/or marginalization.

The community could sink deeper into poverty and become increasingly desperate. With dwindling capacity, leadership, incomes, and health, there is a risk of the community blaming conservation for the situation. HIV/AIDS is heavily stigmatized in

South Africa, and local residents are unlikely to acknowledge the disease for the deteriorating situation. A history of forced removals from parks and years of waiting for the land claim to be resolved combined with forgone communal land and household resettlement could compound to make conservation a likely target for community frustration and helplessness. If not addressed, the situation could lead to a risk of conflict by a community who has vandalized park resources in past efforts to vocalize unhappiness with the status quo.

Conclusion

Conservation expansion throughout Southern Africa is likely to require voluntarily resettling thousands of local people in the future. Yet, research continues to focus on involuntary displacement post de facto, while ignoring serious implications of voluntary community resettlement. Construction of a conservation corridor and subsequent resettlement of Mbangweni households will have both positive and negative impacts. Due to its geographic location and the nature of local livelihoods, the impacts will not only be felt by local residents, but also by Mozambicans and South Africans throughout the region. While only 59 households might need to be resettled, thousand of people in the region will be affected. Analysis using the IRR model revealed the importance of understanding both the social and economic elements of resettlement and reconstruction. Although the project will have significant direct impacts on local people, the implementation of a conservation corridor and co-management agreement will have numerous indirect impacts. Community stability will be highly dependent on the success of infrastructure development incentives, particularly nature-based tourism schemes.

Tourism is a fickle industry and expanded conservation in the region will not necessarily attract additional visitors and result in economic sustainability (Aylward, 2003). Tourism projects, resettlement schemes, and co-management agreements all require an adaptive and long-term commitment of at least five to ten years (Eriksen, 1999; Berkes, 2004). Expectations of co-management are often unrealistic and heavily dependent on a common vision of all participants for success (Borrini-Feyerabrand, 2004). A perceived lack of benefits by the community, regardless of cause, will threaten sustainability and could result in conflict. The conservation corridor, household resettlement, and community infrastructure development require comprehensive planning, local participation, community empowerment and decision-making, and consideration of the social and economic impacts to the larger region. An integrated approach using quantitative GIS analyses and a qualitative IRR assessment provided a holistic method for a priori resettlement research.

References

Adams, W. M., & Infield, M. (2003). Who is on the gorilla's payroll: claims on tourist revenue from a Ugandan national park. *World Development, 31*(1), 177-190.

Aylward, B. (2003). The actual and potential contribution of nature tourism in Zululand: considerations for development, equity, and conservation. In B. Aylward & S. Luckett (Eds.), *Creating a Nature Tourism Economy: A Multicriteria Analysis of Options for Policy, Institutions, and Management* (pp. 3-40). Washington D.C.: The World Bank.

Berkes, F. (2004). Rethinking community-based conservation. *Conservation Biology, 18*(3), 621-630.

Bice, J. E. (2004). *Great Limpopo: talk of the transfrontier (Official newsletter of the Great Limpopo Transfrontier Park)*. Stellenbosch: Peace Parks Foundation and the GEF/World Bank.

Borrini-Feyerabend, G., Pimbert, M., Farvar, M. T., Kothari, A., & Renard, Y. (2004). *Sharing power: learning by doing in co-management of natural resources throughout the world*. Tehran: IIED, IUCN/ CEESP/ CMWG, Cenesta.

Cernea, M. M. (1997). The risks and reconstruction model for resettling displaced populations. *World Development, 25*(10), 1569-1587.

Cernea, M. M. (2002). *A conceptual model for involuntary population resettlement Impoverishment Risks and Reconstruction (IRR)*. Manila.

Cernea, M. M., & Schmidt-Soltau, K. (in press). National parks and poverty risks: policy issues in conservation and resettlement. *World Development*.

Cunningham, A. B. (1988). Nutritional value of palm wine form hyphaene coriacea and phoenix reclinata (acrecaceae). *Economic Botany, 42*(3), 301-306.

de Wet, C. (2005). Development-induced displacement and resettlement. In M. Gibney & R. Hansen (Eds.), *Global Migration :an Encyclopedia*. Santa Barbara: ABC-Clio.

Dorrignton, R., Bradshaw, D., & Budlender, D. (2002). *HIV/AIDS profile in the provinces of South Africa: indicators for 2002*. Cape Town: Centre for Actuarial Research, University of Cape Town.

Eriksen, J. H. (1999). Comparing the economic planning for voluntary and involuntary resettlement. In M. M. Cernea (Ed.), *The Economics of Involuntary Resettlement: Questions and Challenges*. Washington, D.C.: The World Bank.

Felton, I., & Hanekom, C. (2000). *Initial assessment of the environmental impact on the excision of land from the east boundary of Ndumu Game Reserve, in respect of the resolution of the land claim by the Mbangweni community*. Pietermaritzburg: Ezemvelo KwaZulu-natal Wildlife.

Fenske, J. (2004). *Fact sheet: poverty in South Africa*. Pretoria: Human Sciences Research Council.

Fenton, L. (2004). Preventing HIV/AIDS through poverty reduction: the only sustainable solution? *The Lancet, 364*(25 September), 1186-1187.

Gillespie, S., & Kadiyala, S. (2005). *HIV/AIDS and food and nutrition security: from evidence to action*. Washington, D.C.: International Food Policy Research Institute.

Goodman, P. S., James, B., & Carlisle, L. (2002). Wildlife utilization: its role in fosterning biodiversity in KwaZulu-Natal. In S. M. Pierce & R. M. Cowling & T. Sandwith & K. MacKinnon (Eds.), *Mainstremaning Biodiversity in Development:*

Case Studies from South Africa (pp. 21-32). Washington D.C.: The World Bank.

Hlongwe, M. (2003). *Umkhanyakude local economic development initiative*. Durban: Haley Sharpe Southern Africa (Pty) Ltd.

HSRC (Human Sciences Research Council). (2002). *The impact of HIV/AIDS on land issues in KwaZulu-Natal province, South Africa*. Pretoria: Integrated Rural & Regional Development.

Jones, J. L. (2005). Transboundary conservation: development implications for communities in KwaZulu-Natal, South Africa. *International Journal of Sustainable Development and World Ecology, in press*.

Kiss, A. (2004). Is community-based ecotourism a good use of biodiversity conservation funds? *TRENDS in Ecology and Evolution, 19*(5), 232-237.

Liu, J., Daily, G. C., Ehrlich, P. R., & Luck, G. W. (2003). Effects of household dynamics on resource consumption and biodiversity. *Nature, 421*(30 January), 530-533.

Loon, R. M., & Polakow, D. (2001). Ecotourism ventures: rags or riches? *Annals of Tourism Research, 28*(4), 892-907.

Luckett, S., Mkhize, K., & Potter, D. (2003). The experience of local boards in KwaZulu-Natal, South Africa. *Parks, 13*(1), 6-15.

Mauambeta, D. D. C. (2003). *HIV/AIDS mainstreaming in conservation: the case of Wildlife and Environmental Society of Malawi*. Embe: Wildlife and Environmental Society of Malawi.

Moodley, S. E. (n.d.). *Environmental economics assessment of land use options: Mbangweni land claim settlement*. Braamfontein: IUCN-NETCAB Biodiversity

Support Project.

Mulholland, G., & Eagles, P. F. J. (2002). African parks: combining fiscal and ecological sustainability. *Parks, 12*(1), 42-49.

Oglethorpe, J., & Gelman, N. (2004). *HIV/AIDS and the environment: gender makes the difference*. Geneva: IUCN.

Pirot, P., Bartos, M., Ghys, P. D., Walker, N., & Schwartländer, B. (2001). The global impact of HIV/AIDS. *Nature, 410*(April 19), 968-973.

Poultney, C., & Spenceley, A. (2001). *Practical strategies for pro-poor tourism: Wilderness Safaris South Africa: Rocktail Bay and Ndumu Lodge, PPT Working Paper No. 1*. London: Overseas Development Institute.

PPF (Peace Parks Foundation). (2002). *The facilitation and development of transfrontier conservation areas in Southern Africa: funding application in support of the Lubombo transfrontier conservation area*. Stellenbosch: Peace Parks Foundation.

Ramutsindela, M. F. (2002). The perfect way to end a painful past? Makuleke land deal in South Africa. *Geoforum, 33*, 15-24.

Rehle, T. M., & Shisana, O. (2003). Epidemiological and demographic HIV/AIDS projections: South Africa. *African Journal of AIDS Research, 2*(1), 1-8.

Robins, S. (2001). NGOs, 'Bushmen' and double vision: the Khomani San land claim and the cultural politics of 'community' and 'development' in the Kalahari. *Journal of Southern African Studies, 27*(4).

Schmidt–Soltau, K. (2003). Conservation–related resettlement in Central Africa: environmental and social risks. *Development and Change, 34*(3), 525-551.

Singh, J. A. (2004). Why AIDS in South Afria threatens stability and economic growth in other parts of Africa. *The Lancet, 24*(27 November), 1919-1920.

Sitoe, A., Kayambazinthu, D., Barany, M., & Anyonge, C. H. (2004). *HIV/AIDS and the Miombo woodlands of Mozambique and Malawi: an exploratory study*. Rome: Department of Forestry, Food and Agriculture Organization.

Statistics South Africa. (2005). *Mortality and causes of death in South Africa 1997-2003: findings from death notifications*. Pretoria.

Tong, M. (N.d.). *Lest we forget: restitution digest on administrative decisions*. Pretoria: South African Departmnet of Land Affairs.

UNAIDS. (2004). *2004 report on the global AIDS epidemic: 4th global report*. Geneva: Joint United Nations Programme on HIV/AIDS.

Whande, W., Kepe, T., & Murphree, M. (Eds.). (2003). *Local communities, equity and conservation in Southern Africa: A synthesis of lessons learnt and recommendations from a southern African technical workshop*. Bellville: Programme for Land and Agrarian Studies, University of the Western Cape.

The response of ***Phragmites australis*** to harvesting pressure in the Muzi Swamp of the Tembe Elephant Park, South Africa

J.A. Tarr[1], M.W. van Rooyen[2] and J. du P. Bothma[1]

[1] Centre for Wildlife Management, University of Pretoria, Pretoria, South Africa, 0002

[2] Department of Botany, University of Pretoria, Pretoria, South Africa, 0002

Short title: Response of *Phragmites australis* to harvesting pressure in the Muzi Swamp

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[1] Correspondence to: J. A. Tarr, Centre for Wildlife Management, University of Pretoria, Pretoria, South Africa, 0002.
E-mail: s9611163@tuks.co.za
Tel: +27 12 420-2338
Fax: +27 12 420-6096

ABSTRACT

Phragmites australis (Cav.) Trin. ex Steud. has been harvested in the Muzi Swamp in Maputaland, South Africa for generations. Over the last 10 years, however, a flourishing trade in this reed has developed. Concern has now been expressed that at the current levels of utilisation the ecological integrity of the Muzi Swamp is being compromised, and that the current harvesting rates are not sustainable in the long term. The hypothesis was put forward that a degradation gradient exists with the most severe degradation occurring the closest to where community members enter the park, and the least degradation the furthest from this point. The results of this study, however, show no distinct degradation gradient. Yet the overall condition of the reeds in the harvesting area is poorer than in the non-utilised area. Expansion of the current harvesting area, coupled with adaptive harvesting systems and yearly monitoring will improve the quality of the reeds within the harvesting area without affecting the harvesting quotas.

KEY WORDS: Conservation, degradation gradient, Muzi Swamp, *Phragmites australis*, resource utilisation, sustainable utilisation

INTRODUCTION

Natural resource utilisation within South Africa's protected areas has become a sensitive issue. Increasing demand by communal rural communities for access to the renewable natural resources in protected areas has come about through a total degradation of these resources outside the protected areas, and an increasing demand for a specific resource within such an area. The occurrence of these natural resources within protected areas is often a result of total protection, or of the correct and prudent management of the resources.

When the Tembe Elephant Park was proclaimed in 1983, it was agreed that controlled harvesting of the natural resources within the park by the neighbouring communal rural communities would be allowed. The common reed (*Phragmites australis* (Cav.) Trin. ex Steud.) is currently being harvested in the Muzi Swamp within the Tembe Elephant Park under this agreement, because it is no longer readily available outside the park.

The harvested reeds are used in hut-wall construction, craftwork, and for thatching material (Cunningham, 1985; Begg, 1988; Browning, 2000; Tosh, 2000). The reed beds generate a substantial income for the neighbouring Sibonisweni community members, because most of the harvested reeds are sold elsewhere for use as building material. These reeds are often the only source of income for many of the community members, a development that was not originally planned for. The reed bundles that are not sold, are used by the Sibonisweni community themselves as building material, and in socio-cultural activities such as burial ceremonies (Browning, 2000).

Ezemvelo KwaZulu-Natal Wildlife is responsible for managing the Tembe Elephant Park and has raised the concern that the *Phragmites australis* dominated Muzi Swamp is being overutilised because the reeds are now also being harvested for commercial sale, and not just for subsistence use as was originally intended (Kyle, 2001 *pers.comm.*[1]). The Sibonisweni community members are in turn concerned that the quality of reeds that are being harvested within the area allocated to them, is deteriorating. Since the proclamation of Tembe Elephant Park in 1983 up to and including 1995, no harvesting quotas existed. In 1996, a harvesting quota was implemented to reduce the volume of reeds harvested from approximately 16 000 bundles per year, to the current quota of some 8 000 bundles per year (Kyle, 2000).

The most heavily utilised reed beds within the Muzi Swamp are those harvested by the Sibonisweni community. The proximity of this community to the tar road has lead to a flourishing trade in this reed resource. Members of the Sibonisweni Reed Cutting Association enter the park at KwaMsomi Gate in the south, and harvest the reeds northwards from there for approximately 1.7 km. Reeds of the desired quality are selected and are harvested by using a machete. Each harvester is allowed to cut a single bundle of reeds per day, sometimes weighing up to 64 kg, which must be carried out of the park. The reed bundles are then sorted into smaller, more manageable bundles at KwaMsomi Gate, before being taken to the tar road for sale.

Many factors have been regarded as being detrimental to reed growth, but it has been difficult to quantify this negative effect (Granéli, 1989; Ostendorp, 1989). One of the

[1] Mr. S. Kyle, Ezemvelo KwaZulu-Natal Wildlife, Resource Ecologist Maputaland. P. O. Box 43, KwaNgwanase, South Africa 3973.

most obvious factors affecting reed growth is that of harvesting. Both the intensity and temporal range of harvesting have an effect on the degree of regeneration and rehabilitation of the reeds (McKean, 2001). Persistent nutrient loss from the above-ground parts because of harvesting during the growing season, causes a decline in the amount of nutrients returned to the rhizomes (Mook and Van der Toorn, 1982). Removal of aerial parts during the growing season prevents full recovery and regrowth in the spring (Čižková *et al.*, 2001).

The hypothesis that is tested here is that the utilisation pressure on the reeds of the Muzi Swamp in the Tembe Elephant Park will show a gradient of use, starting with the highest utilisation pressure close to the entrance gate, followed by a gradual reduction in utilisation pressure the further away from that point. If such a utilisation gradient were present, it should be reflected in changes in the measurable properties of reed quality, such as reed height, diameter, density and biomass per unit surface area. These aspects are examined here to test the above hypothesis.

STUDY AREA

The study area is situated in the eastern portion of Tembe Elephant Park in KwaZulu-Natal, Maputaland, South Africa (Figure 1). It forms a polygon between the following coordinates: 26º 53’ 08’’ S and 32º 34’ 58’’ E, 26º 53’ 04’’ S and 32º 34’ 59’’ E, 27º 01’ 25’’ S and 32º 29’ 54’’ E and 27º 01’ 24’’ S and 32º 29’ 44’’ E. The Muzi Swamp extends northwards from KwaMsomi Gate in the south to Muzi Gate in the north, from where it continues into Mozambique (Figure 1).

The section of the Muzi Swamp that lies within Tembe Elephant Park is approximately 560 ha in size. It lies on Holocene peat deposits that are controlled by the topography of the underlying Pleistocene KwaBonambi coastal dunes (Grundling, 1996). The Muzi Swamp is an elongated interdune valley that is orientated parallel to the present coastline. This interdune peatland and isolated wetland are fed by groundwater from perched aquifers within the sand dunes (Grundling, 1999). The entire Muzi Swamp is dominated by *Phragmites australis* that is sparsely interspersed with open water, higher lying islands and hygrophilous grasses (Matthews *et al.*, 2001).

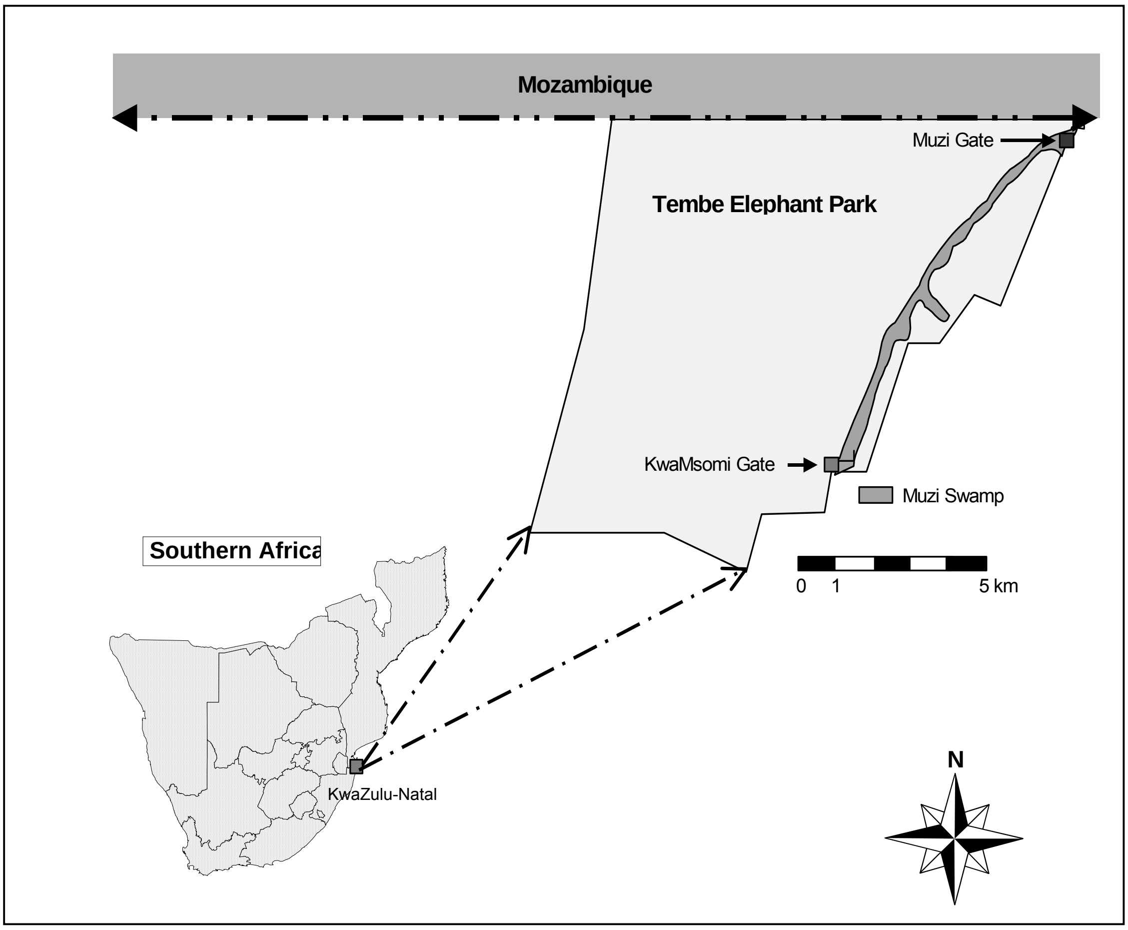


Figure 1: The location of the Muzi Swamp in the Tembe Elephant Park, South Africa.

The mean annual rainfall is 721.5 mm. The minimum recorded annual rainfall is 245.0 mm, while the recorded maximum is 2 105.0 mm. The temperature in Tembe Elephant Park ranges from an extreme minimum of 4ºC to an extreme maximum of 45ºC (Figure 2). The proximity of Tembe Elephant Park to the coast and its low-lying topography result in a high relative humidity of the air (KwaZulu-Natal Nature Conservation Service, 1997).

METHODS

The reed beds in the southern section of the Muzi Swamp were sampled from south to north. Experimental sites were set out approximately every 100 m, starting 300 m from the fence near KwaMsomi Gate (Table 1). Thirteen sites were selected and were referenced by using a Global Positioning System (GPS). Site 13 was considered to be representative of natural areas within the Muzi Swamp where no harvesting is allowed. To ensure uniform sampling of the *Phragmites australis* community, experimental sites were set out approximately 30 m away from the ecotone of the *Phragmites australis* community and the hygrophilous grassland community (Matthews *et al*., 2001).

At each experimental site six replicate quadrates were harvested by using a 1 m^2 frame. All the reeds within the square frame were cut with secateurs at water level, or at ground level in the absence of water. The stem diameter (mm) and reed height (m) were measured for each cut reed within the quadrate. The basal stem diameter was measured by using callipers. The reed height was measured with a tape measure from the stem base to the outstretched apical-leaf blade. To correct for water depth, the water level at each site was added to the mean reed height to obtain total reed height. The number of reeds harvested per sample quadrate was counted to determine the reed density per m^2. The total mass of all the reeds harvested within each sample quadrate was measured in kilogrammes by using a spring balance.

The environmental variables recorded at each site were (Table 1): the distance from the gate; the time since the last harvest by the reed cutters; the degree of trampling; and the water depth. The time since the last harvest by the reed cutters was estimated in two-monthly intervals, with the most recent harvests occurring <2 months before the experimental harvesting trial, and the least recent harvest occurring >10 months before the experimental

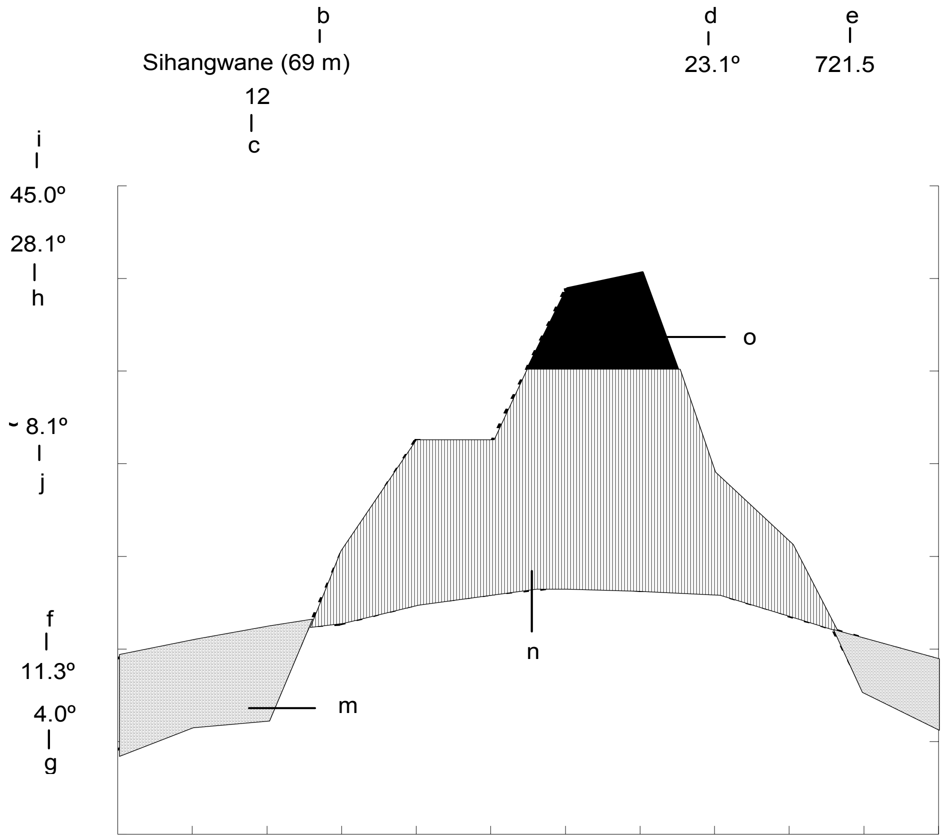


Figure 2: Climatogram of Sihangwane Weather Station, Tembe Elephant Park, following Walter (Cox and Moore, 1994). b = height above sea-level in m; c = duration of observations in years; d = mean annual temperature in ºC; e = mean annual precipitation in mm; f = mean daily minimum of the coldest month; g = lowest temperature recorded; h = mean daily maximum of the warmest month; i = highest temperature recorded; j = mean daily temperature variation; m = relative period of drought; n = relative humid season; o = mean monthly rainfall > 100 mm.

Table 1. *Environmental factors at sites in the reed bed in the Muzi Swamp of Tembe Elephant Park, South Africa. Distance from fence indicates distance away from the boundary fence at the KwaMsomi Gate, the degree of trampling by humans and animals is indicated on a 5-point sclae, time since last utilisation in months, and water depth in metres.*

Plot	Distance from fence (m)	Trampling	Utilisation	Water depth (m)
1	300	3	> 6-8	0.00
2	400	3	> 8-10	0.00
3	500	4	< 2	0.00
4	600	3	> 2-4	0.02
5	700	3	> 6-8	0.31
6	800	2	> 10	0.36
7	900	3	> 2-4	0.21
8	1 000	3	> 4-6	0.22
9	1 100	2	> 8-10	0.10
10	1 500	2	> 10	0.18
11	1 600	1	> 8-10	0.16
12	1 700	2	> 6-8	0.05
13	1 800	1	-	0.37

Trampling: high = 5, low = 1

harvesting trial. The degree of trampling at the sites was recorded on a scale of 0 to 5, with 0 being the lowest degree of trampling and 5 being the highest degree of trampling. The creation of channels and paths most often used by reed cutters, the elephant *Loxodonta africana*, buffalo *Syncerus caffer* and black rhinoceros *Diceros bicornis* had longer lasting and more visible impacts, compared with the more subtle degrees of trampling by smaller animals such as the warthog *Phacochoerus africana* and reedbuck *Redunca arundinum*. The water level was measured by using a metal dropper attached to a thin aluminium plate to prevent the penetration of the rod into the peat layer.

The mean height (m), diameter (mm), density per m^2, yield (kg per m^2) and mean mass per reed (g) were calculated for each sample quadrate. These values were used as replicates to calculate the mean values for each site. The site means were used in linear regression models to test for correlations between reed characteristics and environmental variables. An Analysis of Variance (ANOVA), and *post hoc* Bonferroni tests of the Statistica 6 computer package (StatSoft Inc., Tulsa, Oklahoma, U.S.A) were used to determine statistically significant differences between the reed characteristics at the various sites. The frequency distribution of reeds encountered in various height and diameter classes was plotted against the distance away from the starting point.

RESULTS AND DISCUSSION

Reed height

Reed height was not significantly correlated with the gradient of increasing distance away from the boundary fence at KwaMsomi Gate towards the northern parts of the utilisation area or with trampling (Table 2). Reed height was, however, strongly positively correlated with the time since the last harvest by the reed cutters and weakly positively correlated with water depth (Table 2). The results of the *post hoc* test are indicated in Figure 3a. Site 3 that had been harvested by the reed cutters less than 2 months before the experimental trial, had the shortest reeds (mean ± se: 0.32 ± 0.05 m), while site 13 had the tallest reeds (mean ± se: 2.04 ± 0.10 m). There was a significant difference in reed height ($p<0.01$) between site 13 and the rest of the sites. The disparity between site 13 and the rest of the sites can be attributed to its location in the non-utilised area where reeds have never been harvested, implying that

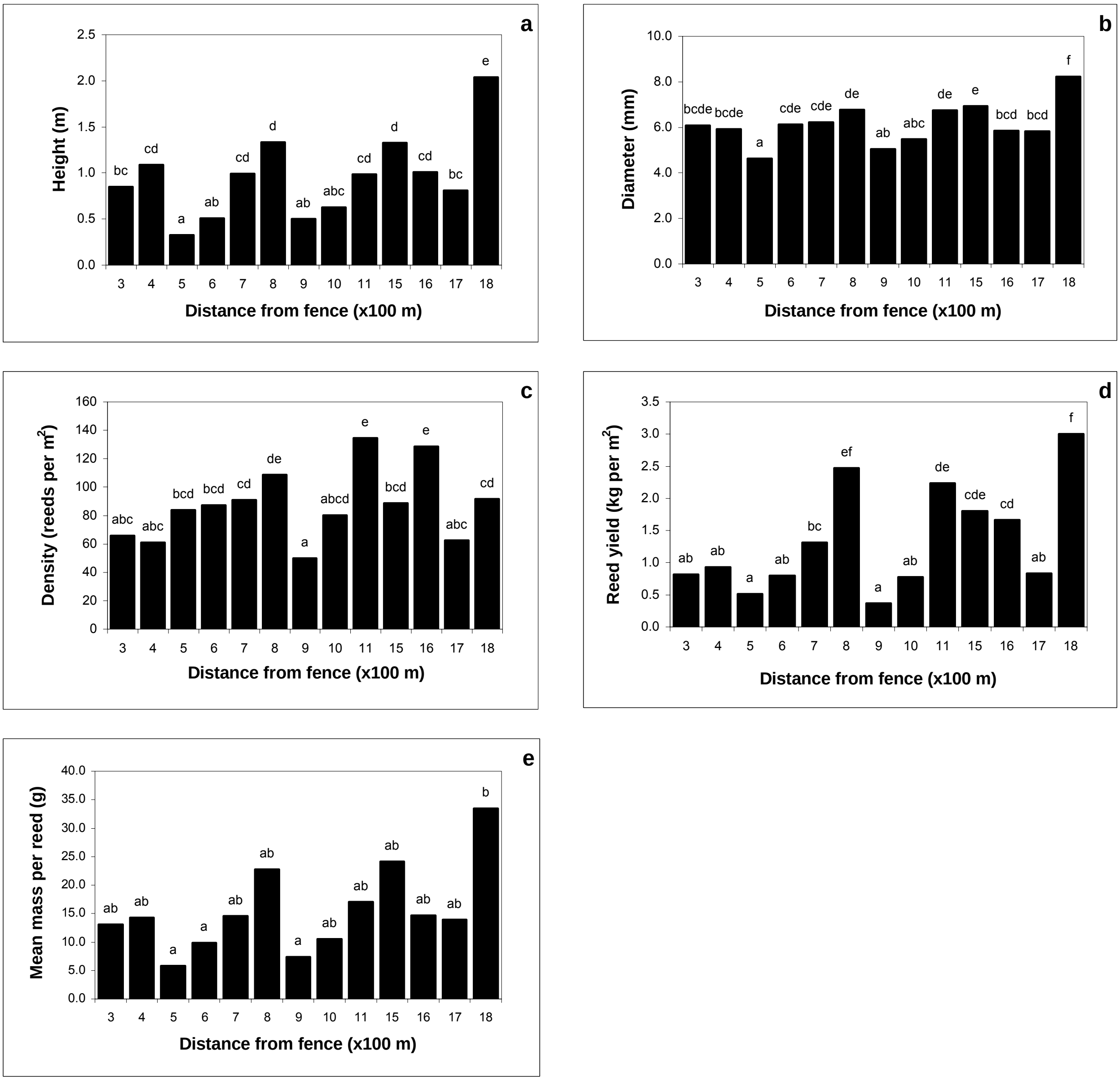


Figure 3: Reed characteristics at sites along a transect from the southern border of the Tembe Elephant Park from site 1 northwards to site 13. (a) Mean reed height; (b) mean reed diameter; (c) mean reed density; (d) mean reed biomass; (e) mean mass per reed. Bars with the same superscripts do not differ significantly (p>0.05).

Table 2. *Simple linear regression between various measures of reed quality and environmental variables. r^2 values and p-values are shown. An asterisk denotes a statistically significant relationship at α = 0.05.*

	Distance from fence		Degree of trampling		Time since last utilisation		Water depth	
	r^2	p	r^2	p	r^2	p	r^2	p
Reed height	0.269	0.069	0.020	0.640	0.885	0.000*	0.368	0.028*
Reed diameter	0.219	0.107	0.011	0.735	0.739	0.000*	0.274	0.066
Reed density	0.092	0.314	0.032	0.556	0.156	0.181	0.079	0.353
Reed yield	0.266	0.071	0.089	0.321	0.74	0.000*	0.405	0.079
Mean mass per reed	0.257	0.076	0.050	0.461	0.821	0.000*	0.379	0.025*
Degree of trampling	0.058	0.429	-	-	0.038	0.523	0.115	0.188
Time since last utilisation	0.266	0.071	0.038	0.523	-	-	0.254	0.079
Water depth	0.171	0.159	0.115	0.188	0.254	0.079	-	-

reed harvesting has a negative effect on reed height.

Sites 3, 4, and 7 that had been harvested by the reed cutters within 4 months before the experimental trial (Table 1) did not have a high percentage of tall reeds. These recently harvested sites had a significantly ($p<0.01$) higher frequency of short reeds in the >0.0–0.5 m height class, than sites 6 and 10 that had been harvested more than 10 months before the experimental trial (Figure 4a). New shoots sprouting from the cut stem of harvested reeds accounted for the high frequency of short reeds in the recently harvested sites. As the height classes increase, the frequency of occurrence of reeds in these classes in the recently harvested sites decreases. Site 13 had a significantly ($p<0.01$) higher frequency (mean ± se: 31.5 ± 5.0%) of reeds in the >2.5 m height class than any of the other sites (Figure 4f).

Reed diameter

Reed diameter was not significantly correlated with the distance gradient away from the boundary fence at KwaMsomi Gate, degree of trampling or water depth (Table 2). Reed diameter was, however, significantly positively correlated with the time since the last harvest by the reed cutters (Table 2). Site 3 had the smallest mean reed diameter (mean ± se: 4.64 ± 0.33 mm)(Figure 3b), while site 13 had the largest one (mean ± se: 8.22 ± 0.23 mm). Site 13 had significantly thicker reeds ($p<0.03$) than the utilised sites, implying that utilisation has had a negative influence on the mean reed diameter of the sites.

Site 13 is 1.8 km away from the boundary fence at KwaMsomi Gate and it has a significantly ($p<0.01$) higher frequency (mean ± se: 23.6 ± 2.4%) of reeds in the >10.0 mm diameter class compared with that of any of the sites that were utilised by the reed cutters less than 10 months before the harvesting trial (Figure 5f).

Phragmites australis is a rhizomatous, perennial plant, producing annual aerial shoots. The basal diameter of the emergent shoot is determined by the size of the bud on the rhizome. The rhizomatous growth habit of *Phragmites australis* also determines the reaction to damage caused by harvesting. Early damage to the emergent shoot's apical meristem results in the complete replacement of the shoot from subterranean buds. Damage to the apical meristem of the shoot late in the growing season leads to replacement by several thinner shoots from the above-ground nodes (Van der Toorn and Mook, 1982).

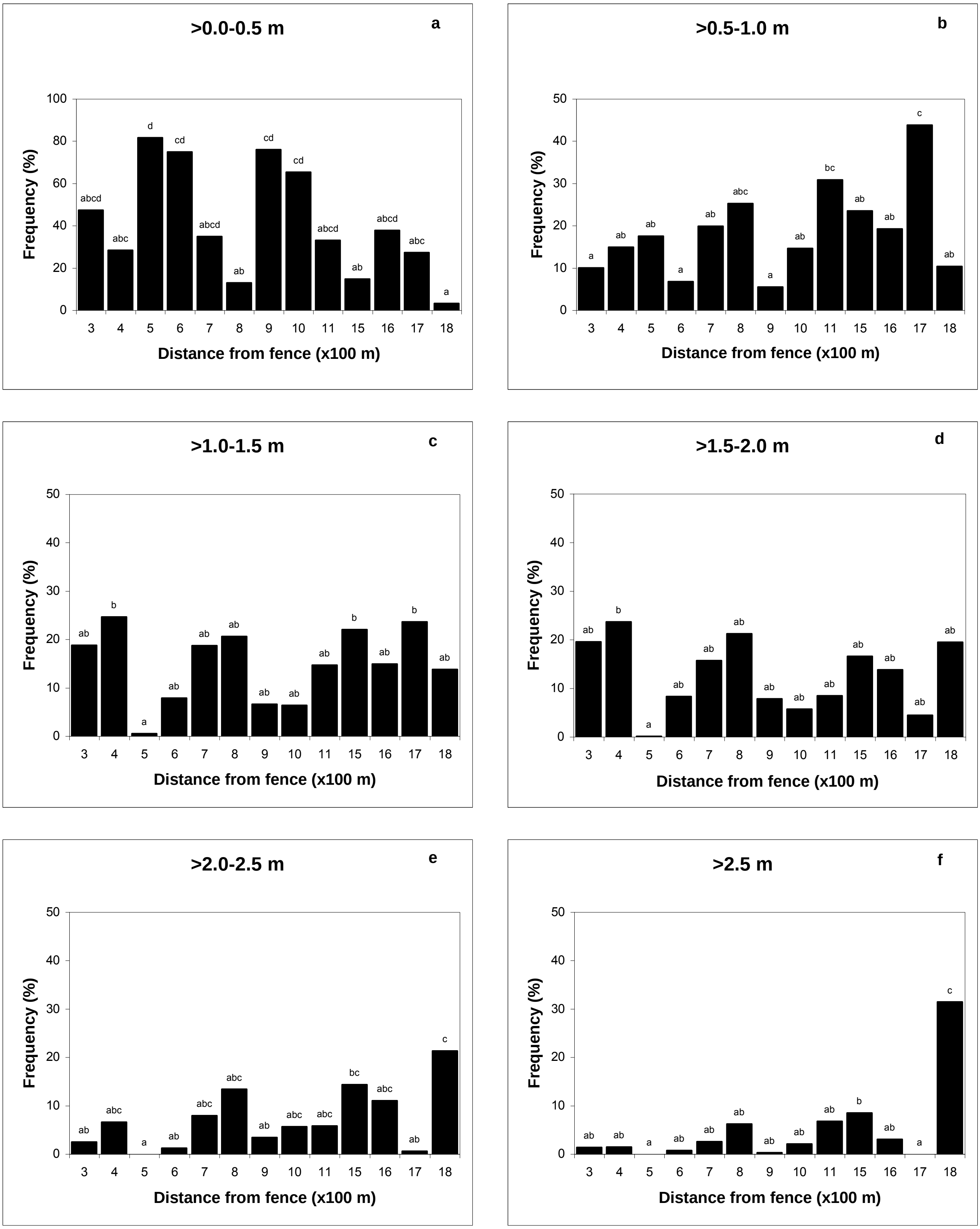


Figure 4: Frequency of height classes of reeds in sites along a transect from 300 m north of the fence at KwaMsomi Gate to 1 800 m north of the fence at KwaMsomi Gate. (a). >0.0-0.5 m height class; (b). > 0.5-1.0 m height class; (c). > 1.0-1.5 m height class; (d). > 1.5-2.0 m height class; (e). > 2.0-2.5 m height class; (f). >2.5 m height class. Bars with the same superscripts do not differ significantly (p>0.05).

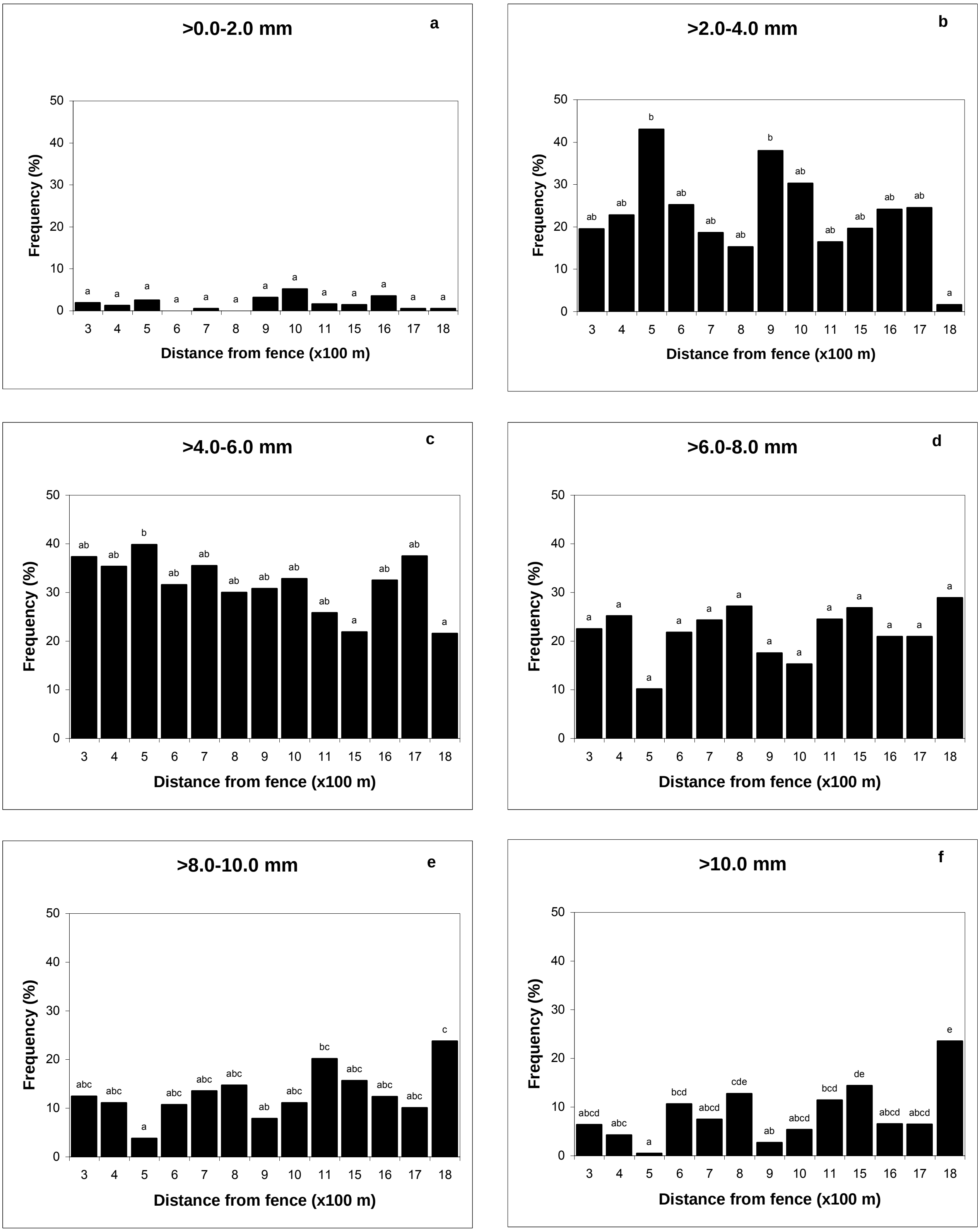


Figure 5: Frequency of diameter classes of reeds in sites along a transect from 300 m north of the fence at KwaMsomi Gate to 1 800 m north of the fence at KwaMsomi Gate. (a) >0.0-2.0 mm diameter class; (b) >2.0-4.0 mm diameter class; (c) >4.0-6.0 mm diameter class; (d) >6.0-8.0 mm diameter class; (e) >8.0-10.0 mm diameter class; (f) >10.0 mm diameter class. Bars with the same superscripts do not differ significantly (p>0.05).

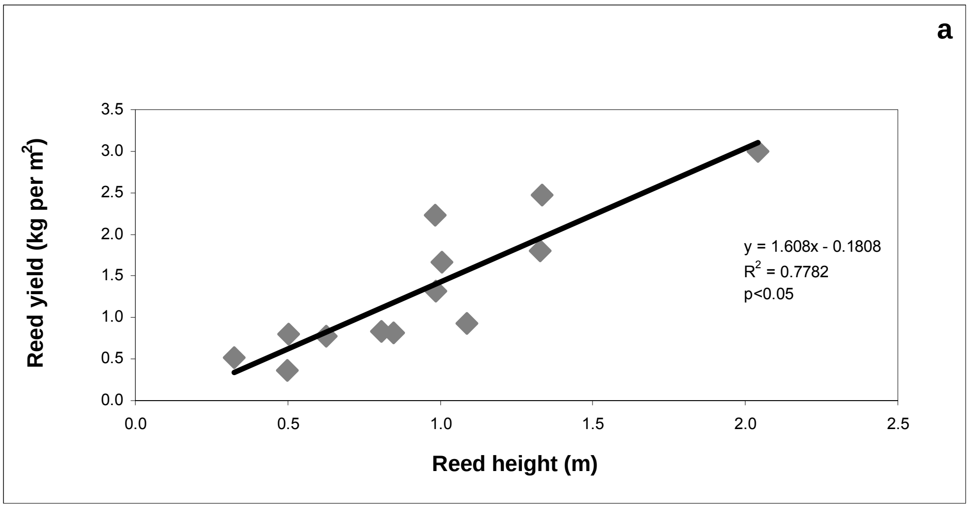
The similarity in the mean diameter of reeds at the various sites can be partly ascribed to the vegetative growth pattern of *Phragmites australis*. Shoots emerging from the rhizome have a basal stem diameter that remains stable throughout the year. An emergent shoot can therefore have a large basal diameter at the beginning of the growing season and not necessarily have grown into a tall reed yet. Nevertheless, Mook and Van der Toorn (1982) found a positive linear correlation between basal diameter and eventual reed height, and reeds with a large basal diameter tend to be proportionately taller than reeds with a small basal diameter. The results of the present study do not reflect this correlation as all the shoots were harvested for the purpose of the study and not only the mature reeds.

Reed density

None of the linear regressions revealed a significant relationship between reed density and the environmental variables that were recorded (Table 2). Reed density did not show a distinct gradient with distance away from the boundary fence at KwaMsomi Gate to the northern sections of the utilisation area (Figure 3c). Site 7 had the lowest mean reed density (mean ± se: 50.00 ± 5.16 reeds per m^2), while site 9 had the highest one (mean ± se: 134.33 ± 11.43 reeds per m^2). Site 13 differs significantly from sites 7 ($p<0.01$), 9 ($p<0.01$) and 11 ($p<0.02$) in terms of reed density, but it did not differ significantly ($p>0.05$) from any of the other sites in this parameter. No predictable effect of reed utilisation on the mean reed density of the reed beds in the Muzi Swamp could be established (Table 2).

Reed yield

As was the case for reed diameter, reed yield per m^2 was not significantly correlated with the distance from KwaMsomi Gate, degree of trampling or water depth (Table 2). Reed yield was, however, significantly positively correlated with the time since the last harvest by the reed cutters (Table 2). Site 7 had the lowest mean reed yield (mean ± se: 0.37 ± 0.15 kg) while site 13 had the highest one (mean ± se: 3.00 ± 0.04 kg) (Figure 3d). There is a significant difference ($p<0.05$) in mean reed yield between site 13 and all of the other sites except for site 6 ($p>0.20$). There is a direct linear relationship between mean reed height and reed yield (Figure 6a).



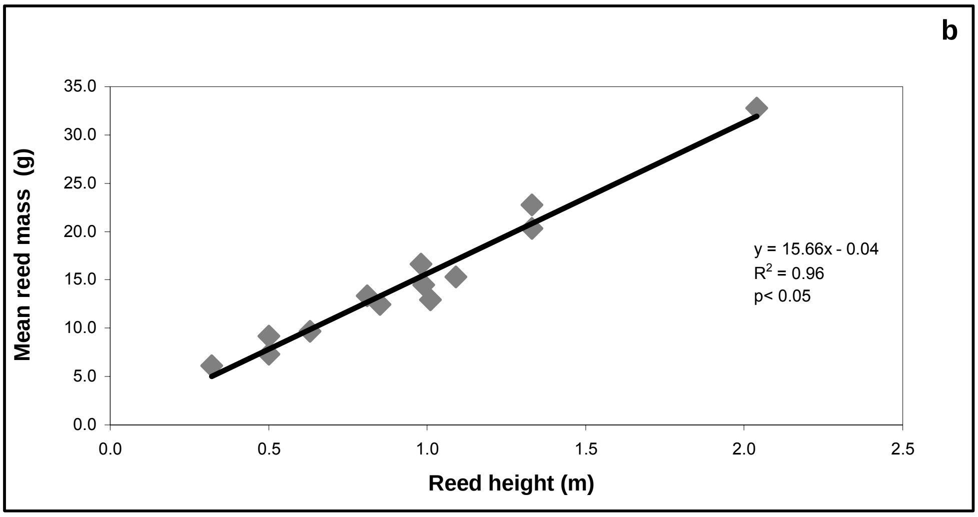


Figure 6: Positive linear relationship between reed height and (a) reed yield and (b) mean reed mass, determined along a transect from 300 m north of the fence at KwaMsomi Gate to approximately 1 800 m north of the KwaMsomi Gate.

Mean reed mass

No significant relationship between mean mass per reed and distance from KwaMsomi Gate or degree of trampling could be demonstrated (Table 2). However, mean mass per reed was strongly positively correlated with the time since the last utilisation and weakly positively with water depth (Table 2). Site 3 had the lowest mean reed mass (mean ± se: 5.77 ± 0.65 g), while site 13 had the highest one (mean ± se: 33.44 ± 2.27 g) (Figure 3e). The mean reed mass in site 13 was significantly higher only from that of sites 3 ($p<0.01$), 4 ($p<0.02$) and 7 ($p<0.01$). Mean reed mass is linearly proportional to reed height (Figure 6b), and differences in the mean reed mass are consistent with the differences in mean reed height for the same sites.

CONCLUSIONS AND MANAGEMENT RECOMMENDATIONS

At the current harvesting intensity the structure and size of the reeds fluctuate within the utilisable area in the Muzi Swamp. These fluctuations produce some clear and significant changes in reed quality, but there is no observed gradient in reduced utilisation pressure associated with the distance away from the boundary fence at KwaMsomi Gate in a northwards direction. The lack of such a gradient indicates that the more accessible reeds close to KwaMsomi gate are not under a higher utilisation pressure than those further away. Reed harvesting within the Muzi Swamp is not concentrated entirely to the southern sections of the Muzi Swamp near the KwaMsomi gate, as was expected, due to the limitations placed on the reed cutters' movements. The Sibonisweni reed cutters appear to be harvesting the reeds systematically by selecting areas within the reed bed where reeds of a desirable quality are found. It does also appear that the reed cutters allow a regeneration period before returning to a previously harvested area. However, reed size and structure are not reaching their full potential in the utilisable areas. Reeds outside the harvesting area display an improved quality as is evident from the data obtained in site 13, which is representative of areas where utilisation does not occur.

Areas that were harvested 10 months before the experimental trial showed significantly taller and thicker reeds with a higher reed yield when compared to reed beds outside the utilisation area. The same did not show significant differences in reed density and mean reed mass when compared with reed beds outside the allotted harvesting area. Sites that had been utilised 6 months before the start of the experimental harvesting trial, showed a significantly decreased frequency of reeds in the height class >2.0 – 2.5 m when compared with that of the unutilised site 13. The frequency of reeds occurring in the >2.5 m height class was significantly higher in site 13 than in any of the sites. The results of the frequency of reeds in the various height classes are not reflected in the frequency of occurrence of the reed diameter classes.

The basal diameter of a new reed shoot can be as thick as that of the basal diameter of a fully-grown reed. All reeds were harvested in the quadrates, irrespective of their maturity. This is reflected in the significantly similar diameter frequencies of the sites found in the individual diameter classes. The mean reed diameter at the unutilised site 13 is, however, significantly different from that of all the sites. This might indicate a larger rootstock, and thus improved shoot production, due to greater amounts of nutrient reserves accumulated over time. This is only possible in a reed bed that is allowed adequate recovery time before being re-harvested.

The production potential of the reeds over the entire harvesting area appears to be uniform, but it does not reach the production potential of the areas outside the harvesting area. Reed quality in the harvesting area consistently differs from that of the reed beds outside the harvesting area.

Reed harvesters do appear to be allowing for the regeneration of reeds after harvesting, but the current period of rest between the harvests is not long enough. This can be attributed to the small area within the Muzi Swamp in which the reed cutters are allowed to harvest at present. By increasing the size of the current harvesting area while maintaining similar quotas will allow for the implementation of a rotational resting system. Such a system will allow for a longer recovery period between successive harvests. The extension of the recovery period will result in a healthier rootstock in the long term, and should produce reeds that are comparable in quality to those found outside the utilisation areas.

The expansion of the harvesting area by 30%, or 540 m in a northerly direction, and division of the entire area into three equal sectors for a tri-annual harvest is suggested to allow sufficient time for the recovery of the reed beds to their full potential. Harvesting of these three sectors should only occur in the winter, once the growing season and the nutrient transfer to the rootstock has been completed. The first year's harvest should take place for the larger part in the previously unharvested area, between 1 600 m and 2 400 m north of the fence at KwaMsomi Gate. The second year's harvest should occur in the sector between 800 m and 1 600 m north of the fence at KwaMsomi Gate. The third year's harvest should occur in the sector between the fence to 800 m north of the fence at KwaMsomi Gate. Easily distinguishable posts or markers dividing these sectors should be put in place to avoid any confusion as to the location of the areas. Harvesting quotas should be maintained at their current level, with the focus being to harvest the yearly quota within the winter months, and not to spread the harvest over the entire year as was previously done. Yearly monitoring of the size, number and structure (basal diameter, height and reed density) of the reed bundles being harvested is essential. Non-destructive monitoring of the reed bed structure in the sectors to be harvested in the following years should also be implemented. As an alternative to overutilisation, other sources of building material may also have to be developed. Rehabilitating the degraded reed beds outside Tembe Elephant Park, and developing these for sustainable commercial utilisation will also reduce the harvesting pressure on the reed beds occurring within the park.

The results have shown that the hypothesis put forward at the beginning of the study is incorrect. Reed quality in the Muzi Swamp shows no degradation gradient in a south to north direction in the harvesting area north of KwaMsomi Gate. The study has proved, however, that there is a general reduction in reed quality in the harvested areas.

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REFERENCES

Begg GW. 1988. The Wetlands of Natal. Natal Town and Regional Planning Commission, Pietermaritzburg

Browning TC. 2000. Preliminary study of the socio-economic value of *Phragmites* reeds to the people neighbouring Tembe Elephant Park, KwaZulu-Natal. BA (Hons) APL 770 Project Report. University of Pretoria: Pretoria.

Čižková H, Istvánovics V, Bauer V, Balázs L. 2001. Low levels of reserve carbohydrates in reed (*Phragmites australis*) stands of Kis-Balaton, Hungary. *Aquatic Botany* **69**: 209-216.

Cox CB, Moore PD. 1994. *Biogeography: an ecological and evolutionary approach.* 5thedition. Blackwell Scientific Publishing: Oxford.

Cunningham AB. 1985. The resource value of indigenous plants to rural people in a low agricultural potential area. PhD (Botany) thesis, University of Cape Town: Cape Town.

Granéli W. 1989. Influence of standing litter on shoot production in reed, *Phragmites australis* (Cav.) Trin. ex Steudel. *Aquatic Botany* **35**: 99-109.

Grundling P-L. 1996. The implication of C^{14} and pollen derived peat ages on the characterisation of peat lands of the Zululand-Mozambique Coastal Plain, South Africa. Report no. 1996-0119. Council for Geoscience Geological Survey: Pretoria.

Grundling P-L. 1999. Some characteristics of the Muzi Peatland, in the Tembe Elephant Park, northern KwaZulu-Natal, South Africa. Report no. 1999-0066. Council for Geoscience Geological Survey: Pretoria.

Kyle S. 2000. A summary and some comments on resource utilisation in the Tembe/Ndumo Game Reserve Complex during 2000. Unpublished report. Ezemvelo KwaZulu-Natal Wildlife: Pietermaritzburg.

KwaZulu-Natal Nature Conservation Service Protected Area Management Plan. 1997. Part B: General description of the Tembe Ndumo Complex and key references. Unpublished Report. KwaZulu-Natal Nature Conservation Services: Pietermaritzburg.

Matthews WS, Van Wyk AE, Van Rooyen N, Botha GA. 2001. Vegetation of the Tembe Elephant Park, Maputaland, South Africa. *South African Journal of Botany* **67**: 573-594.

McKean SG. 2001. Productivity and sustainable use of *Phragmites* in the Fuyeni reed bed - Hluluwe-Umfolozi Park – Management guidelines for harvest. *South African Journal of Botany* **67**: 274-280.

Mook JH, Van Der Toorn J. 1982. The influence of environmental factors and management on stands of *Phragmites australis* **II**. Effects on yield and its relationship with shoot density. *Journal of Applied Ecology* **19**: 501-517.

Ostendorp W. 1989. 'Die-back' of reeds in Europe - A critical review of literature. *Aquatic Botany* **35**: 5-26.

StatSoft, Inc. 2300 East 14th Street, Tulsa, OK 74104.

Tosh C. 2000. The effect of human harvesting on the height and diameter of *Phragmites australis* in Tembe Elephant Park. Botany project, University of Pretoria: Pretoria.

Van Der Toorn J, Mook JH. 1982. The influence of environmental factors and management on stands of *Phragmites australis* **I**. Effects of burning, frost and insect damage on shoot density and shoot size. *Journal of Applied Ecology* **19**: 477-499.

The response of *Phragmites australis* to harvesting pressure in the Muzi Swamp of the Tembe Elephant Park, South Africa

J.A. Tarr[1], M.W. van Rooyen[2] and J. du P. Bothma[1]

[1] Centre for Wildlife Management, University of Pretoria, Pretoria, South Africa, 0002

[2] Department of Botany, University of Pretoria, Pretoria, South Africa, 0002

Short title: Response of *Phragmites australis* to harvesting pressure in the Muzi Swamp

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[1] Correspondence to: J. A. Tarr, Centre for Wildlife Management, University of Pretoria, Pretoria, South Africa, 0002.
E-mail: s9611163@tuks.co.za
Tel: +27 12 420-2338
Fax: +27 12 420-6096

ABSTRACT

Phragmites australis (Cav.) Trin. ex Steud. has been harvested in the Muzi Swamp in Maputaland, South Africa for generations. Over the last 10 years, however, a flourishing trade in this reed has developed. Concern has now been expressed that at the current levels of utilisation the ecological integrity of the Muzi Swamp is being compromised, and that the current harvesting rates are not sustainable in the long term. The hypothesis was put forward that a degradation gradient exists with the most severe degradation occurring the closest to where community members enter the park, and the least degradation the furthest from this point. The results of this study, however, show no distinct degradation gradient. Yet the overall condition of the reeds in the harvesting area is poorer than in the non-utilised area. Expansion of the current harvesting area, coupled with adaptive harvesting systems and yearly monitoring will improve the quality of the reeds within the harvesting area without affecting the harvesting quotas.

KEY WORDS: Conservation, degradation gradient, Muzi Swamp, *Phragmites australis*, resource utilisation, sustainable utilisation

INTRODUCTION

Natural resource utilisation within South Africa's protected areas has become a sensitive issue. Increasing demand by communal rural communities for access to the renewable natural resources in protected areas has come about through a total degradation of these resources outside the protected areas, and an increasing demand for a specific resource within such an area. The occurrence of these natural resources within protected areas is often a result of total protection, or of the correct and prudent management of the resources.

When the Tembe Elephant Park was proclaimed in 1983, it was agreed that controlled harvesting of the natural resources within the park by the neighbouring communal rural communities would be allowed. The common reed (*Phragmites australis* (Cav.) Trin. ex Steud.) is currently being harvested in the Muzi Swamp within the Tembe Elephant Park under this agreement, because it is no longer readily available outside the park.

The harvested reeds are used in hut-wall construction, craftwork, and for thatching material (Cunningham, 1985; Begg, 1988; Browning, 2000; Tosh, 2000). The reed beds generate a substantial income for the neighbouring Sibonisweni community members, because most of the harvested reeds are sold elsewhere for use as building material. These reeds are often the only source of income for many of the community members, a development that was not originally planned for. The reed bundles that are not sold, are used by the Sibonisweni community themselves as building material, and in socio-cultural activities such as burial ceremonies (Browning, 2000).

Ezemvelo KwaZulu-Natal Wildlife is responsible for managing the Tembe Elephant Park and has raised the concern that the *Phragmites australis* dominated Muzi Swamp is being overutilised because the reeds are now also being harvested for commercial sale, and not just for subsistence use as was originally intended (Kyle, 2001 *pers.comm.*[1]). The Sibonisweni community members are in turn concerned that the quality of reeds that are being harvested within the area allocated to them, is deteriorating. Since the proclamation of Tembe Elephant Park in 1983 up to and including 1995, no harvesting quotas existed. In 1996, a harvesting quota was implemented to reduce the volume of reeds harvested from approximately 16 000 bundles per year, to the current quota of some 8 000 bundles per year (Kyle, 2000).

The most heavily utilised reed beds within the Muzi Swamp are those harvested by the Sibonisweni community. The proximity of this community to the tar road has lead to a flourishing trade in this reed resource. Members of the Sibonisweni Reed Cutting Association enter the park at KwaMsomi Gate in the south, and harvest the reeds northwards from there for approximately 1.7 km. Reeds of the desired quality are selected and are harvested by using a machete. Each harvester is allowed to cut a single bundle of reeds per day, sometimes weighing up to 64 kg, which must be carried out of the park. The reed bundles are then sorted into smaller, more manageable bundles at KwaMsomi Gate, before being taken to the tar road for sale.

Many factors have been regarded as being detrimental to reed growth, but it has been difficult to quantify this negative effect (Granéli, 1989; Ostendorp, 1989). One of the

[1] Mr. S. Kyle, Ezemvelo KwaZulu-Natal Wildlife, Resource Ecologist Maputaland. P. O. Box 43, KwaNgwanase, South Africa 3973.

most obvious factors affecting reed growth is that of harvesting. Both the intensity and temporal range of harvesting have an effect on the degree of regeneration and rehabilitation of the reeds (McKean, 2001). Persistent nutrient loss from the above-ground parts because of harvesting during the growing season, causes a decline in the amount of nutrients returned to the rhizomes (Mook and Van der Toorn, 1982). Removal of aerial parts during the growing season prevents full recovery and regrowth in the spring (Čižková *et al*., 2001).

The hypothesis that is tested here is that the utilisation pressure on the reeds of the Muzi Swamp in the Tembe Elephant Park will show a gradient of use, starting with the highest utilisation pressure close to the entrance gate, followed by a gradual reduction in utilisation pressure the further away from that point. If such a utilisation gradient were present, it should be reflected in changes in the measurable properties of reed quality, such as reed height, diameter, density and biomass per unit surface area. These aspects are examined here to test the above hypothesis.

STUDY AREA

The study area is situated in the eastern portion of Tembe Elephant Park in KwaZulu-Natal, Maputaland, South Africa (Figure 1). It forms a polygon between the following coordinates: 26º 53’ 08’’ S and 32º 34’ 58’’ E, 26º 53’ 04’’ S and 32º 34’ 59’’ E, 27º 01’ 25’’ S and 32º 29’ 54’’ E and 27º 01’ 24’’ S and 32º 29’ 44’’ E. The Muzi Swamp extends northwards from KwaMsomi Gate in the south to Muzi Gate in the north, from where it continues into Mozambique (Figure 1).

The section of the Muzi Swamp that lies within Tembe Elephant Park is approximately 560 ha in size. It lies on Holocene peat deposits that are controlled by the topography of the underlying Pleistocene KwaBonambi coastal dunes (Grundling, 1996). The Muzi Swamp is an elongated interdune valley that is orientated parallel to the present coastline. This interdune peatland and isolated wetland are fed by groundwater from perched aquifers within the sand dunes (Grundling, 1999). The entire Muzi Swamp is dominated by *Phragmites australis* that is sparsely interspersed with open water, higher lying islands and hygrophilous grasses (Matthews *et al*., 2001).

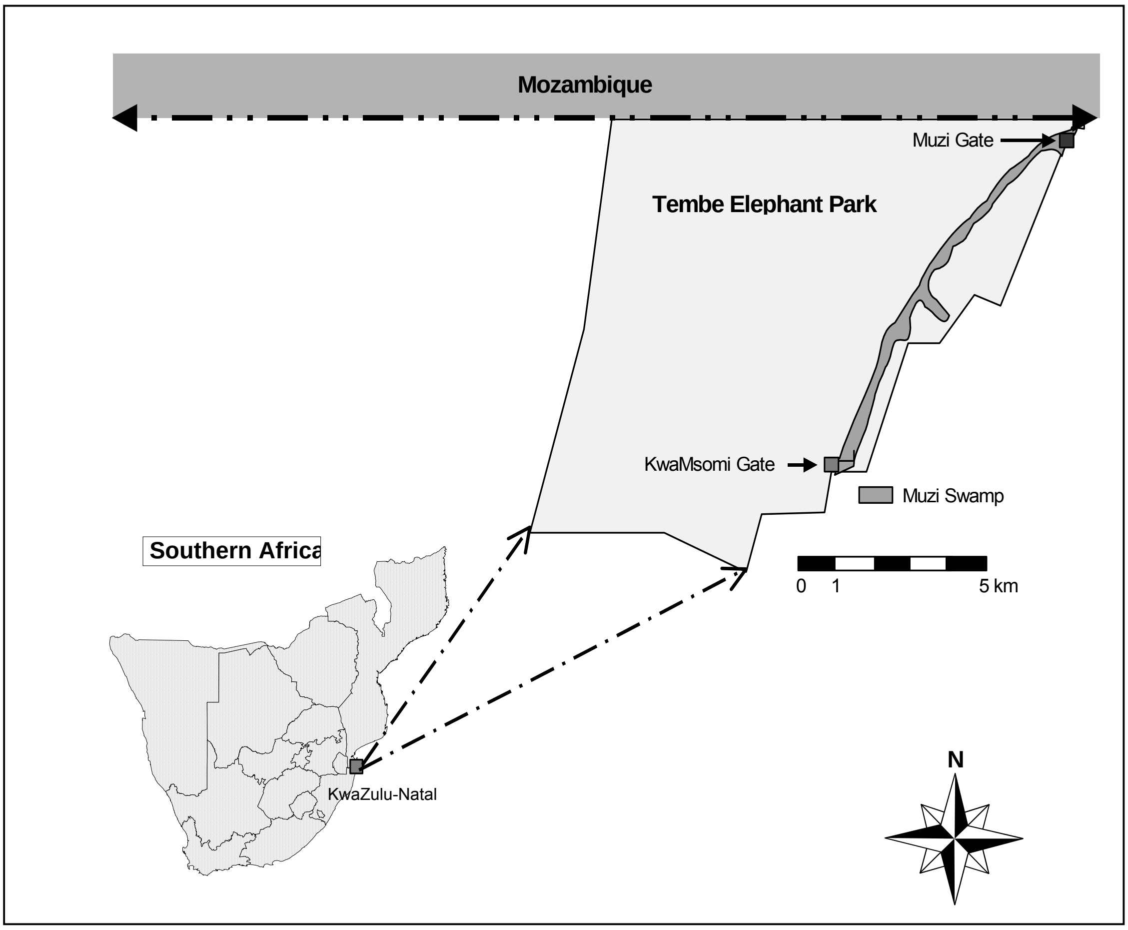


Figure 1: The location of the Muzi Swamp in the Tembe Elephant Park, South Africa.

The mean annual rainfall is 721.5 mm. The minimum recorded annual rainfall is 245.0 mm, while the recorded maximum is 2 105.0 mm. The temperature in Tembe Elephant Park ranges from an extreme minimum of 4ºC to an extreme maximum of 45ºC (Figure 2). The proximity of Tembe Elephant Park to the coast and its low-lying topography result in a high relative humidity of the air (KwaZulu-Natal Nature Conservation Service, 1997).

METHODS

The reed beds in the southern section of the Muzi Swamp were sampled from south to north. Experimental sites were set out approximately every 100 m, starting 300 m from the fence near KwaMsomi Gate (Table 1). Thirteen sites were selected and were referenced by using a Global Positioning System (GPS). Site 13 was considered to be representative of natural areas within the Muzi Swamp where no harvesting is allowed. To ensure uniform sampling of the *Phragmites australis* community, experimental sites were set out approximately 30 m away from the ecotone of the *Phragmites australis* community and the hygrophilous grassland community (Matthews *et al*., 2001).

At each experimental site six replicate quadrates were harvested by using a 1 m^2 frame. All the reeds within the square frame were cut with secateurs at water level, or at ground level in the absence of water. The stem diameter (mm) and reed height (m) were measured for each cut reed within the quadrate. The basal stem diameter was measured by using callipers. The reed height was measured with a tape measure from the stem base to the outstretched apical-leaf blade. To correct for water depth, the water level at each site was added to the mean reed height to obtain total reed height. The number of reeds harvested per sample quadrate was counted to determine the reed density per m^2. The total mass of all the reeds harvested within each sample quadrate was measured in kilogrammes by using a spring balance.

The environmental variables recorded at each site were (Table 1): the distance from the gate; the time since the last harvest by the reed cutters; the degree of trampling; and the water depth. The time since the last harvest by the reed cutters was estimated in two-monthly intervals, with the most recent harvests occurring <2 months before the experimental harvesting trial, and the least recent harvest occurring >10 months before the experimental

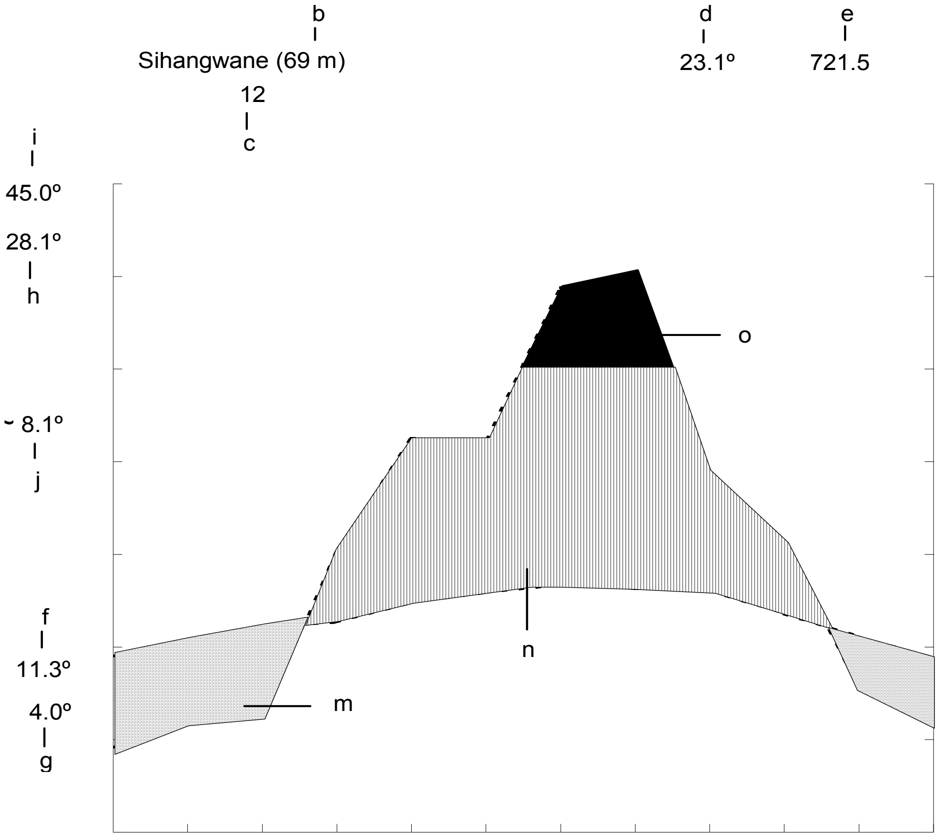


Figure 2: Climatogram of Sihangwane Weather Station, Tembe Elephant Park, following Walter (Cox and Moore, 1994). b = height above sea-level in m; c = duration of observations in years; d = mean annual temperature in ºC; e = mean annual precipitation in mm; f = mean daily minimum of the coldest month; g = lowest temperature recorded; h = mean daily maximum of the warmest month; i = highest temperature recorded; j = mean daily temperature variation; m = relative period of drought; n = relative humid season; o = mean monthly rainfall > 100 mm.

Table 1. *Environmental factors at sites in the reed bed in the Muzi Swamp of Tembe Elephant Park, South Africa. Distance from fence indicates distance away from the boundary fence at the KwaMsomi Gate, the degree of trampling by humans and animals is indicated on a 5-point sclae, time since last utilisation in months, and water depth in metres.*

Plot	Distance from fence (m)	Trampling	Utilisation	Water depth (m)
1	300	3	> 6-8	0.00
2	400	3	> 8-10	0.00
3	500	4	< 2	0.00
4	600	3	> 2-4	0.02
5	700	3	> 6-8	0.31
6	800	2	> 10	0.36
7	900	3	> 2-4	0.21
8	1 000	3	> 4-6	0.22
9	1 100	2	> 8-10	0.10
10	1 500	2	> 10	0.18
11	1 600	1	> 8-10	0.16
12	1 700	2	> 6-8	0.05
13	1 800	1	-	0.37

Trampling: high = 5, low = 1

harvesting trial. The degree of trampling at the sites was recorded on a scale of 0 to 5, with 0 being the lowest degree of trampling and 5 being the highest degree of trampling. The creation of channels and paths most often used by reed cutters, the elephant *Loxodonta africana*, buffalo *Syncerus caffer* and black rhinoceros *Diceros bicornis* had longer lasting and more visible impacts, compared with the more subtle degrees of trampling by smaller animals such as the warthog *Phacochoerus africana* and reedbuck *Redunca arundinum*. The water level was measured by using a metal dropper attached to a thin aluminium plate to prevent the penetration of the rod into the peat layer.

The mean height (m), diameter (mm), density per m^2, yield (kg per m^2) and mean mass per reed (g) were calculated for each sample quadrate. These values were used as replicates to calculate the mean values for each site. The site means were used in linear regression models to test for correlations between reed characteristics and environmental variables. An Analysis of Variance (ANOVA), and *post hoc* Bonferroni tests of the Statistica 6 computer package (StatSoft Inc., Tulsa, Oklahoma, U.S.A) were used to determine statistically significant differences between the reed characteristics at the various sites. The frequency distribution of reeds encountered in various height and diameter classes was plotted against the distance away from the starting point.

RESULTS AND DISCUSSION

Reed height

Reed height was not significantly correlated with the gradient of increasing distance away from the boundary fence at KwaMsomi Gate towards the northern parts of the utilisation area or with trampling (Table 2). Reed height was, however, strongly positively correlated with the time since the last harvest by the reed cutters and weakly positively correlated with water depth (Table 2). The results of the *post hoc* test are indicated in Figure 3a. Site 3 that had been harvested by the reed cutters less than 2 months before the experimental trial, had the shortest reeds (mean ± se: 0.32 ± 0.05 m), while site 13 had the tallest reeds (mean ± se: 2.04 ± 0.10 m). There was a significant difference in reed height ($p<0.01$) between site 13 and the rest of the sites. The disparity between site 13 and the rest of the sites can be attributed to its location in the non-utilised area where reeds have never been harvested, implying that

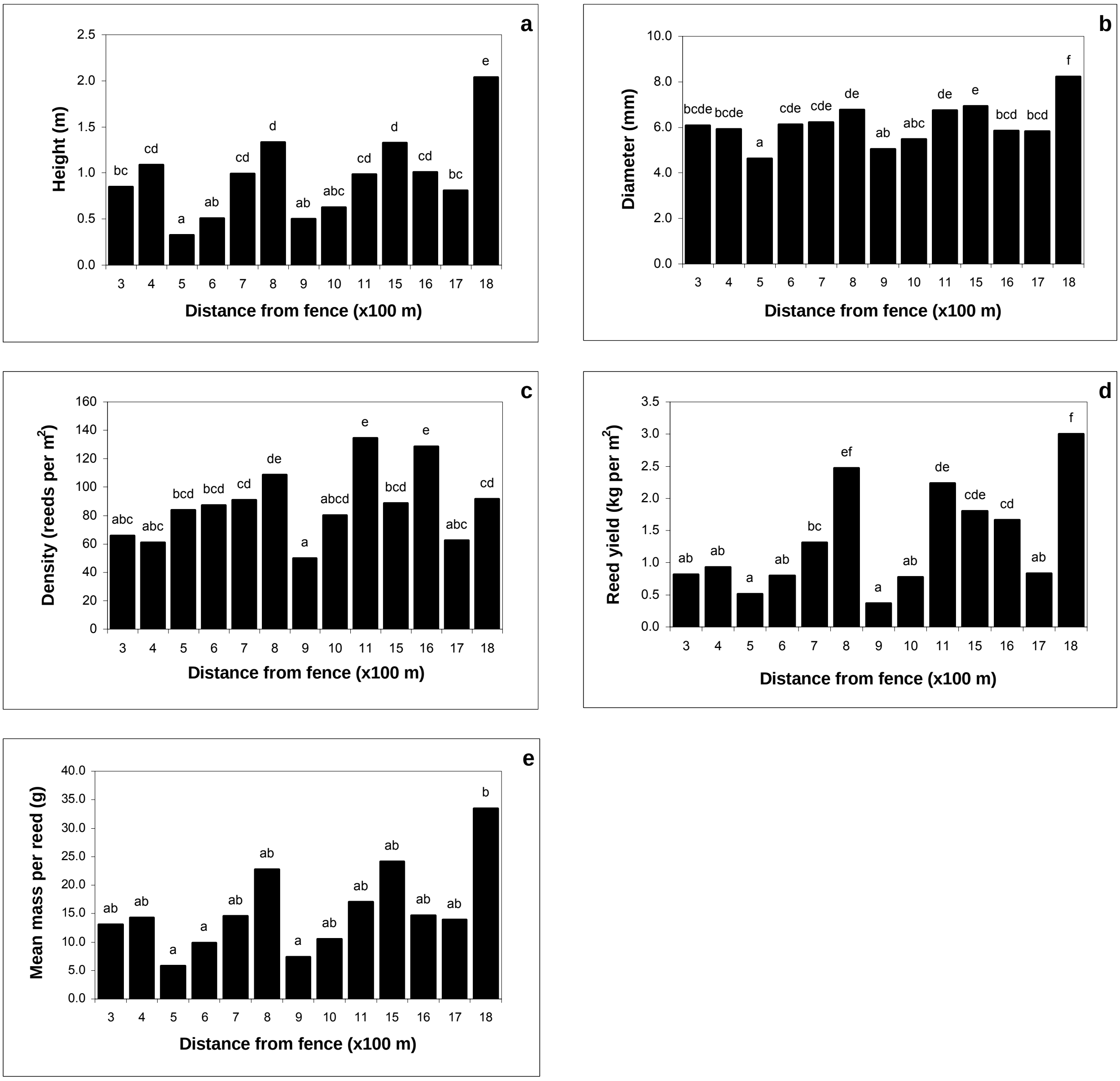


Figure 3: Reed characteristics at sites along a transect from the southern border of the Tembe Elephant Park from site 1 northwards to site 13. (a) Mean reed height; (b) mean reed diameter; (c) mean reed density; (d) mean reed biomass; (e) mean mass per reed. Bars with the same superscripts do not differ significantly (p>0.05).

Table 2. *Simple linear regression between various measures of reed quality and environmental variables. r^2 values and p-values are shown. An asterisk denotes a statistically significant relationship at α = 0.05.*

	Distance from fence		Degree of trampling		Time since last utilisation		Water depth	
	r^2	p	r^2	p	r^2	p	r^2	p
Reed height	0.269	0.069	0.020	0.640	0.885	0.000*	0.368	0.028*
Reed diameter	0.219	0.107	0.011	0.735	0.739	0.000*	0.274	0.066
Reed density	0.092	0.314	0.032	0.556	0.156	0.181	0.079	0.353
Reed yield	0.266	0.071	0.089	0.321	0.74	0.000*	0.405	0.079
Mean mass per reed	0.257	0.076	0.050	0.461	0.821	0.000*	0.379	0.025*
Degree of trampling	0.058	0.429	-	-	0.038	0.523	0.115	0.188
Time since last utilisation	0.266	0.071	0.038	0.523	-	-	0.254	0.079
Water depth	0.171	0.159	0.115	0.188	0.254	0.079	-	-

reed harvesting has a negative effect on reed height.

Sites 3, 4, and 7 that had been harvested by the reed cutters within 4 months before the experimental trial (Table 1) did not have a high percentage of tall reeds. These recently harvested sites had a significantly ($p<0.01$) higher frequency of short reeds in the >0.0–0.5 m height class, than sites 6 and 10 that had been harvested more than 10 months before the experimental trial (Figure 4a). New shoots sprouting from the cut stem of harvested reeds accounted for the high frequency of short reeds in the recently harvested sites. As the height classes increase, the frequency of occurrence of reeds in these classes in the recently harvested sites decreases. Site 13 had a significantly ($p<0.01$) higher frequency (mean ± se: 31.5 ± 5.0%) of reeds in the >2.5 m height class than any of the other sites (Figure 4f).

Reed diameter

Reed diameter was not significantly correlated with the distance gradient away from the boundary fence at KwaMsomi Gate, degree of trampling or water depth (Table 2). Reed diameter was, however, significantly positively correlated with the time since the last harvest by the reed cutters (Table 2). Site 3 had the smallest mean reed diameter (mean ± se: 4.64 ± 0.33 mm)(Figure 3b), while site 13 had the largest one (mean ± se: 8.22 ± 0.23 mm). Site 13 had significantly thicker reeds ($p<0.03$) than the utilised sites, implying that utilisation has had a negative influence on the mean reed diameter of the sites.

Site 13 is 1.8 km away from the boundary fence at KwaMsomi Gate and it has a significantly ($p<0.01$) higher frequency (mean ± se: 23.6 ± 2.4%) of reeds in the >10.0 mm diameter class compared with that of any of the sites that were utilised by the reed cutters less than 10 months before the harvesting trial (Figure 5f).

Phragmites australis is a rhizomatous, perennial plant, producing annual aerial shoots. The basal diameter of the emergent shoot is determined by the size of the bud on the rhizome. The rhizomatous growth habit of *Phragmites australis* also determines the reaction to damage caused by harvesting. Early damage to the emergent shoot's apical meristem results in the complete replacement of the shoot from subterranean buds. Damage to the apical meristem of the shoot late in the growing season leads to replacement by several thinner shoots from the above-ground nodes (Van der Toorn and Mook, 1982).

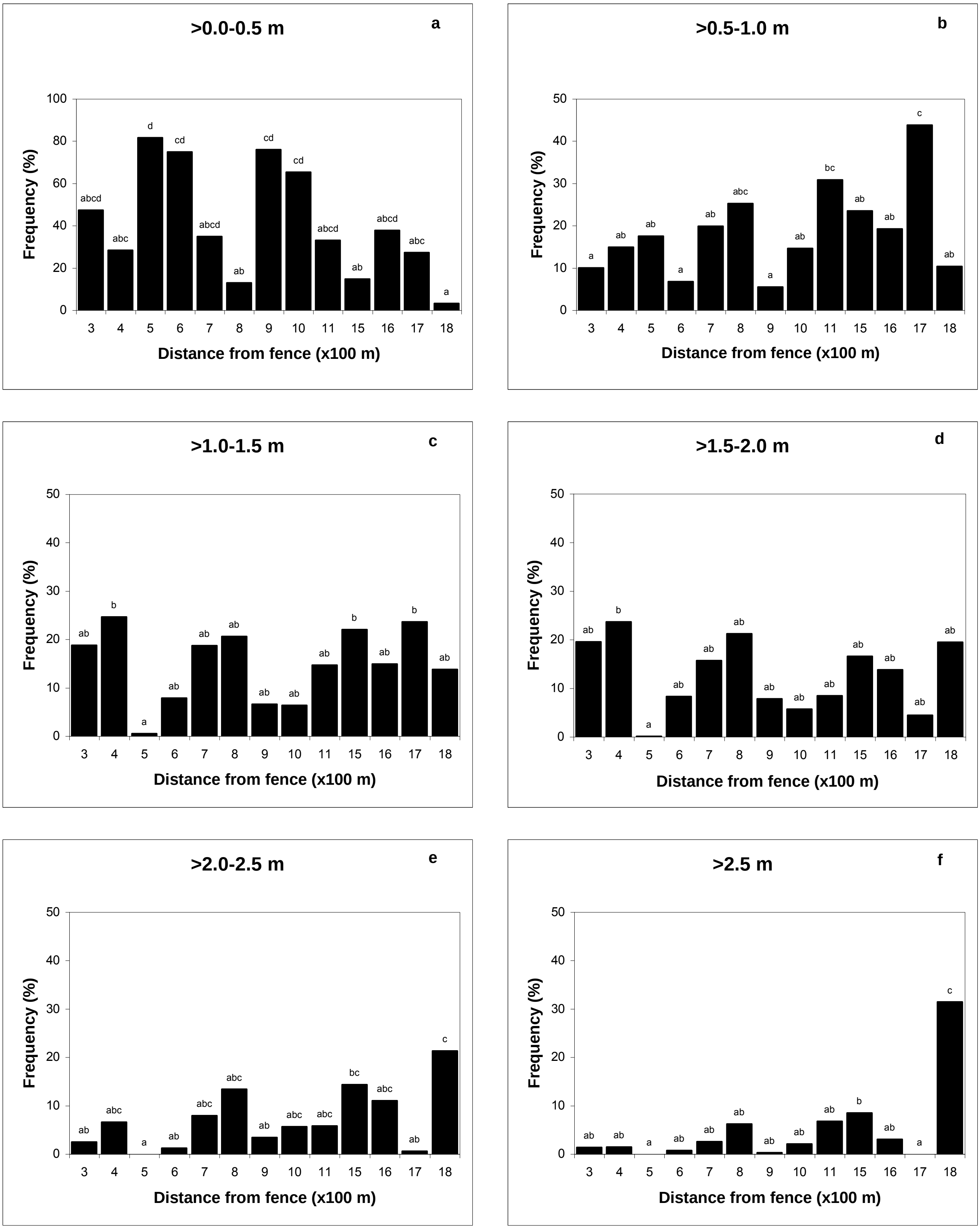


Figure 4: Frequency of height classes of reeds in sites along a transect from 300 m north of the fence at KwaMsomi Gate to 1 800 m north of the fence at KwaMsomi Gate. (a). >0.0-0.5 m height class; (b). > 0.5-1.0 m height class; (c). > 1.0-1.5 m height class; (d). > 1.5-2.0 m height class; (e). > 2.0-2.5 m height class; (f). >2.5 m height class. Bars with the same superscripts do not differ significantly (p>0.05).

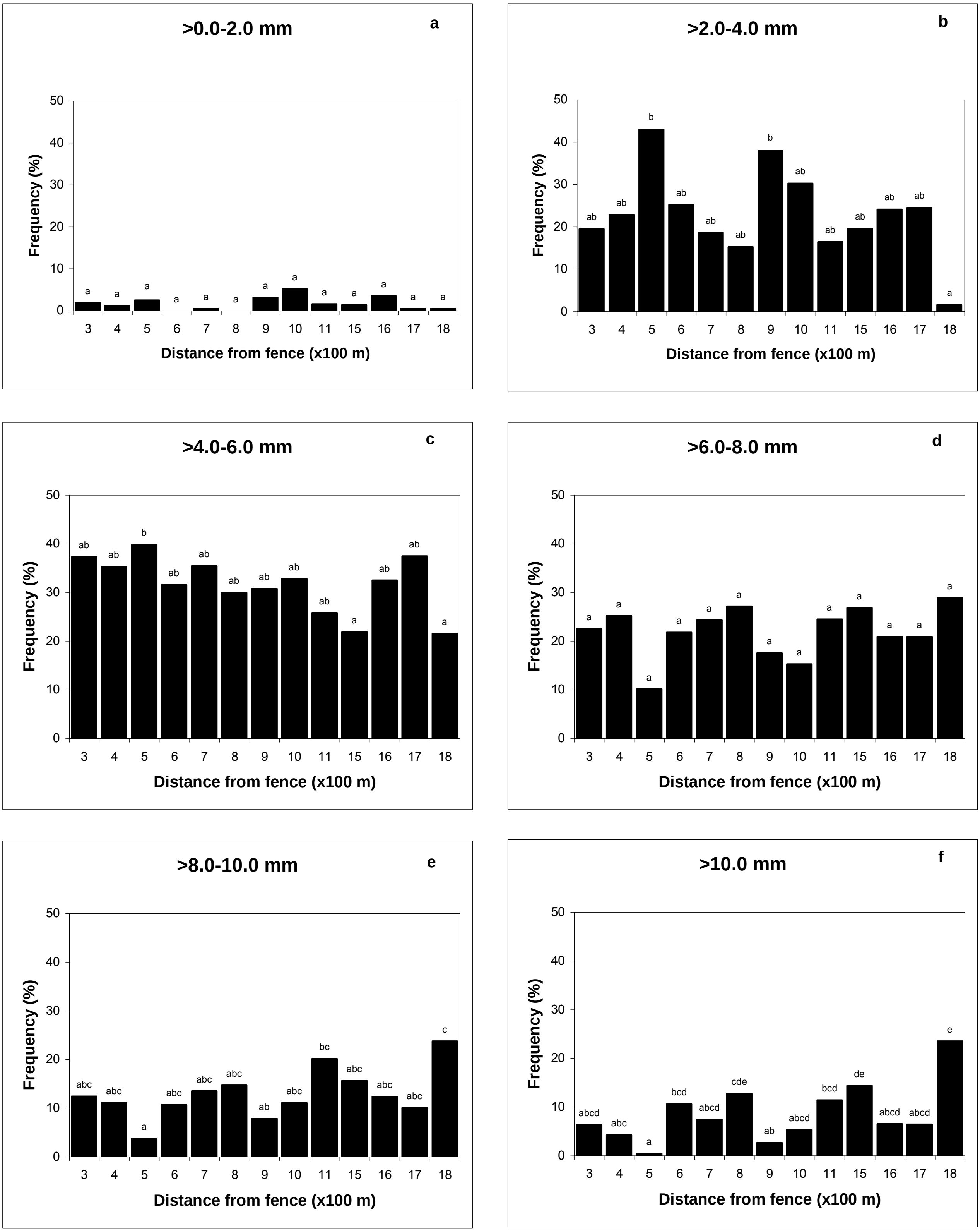


Figure 5: Frequency of diameter classes of reeds in sites along a transect from 300 m north of the fence at KwaMsomi Gate to 1 800 m north of the fence at KwaMsomi Gate. (a) >0.0-2.0 mm diameter class; (b) >2.0-4.0 mm diameter class; (c) >4.0-6.0 mm diameter class; (d) >6.0-8.0 mm diameter class; (e) >8.0-10.0 mm diameter class; (f) >10.0 mm diameter class. Bars with the same superscripts do not differ significantly (p>0.05).

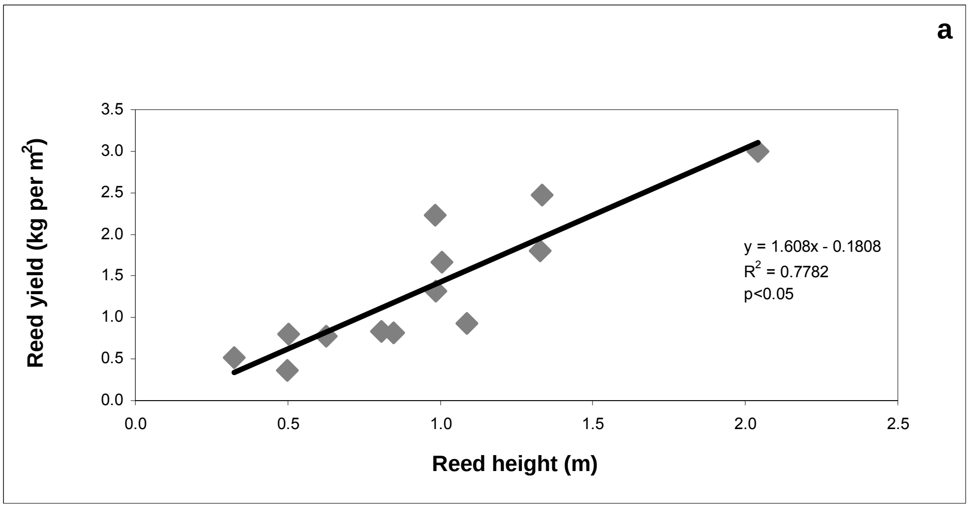
The similarity in the mean diameter of reeds at the various sites can be partly ascribed to the vegetative growth pattern of *Phragmites australis*. Shoots emerging from the rhizome have a basal stem diameter that remains stable throughout the year. An emergent shoot can therefore have a large basal diameter at the beginning of the growing season and not necessarily have grown into a tall reed yet. Nevertheless, Mook and Van der Toorn (1982) found a positive linear correlation between basal diameter and eventual reed height, and reeds with a large basal diameter tend to be proportionately taller than reeds with a small basal diameter. The results of the present study do not reflect this correlation as all the shoots were harvested for the purpose of the study and not only the mature reeds.

Reed density

None of the linear regressions revealed a significant relationship between reed density and the environmental variables that were recorded (Table 2). Reed density did not show a distinct gradient with distance away from the boundary fence at KwaMsomi Gate to the northern sections of the utilisation area (Figure 3c). Site 7 had the lowest mean reed density (mean ± se: 50.00 ± 5.16 reeds per m^2), while site 9 had the highest one (mean ± se: 134.33 ± 11.43 reeds per m^2). Site 13 differs significantly from sites 7 ($p<0.01$), 9 ($p<0.01$) and 11 ($p<0.02$) in terms of reed density, but it did not differ significantly ($p>0.05$) from any of the other sites in this parameter. No predictable effect of reed utilisation on the mean reed density of the reed beds in the Muzi Swamp could be established (Table 2).

Reed yield

As was the case for reed diameter, reed yield per m^2 was not significantly correlated with the distance from KwaMsomi Gate, degree of trampling or water depth (Table 2). Reed yield was, however, significantly positively correlated with the time since the last harvest by the reed cutters (Table 2). Site 7 had the lowest mean reed yield (mean ± se: 0.37 ± 0.15 kg) while site 13 had the highest one (mean ± se: 3.00 ± 0.04 kg) (Figure 3d). There is a significant difference ($p<0.05$) in mean reed yield between site 13 and all of the other sites except for site 6 ($p>0.20$). There is a direct linear relationship between mean reed height and reed yield (Figure 6a).



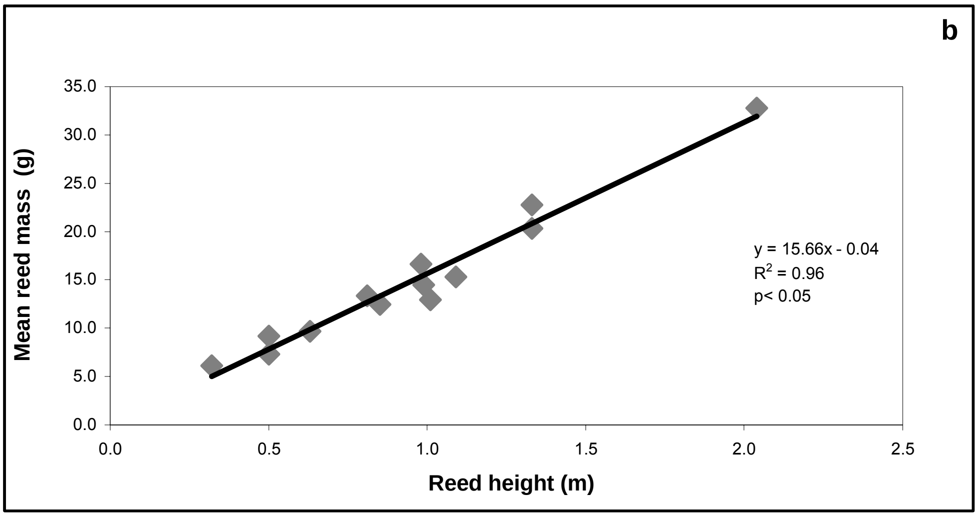


Figure 6: Positive linear relationship between reed height and (a) reed yield and (b) mean reed mass, determined along a transect from 300 m north of the fence at KwaMsomi Gate to approximately 1 800 m north of the KwaMsomi Gate.

Mean reed mass

No significant relationship between mean mass per reed and distance from KwaMsomi Gate or degree of trampling could be demonstrated (Table 2). However, mean mass per reed was strongly positively correlated with the time since the last utilisation and weakly positively with water depth (Table 2). Site 3 had the lowest mean reed mass (mean ± se: 5.77 ± 0.65 g), while site 13 had the highest one (mean ± se: 33.44 ± 2.27 g) (Figure 3e). The mean reed mass in site 13 was significantly higher only from that of sites 3 ($p<0.01$), 4 ($p<0.02$) and 7 ($p<0.01$). Mean reed mass is linearly proportional to reed height (Figure 6b), and differences in the mean reed mass are consistent with the differences in mean reed height for the same sites.

CONCLUSIONS AND MANAGEMENT RECOMMENDATIONS

At the current harvesting intensity the structure and size of the reeds fluctuate within the utilisable area in the Muzi Swamp. These fluctuations produce some clear and significant changes in reed quality, but there is no observed gradient in reduced utilisation pressure associated with the distance away from the boundary fence at KwaMsomi Gate in a northwards direction. The lack of such a gradient indicates that the more accessible reeds close to KwaMsomi gate are not under a higher utilisation pressure than those further away. Reed harvesting within the Muzi Swamp is not concentrated entirely to the southern sections of the Muzi Swamp near the KwaMsomi gate, as was expected, due to the limitations placed on the reed cutters' movements. The Sibonisweni reed cutters appear to be harvesting the reeds systematically by selecting areas within the reed bed where reeds of a desirable quality are found. It does also appear that the reed cutters allow a regeneration period before returning to a previously harvested area. However, reed size and structure are not reaching their full potential in the utilisable areas. Reeds outside the harvesting area display an improved quality as is evident from the data obtained in site 13, which is representative of areas where utilisation does not occur.

Areas that were harvested 10 months before the experimental trial showed significantly taller and thicker reeds with a higher reed yield when compared to reed beds outside the utilisation area. The same did not show significant differences in reed density and mean reed mass when compared with reed beds outside the allotted harvesting area. Sites that had been utilised 6 months before the start of the experimental harvesting trial, showed a significantly decreased frequency of reeds in the height class >2.0 – 2.5 m when compared with that of the unutilised site 13. The frequency of reeds occurring in the >2.5 m height class was significantly higher in site 13 than in any of the sites. The results of the frequency of reeds in the various height classes are not reflected in the frequency of occurrence of the reed diameter classes.

The basal diameter of a new reed shoot can be as thick as that of the basal diameter of a fully-grown reed. All reeds were harvested in the quadrates, irrespective of their maturity. This is reflected in the significantly similar diameter frequencies of the sites found in the individual diameter classes. The mean reed diameter at the unutilised site 13 is, however, significantly different from that of all the sites. This might indicate a larger rootstock, and thus improved shoot production, due to greater amounts of nutrient reserves accumulated over time. This is only possible in a reed bed that is allowed adequate recovery time before being re-harvested.

The production potential of the reeds over the entire harvesting area appears to be uniform, but it does not reach the production potential of the areas outside the harvesting area. Reed quality in the harvesting area consistently differs from that of the reed beds outside the harvesting area.

Reed harvesters do appear to be allowing for the regeneration of reeds after harvesting, but the current period of rest between the harvests is not long enough. This can be attributed to the small area within the Muzi Swamp in which the reed cutters are allowed to harvest at present. By increasing the size of the current harvesting area while maintaining similar quotas will allow for the implementation of a rotational resting system. Such a system will allow for a longer recovery period between successive harvests. The extension of the recovery period will result in a healthier rootstock in the long term, and should produce reeds that are comparable in quality to those found outside the utilisation areas.

The expansion of the harvesting area by 30%, or 540 m in a northerly direction, and division of the entire area into three equal sectors for a tri-annual harvest is suggested to allow sufficient time for the recovery of the reed beds to their full potential. Harvesting of these three sectors should only occur in the winter, once the growing season and the nutrient transfer to the rootstock has been completed. The first year's harvest should take place for the larger part in the previously unharvested area, between 1 600 m and 2 400 m north of the fence at KwaMsomi Gate. The second year's harvest should occur in the sector between 800 m and 1 600 m north of the fence at KwaMsomi Gate. The third year's harvest should occur in the sector between the fence to 800 m north of the fence at KwaMsomi Gate. Easily distinguishable posts or markers dividing these sectors should be put in place to avoid any confusion as to the location of the areas. Harvesting quotas should be maintained at their current level, with the focus being to harvest the yearly quota within the winter months, and not to spread the harvest over the entire year as was previously done. Yearly monitoring of the size, number and structure (basal diameter, height and reed density) of the reed bundles being harvested is essential. Non-destructive monitoring of the reed bed structure in the sectors to be harvested in the following years should also be implemented. As an alternative to overutilisation, other sources of building material may also have to be developed. Rehabilitating the degraded reed beds outside Tembe Elephant Park, and developing these for sustainable commercial utilisation will also reduce the harvesting pressure on the reed beds occurring within the park.

The results have shown that the hypothesis put forward at the beginning of the study is incorrect. Reed quality in the Muzi Swamp shows no degradation gradient in a south to north direction in the harvesting area north of KwaMsomi Gate. The study has proved, however, that there is a general reduction in reed quality in the harvested areas.

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REFERENCES

Begg GW. 1988. The Wetlands of Natal. Natal Town and Regional Planning Commission, Pietermaritzburg

Browning TC. 2000. Preliminary study of the socio-economic value of *Phragmites* reeds to the people neighbouring Tembe Elephant Park, KwaZulu-Natal. BA (Hons) APL 770 Project Report. University of Pretoria: Pretoria.

Čižková H, Istvánovics V, Bauer V, Balázs L. 2001. Low levels of reserve carbohydrates in reed (*Phragmites australis*) stands of Kis-Balaton, Hungary. *Aquatic Botany* **69**: 209-216.

Cox CB, Moore PD. 1994. *Biogeography: an ecological and evolutionary approach.* 5thedition. Blackwell Scientific Publishing: Oxford.

Cunningham AB. 1985. The resource value of indigenous plants to rural people in a low agricultural potential area. PhD (Botany) thesis, University of Cape Town: Cape Town.

Granéli W. 1989. Influence of standing litter on shoot production in reed, *Phragmites australis* (Cav.) Trin. ex Steudel. *Aquatic Botany* **35**: 99-109.

Grundling P-L. 1996. The implication of C^{14} and pollen derived peat ages on the characterisation of peat lands of the Zululand-Mozambique Coastal Plain, South Africa. Report no. 1996-0119. Council for Geoscience Geological Survey: Pretoria.

Grundling P-L. 1999. Some characteristics of the Muzi Peatland, in the Tembe Elephant Park, northern KwaZulu-Natal, South Africa. Report no. 1999-0066. Council for Geoscience Geological Survey: Pretoria.

Kyle S. 2000. A summary and some comments on resource utilisation in the Tembe/Ndumo Game Reserve Complex during 2000. Unpublished report. Ezemvelo KwaZulu-Natal Wildlife: Pietermaritzburg.

KwaZulu-Natal Nature Conservation Service Protected Area Management Plan. 1997. Part B: General description of the Tembe Ndumo Complex and key references. Unpublished Report. KwaZulu-Natal Nature Conservation Services: Pietermaritzburg.

Matthews WS, Van Wyk AE, Van Rooyen N, Botha GA. 2001. Vegetation of the Tembe Elephant Park, Maputaland, South Africa.*South African Journal of Botany* **67**: 573-594.

McKean SG. 2001. Productivity and sustainable use of *Phragmites* in the Fuyeni reed bed - Hluluwe-Umfolozi Park – Management guidelines for harvest. *South African Journal of Botany* **67**: 274-280.

Mook JH, Van Der Toorn J. 1982. The influence of environmental factors and management on stands of *Phragmites australis* **II**. Effects on yield and its relationship with shoot density. *Journal of Applied Ecology* **19**: 501-517.

Ostendorp W. 1989. 'Die-back' of reeds in Europe - A critical review of literature. *Aquatic Botany* **35**: 5-26.

StatSoft, Inc. 2300 East 14th Street, Tulsa, OK 74104.

Tosh C. 2000. The effect of human harvesting on the height and diameter of *Phragmites australis* in Tembe Elephant Park. Botany project, University of Pretoria: Pretoria.

Van Der Toorn J, Mook JH. 1982. The influence of environmental factors and management on stands of *Phragmites australis* **I**. Effects of burning, frost and insect damage on shoot density and shoot size. *Journal of Applied Ecology* **19**: 477-499.

THE DEVELOPMENT OF SECONDARY INDUSTRIES THROUGH THE SUSTAINABLE UTILISATION OF REEDS AND FOREST TIMBER IN THE TEMBE ELEPHANT PARK, MAPUTALAND, SOUTH AFRICA.

J. A. Tarr[1], J. Y. Gaugris[1], M. W. van Rooyen[2] and J. du P. Bothma[1]

[1] Centre for Wildlife Management, University of Pretoria, Pretoria, South Africa, 0002

[2] Department of Botany, University of Pretoria, Pretoria, South Africa, 0002

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[1] Correspondence to: Jason Tarr, Centre for Wildlife Management, University of Pretoria, Pretoria, South Africa, 0002.
E-mail: jason.tarr@tuks.co.za
Tel: +27 12 420-2338
Fax: +27 12 420-6096

SUMMARY

The harvesting of *Phragmites australis* reeds in the Tembe Elephant Park has to be managed pro-actively. Solutions to potential problems should be sought before they arise. This paper offers a potential solution to the problem of instating a winter-only reed harvest in the Muzi Swamp. The potential for manufacturing finished products such as prefabricated huts from sustainably harvested reeds and forest timber is examined. The manufacturing of finished products from the harvested material will add secondary value to the resource and also offer an alternative employment to harvesting reeds in the summer. The higher prices obtained for a processed article will also hopefully reduce the demand for the resource in its raw form, thereby increasing the perceived value of the resource and reducing wastage from raw materials that are not sold.

INTRODUCTION

Poor rural communities in South Africa are hugely dependent on natural resources for subsistence use. In the past, natural resources could sustain small communities with additional resources coming from the planting of crops for their families. Rural development in South Africa in areas such as Maputaland in northern KwaZulu-Natal has increased the number of people needing a source of income to survive. Rural community members are no longer satisfied with a traditional subsistence livelihood and are looking for ways to increase their family's income through the harvesting, manufacture, and the sale of products from the environment. The raw materials are collected in the field for the production of arts, crafts and curios for the tourist market. This craftwork, however, only supplies an income on an *ad hoc* basis and there are no guarantees as to the amount and regularity of the income earned. Tourists also only buy crafts that they consider to be "authentic" or truly Zulu (Van Wyk 2003). In a case like this the people with money, the tourists, hold a position of power over those that have none, the crafters. Tourists can therefore dictate to the crafters as to the price they would like to pay for the craftwork. The end result is that the crafters earn little income for an extremely labour-intensive production process (Van Wyk 2003). There are also no guarantees as to the sustainability of the natural resources being harvested. In many instances these craftworks are made of threatened hardwood species for which levels of sustainable utilisation have not yet been established.

The members of the Sibonisweni community, which neighbours the Tembe Elephant Park, harvest *Phragmites australis* reeds in the Muzi Swamp. Due to the seasonal nature of its growth *Phragmites australis* is a resource that can deliver high yields of raw material if managed appropriately and utilised in a sustainable manner. There is potential for the development of a lucrative market from the processing and manufacture of reed-related products. This paper attempts to highlight one of the possible means of making reeds more valuable as a resource, other than from their sale as raw material.

The reeds are harvested by hand and permits are issued to community members who belong to the Sibonisweni Reed Cutters Association. The current levels of utilisation in the Muzi Swamp are not threatening to decimate the reed beds. Evidence suggests, however, that the present harvesting regime has negatively affected the reed quality in the harvesting area of the Tembe Elephant Park. Harvesting at the incorrect time of year is depleting the below-ground resources stored in the rhizomes and the reeds are not allowed enough time to recover between the harvests (Tarr *et al.* 2004). A winter-only harvest of the reed beds would improve the condition of the reed beds because the mobilisation of nutrients, produced in the summer months, from the above-ground parts of the reed to the below-ground parts would be complete (Van der Toorn and Mook 1982). Harvesting cessation in the summer months will enhance the production of better quality reeds than what are currently being produced and harvested in the Muzi Swamp (Ostendorp 1989; Weisner *et al*. 1989; Tarr *et al*. 2004). The Tembe Elephant Park management have tried to encourage a winter harvest without success. Harvesters prefer a year round collection of reeds rather than condensing the harvest into the winter months when the aerial parts of the reeds are dormant. This is possibly due to the time that they would be idle in the summer months when not harvesting reeds, as it would seem to them that they are unemployed during this time. There are also social aspects to consider with regard to reed harvesting. While collecting reeds and other such resources people have a chance to interact and discuss important personal and community-related issues. This is especially important for rural African women who generally have no formal forum for discussion (Kloppers, pers comm.)[1]. This type of social interaction is an important part of African culture.

Another rural community with close ties to the Tembe Elephant Park is the Manqakulani community. They have established a community conservation area, known as the Tshanini Game Reserve, in an attempt to encourage economic development in the area through ecotourism. With the permission of the local authority, the timber in that area is utilised for the construction of houses. Gaugris (2004) established the sustainable levels of this community stewardship for a range of highly desirable hardwood species for the Tshanini Game Reserve and Manqakulani area. Because of the similarity between the vegetation of the Tshanini Game Reserve and the Tembe Elephant Park (Gaugris 2004), the assumption was made that many of the species in the Tembe Elephant Park can be harvested sustainably, the numbers of which were calculated similarly to that of the Tshanini Game Reserve (Gaugris 2004).

The methods used in this article are based on the findings of the sustainable utilisation potential of *Phragmites australis* and forest timber hardwood in two different studies by the first two authors. The aim of this paper was to investigate the initiation of a form of secondary industry in the communities surrounding the Tembe

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[1] Dr. Roelie Kloppers, TFCA Communications Co-ordinator, Ndumo-Tembe-Futi TFCA
E-mail: kloppers@mweb.co.za

Elephant Park. This type of industry could be practised at a time when it is suggested that reed harvesting should be halted so that the reed beds can be rested in the summer months. The unemployment and social interaction issues can also be addressed in this way. Making and selling prefabricated huts will generate income and bring community members together in the shared tasks performed whilst making the products. This elaborate form of utilisation of the sustainably collected natural resources from the area, and subsequent manufacture of finished products will add value to resources that are currently being used in their most raw form.

The making of reed and forest timber prefabricated panels for use in hut building was examined specifically. The cost of building a hut from western building materials is compared with the cost of building a hut made of ready-made panels manufactured from locally sourced materials and labour. Admittedly the calculations, measurements, building methods and quantities of the natural resources used to describe the building of the individual panels are based on the authors’ somewhat limited practical experience but feel that these estimates are an adequate starting point. Sufficient time spent researching and surveying within local communities, as well as interaction with local community members, alludes to an accurate account of the practicality of the concept. The suggestions and recommendations with regard to the prefabricated huts are based on personal observation and empirical evidence. While the authors have not actually built the suggested panels and huts they believe that the dimensions, quantities and practical application of the concept are sound because they are based on what actually happens in the community (Gaugris 2004).

STUDY AREA

The Sibonisweni community borders the Tembe Elephant Park to the southeast (Figure 1). Many of these community members have lived in the Tembe Elephant

Park before its proclamation as a wildlife reserve in 1983. Part of the relocation agreement was that members of the Sibonisweni community would still be allowed to harvest *Phragmites australis* reeds from the Muzi Swamp within the Tembe Elephant Park. Reed harvesting provides a substantial supplement to the household income in the area. The total value of reed bundles harvested in the Muzi Swamp in 2000 was approximately ZAR 80 000 (Browning 2000). Should all the bundles be sold this would amount to a substantial revenue augmentation in a region where the mean annual income per household is ZAR 6 000, most of which comprises state pensions (Els & Bothma 2000; Van Wyk 2003).

The Tshanini Game Reserve of the Manqakulani community is situated approximately 6 km due south of the Tembe Elephant Park, and the village where the people reside lies east of the reserve in an area bordering the Muzi Swamp. This southern part of the Muzi Swamp is not inside the Tembe Elephant Park and the resources found there are not afforded protection through controlled use. Consequently, the reeds in the Muzi Swamp outside the Tembe Elephant Park are few and of a poor quality, making them undesirable for harvesting. Much of the Muzi Swamp outside the conservation area has been converted to agriculture because of the relatively moist and fertile soils that the swamp conditions afford. These land-use trends are also reflected in the Sibonisweni community. The areas shaded in yellow (Figure 1) indicate where human settlements are expected to expand to within the next 50 years.

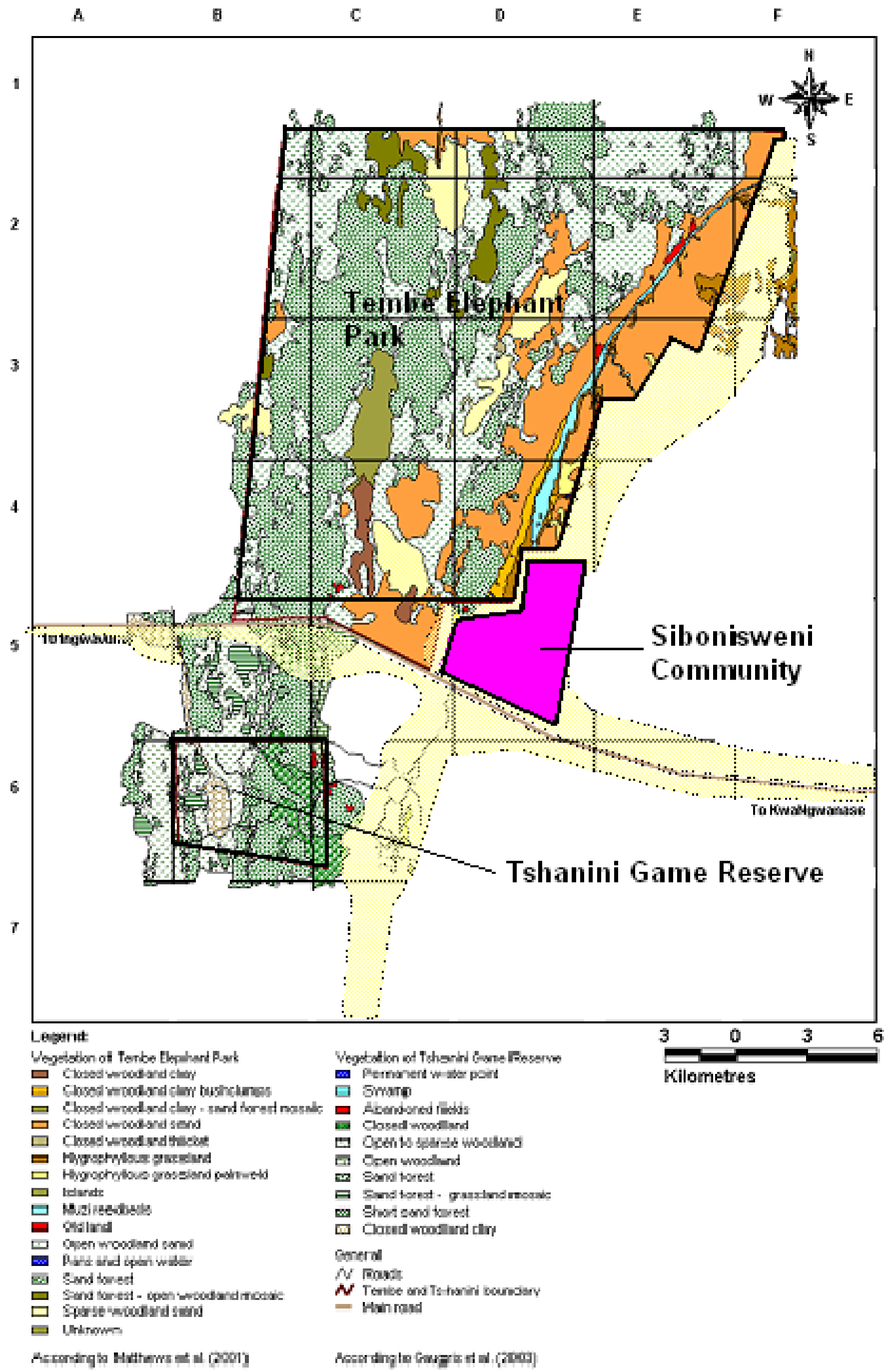

Figure 1: Grid map of the study area including the Tembe Elephant Park and Tshanini Game Reserve area, Northern Maputaland, KwaZulu-Natal province, South Africa. The area shaded in yellow indicates the areas where human utilisation is expected to occur in the next 50 years.

METHODS

Baseline data on the extent and implications of reed use within the Sibonisweni community were obtained by conducting interviews with members of the Sibonisweni Reed Cutters Association and through quantitative information obtained in questionnaire surveys. Information such as the mean number of bundles of reeds required in the construction of a hut, the price per bundle of reeds, where there reeds were bought, and preferences in the type of material used in construction were gathered from questionnaires. The game rangers at KwaMsomi Scout Camp noted the number of bundles harvested per annum. Reed bundle characteristics were measured from a sample of the harvested bundles as they were removed from the Tembe Elephant Park. Reed characteristics, such as the mean reed diameter, mean reed height and the mean number of reeds per harvested bundle were recorded. Each year the total number of bundles of reeds harvested and their mean morphometric characteristics were therefore quantified.

If the revised management strategy for the Muzi Swamp were to be accepted by the Sibonisweni community and Tembe Elephant Park management, then 6714 reed bundles can be harvested in the first harvesting season. It was calculated that there were 508 (SD ± 162) reeds per reed bundle, that the mean basal diameter of the reeds was 10.17 mm (SD ± 1.59) and that the mean reed height was 2.46 m (SD ± 0.45). By using these parameters the number of reeds that it would take to construct a 2 X 2 m reed panel that is three layers of reeds thick could be calculated. The layering of the reeds is necessary to create a robust panel and to improve its wind- and waterproofing qualities. The number of reeds needed to construct a 2 m length of three-layered panelling would be 590 reeds. It would therefore require 12 m of reed panelling to construct a typically sized hut of 2.0 X 4.0 m. This implies that the total number of reeds required to construct the panels for one hut would be 3 540, or seven harvested reed bundles.

According to Gaugris (2004), the proposed harvesting rate for poles of a diameter ranging from 50 to 80 mm for selected tree species equates to approximately 16 poles per hectare. The Tshanini Game Reserve is considered a current benchmark for the eastern Sand Forest vegetation type as it has not been significantly utilised either by humans or animals (Gaugris *et al.* 2004). In the Tembe Elephant Park, the Sand Forest has been utilised by large herbivores, especially the elephant *Loxodonta africana*. The harvesting rate for the Tembe Elephant Park should take the potential impact by large herbivores into consideration, and it is therefore suggested that the Tshanini Game Reserve’s harvest rate of poles should be halved when calculating sustainable harvesting rates for the Tembe Elephant Park.

Matthews *et al*. (2001) determined that the extent of the Sand Forest vegetation type in the Tembe Elephant Park is approximately 4 500 ha. If a minimum area of 1 933 ha of the Sand Forest in the Tembe Elephant Park is set aside for complete preservation as suggested in Gaugris (2004) then harvesting should only be allowed on the remaining 2 567 ha. This area takes into account the additional precaution, suggested by Gaugris (2004), that the Sand Forest patches that are less than 200 ha in size should not be harvested.

RESULTS

Preliminary results suggest that it is possible to harvest 20 530 poles in the 50–90 mm size class per year, this size class being favoured for hut construction (Gaugris 2004). The estimated requirement to build one hut is 50 poles, which consists of six anchor poles, eight roof supports and 36 poles for the construction of the panel frames. Based on the known annual sustainable harvesting rates, a total of 410 huts can be constructed from the available natural resources annually. The harvested trees should be reduced to standard length poles of 2.5 m, debarked, and treated against termites and various other wood damaging insects. Harvested reeds should also be treated to prevent termite damage. To maximise the harvest output, the remaining usable length of each harvested tree should be equally treated and prepared, as it could be used in the assemblages where short lengths are required.

In the above evaluation, the harvesting of poles is only estimated for Tembe Elephant Park, and therefore the number of poles, and not the number of reeds that can sustainably be harvested is the limiting factor. The reeds harvested by the Sibonisweni reed harvesters would be enough to construct 960 huts, or 5 760 panels, per annum.

The value of the harvested materials is currently estimated to be 20% of the cost of bought materials. It is estimated that the value of a thin (50<70 mm), harvested pole is ZAR6, while the value of a thick (70<90 mm), harvested pole is ZAR12. The manufacture of the huts would require 44 thin poles for use in the panels and the roof supports. The anchor supports for a hut would comprise six thick poles. An illustration of the proposed panels showing the number of poles needed is given in Figure 2. This means that the total value of the poles used in the hut would be ZAR336. The value of a total of seven reed bundles needed to manufacture the reed panels for a hut would be ZAR175 at a cost of ZAR25 per bundle. The estimated cost of sundry materials required for a single hut is ZAR100. This includes nails, binding material, nuts, bolts and creosote for the treatment of the poles. The cost of corrugated-iron roofing is estimated at ZAR50 for a 0.7 x 2.5 m panel. Six of these panels would be required for sufficient roofing, totalling ZAR300. The hut would also include a window (ZAR195) as well as a door (ZAR110). The labour cost for one person to erect the hut would be ZAR45 per day, or a total cost of ZAR90 for two people for one day. The total value of the materials and the labour used for the erection of the hut will therefore be ZAR1356. In comparison, the cost of building a house of similar size that is made of cement blocks, roof supports and corrugated-iron roofing would cost approximately ZAR6 500.00. Such a house would be 4 m x 3 m x 2.3 m in size, a total of 12 m^2 and therefore will be 4 m^2 larger than the proposed prefabricated reed huts. The price quoted includes ZAR1 500 labour for the builder, two windows, a single door, and six corrugated iron sheets. Calculations based on the cost of materials for a concrete-block house of the same size as the proposed prefabricated reed huts would total ZAR4 333.33. This is more than three times the cost of a completed house made of natural, renewable resources. The main difference lies in the cost of labour. Man-hours in an economically challenged area such as Maputaland are not worth as much as skilled labour in urban areas in other parts of South Africa. The lack of employment opportunities in the region means that families have time to spend building their own houses. Builders are rarely employed to build a house on behalf of others because it is simply too expensive.

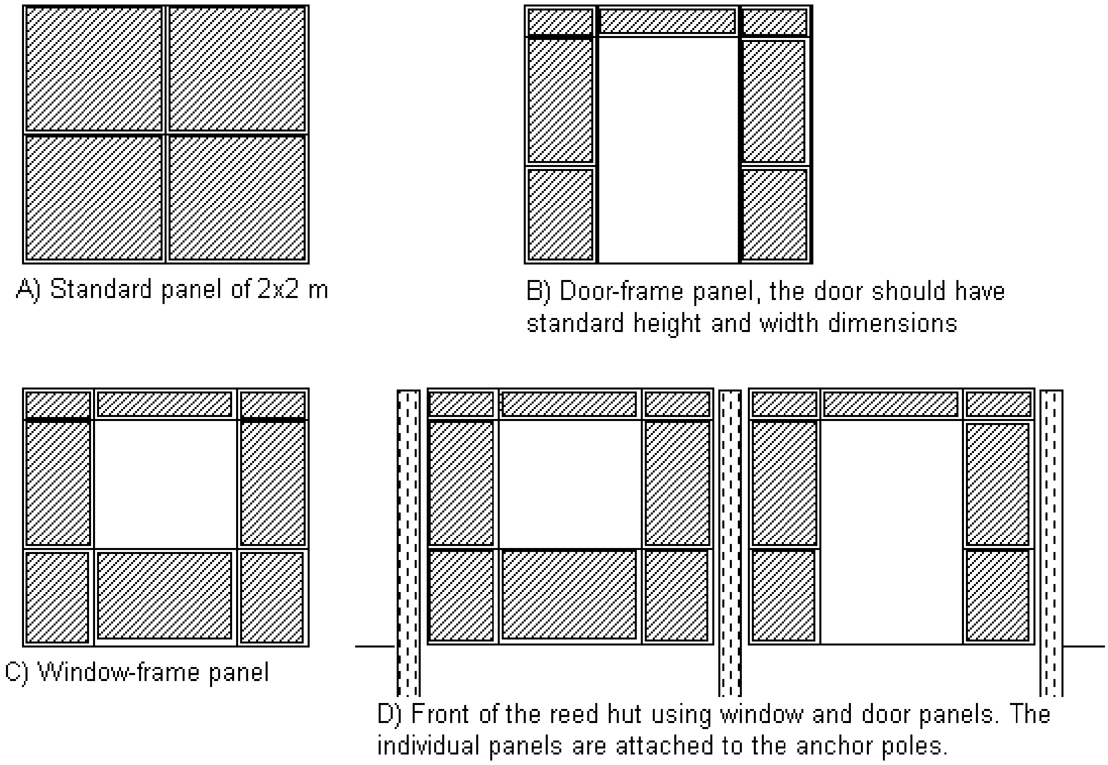

Figure 2: Illustration of the proposed prefabricated reed and forest timber panels to be used in hut construction.

Although the cost of a completed house made from natural renewable resources is cheaper than the cost of modern building materials, the preference is still to live in a house made of concrete even if it is not professionally built. It might seem unique and quaint for tourists to spend a few nights in a reed hut whilst on holiday, but to live permanently in a reed hut has its drawbacks. This does not mean, however, that there will be no local market for prefabricated reed and forest timber huts. In any given household in the Maputaland region there is more than a single dwelling. The household head’s main room can still be built of cement blocks but there might well be a demand for secondary reed and forest timber dwellings that are used as sleeping quarters for extended family, kitchens or grain stores. Furthermore, the people in the communities perceive the cost of building a brick house as prohibitive at present (Mthembu, pers comm.)[2] The demand for reed panels can also potentially reach further than the local market. There is also an increasing trend in the use of non-permanent structures for tourist accommodation. This is especially evident in the national and provincial parks and reserves within South Africa. Non-permanent structures are less intrusive, merge more effectively with, and are less disfiguring to the natural environment. Reed huts would be a perfect alternative to tourist facilities made from non-biodegradable materials. Reed panels are also used in the urban environment to improve interior and exterior décor. Reed panels are sold in Europe at around ZAR300 m^{-2} (www.thatch.co.uk/trolleyed). Beachfront concession stands (Figure 3) are also sold as “kits” where the structures are pre-manufactured and then assembled on site (www.greenbuilder.com/thatch/concstand). Many other practical and useful interior décor items are available on the market, and are sold at a much higher price than

[2] Mr Thabani Mthembu, Field assistant, School of Environmental and Life Sciences, University of KwaZulu-Natal, Tembe Elephant Park Research Station, +27 72 143 8983.

unprocessed reed bundles. The problem for the people living in the Maputaland region is their lack of business acumen, resulting in an inability to penetrate these lucrative markets.

DISCUSSION

A major concern for the conservation areas in South Africa is that they rarely offer value to people directly neighbouring them. This brings about conflict between local rural communities and wildlife managers. Viable partnerships between neighbouring communities and, specifically, South African National Parks, need to be promoted. The dual objectives of which should be to improve economic conditions whilst instilling among the communities a culture of conservation (Mandela 2000). Improvements to standards of living and infrastructure in poor communities neighbouring protected areas and private game ranches are essential if the reserve in question is to remain viable as an asset to the country as a whole (Els and Bothma 2000). Barrow and Fabricius (2002) concur that natural resources must contribute to people's well-being and that local people must be involved in their management:

The ground rules have changed: no protected area is an island, and people and conservation cannot be separated…Ultimately, conservation and protected areas in contemporary Africa must either contribute to national and local livelihoods, or fail in their biodiversity goals (Barrow and Fabricius 2002).

Figure 3: Beachfront concession stand made from reeds and thatching material, an example of what could be made with sustainable natural resources available in the Tembe Elephant Park.

There have to be tangible benefits to neighbouring communities to justify excluding large areas of land from human use. One of the ways to change the negative attitude towards wildlife reserves is to sustainably utilise some of the vast resources within its protected boundaries. The problem in the past has been the lack of data available to scientifically quantify a sustainable harvest of certain resources. Once the quantity of the resource that can be harvested without doing irreparable damage to the environment has been established, these resources should be put to good use. This can be achieved by converting natural assets into financial assets.

To merely harvest a resource and sell it as a raw material is not acceptable. The raw, harvested material has to be processed so as to add value to it. Reeds should no longer only be sold as unprocessed bundles for a meagre sum. If the reed bundles were to be processed as described above and the prefabricated huts were sold for around ZAR2 000.00, still less than half the price of a concrete-block hut, the value added to the reeds by manufacturing a product would be ZAR644.00. This equates to an additional ZAR92.00 per reed bundle. The value of the reed bundles would then represent ZAR117.00 as opposed to the original ZAR25.00 per unprocessed reed bundle. The above figures ignore the value of the poles, for which there are no data on the market-related price, as poles have not yet been utilised on a commercial basis. Even taking into consideration the value of the poles the value of the reed bundles would still be significantly improved. The processing and subsequent increase in value per harvested bundle might protect the resource from overutilisation and misuse. Community involvement in the monitoring, management and setting of harvesting quotas will hopefully quell any fears of an increased demand in the resource that now fetches a higher price and generates more income than it did in the past. Interactive participation by local communities in using and protecting natural resources will reverse the historical mistrust in the conservation authorities. Quotas and regulations regarding the utilisation of resources will to a degree be self-imposed and easier to assimilate (Fabricius 2004).

Excess reeds from the quota offered and that were not used for the manufacture of prefabricated panels would still be sold in their raw form. Trees must, however, not merely be cut down and sold as untreated poles. They also need to be processed as part of a finished product to increase their value. If the demand for prefabricated panels is less than anticipated then the quota should not be harvested. The trees should only be harvested as and when they are needed, and not stockpiled, because the poles were not previously sold in their raw form.

CONCLUSIONS

The manufacture of prefabricated reed and forest timber huts may not be the panacea for the Sibonisweni community and the Tembe Elephant Park. There are no doubt more complex problems and issues resulting in conflict situations between community members and Tembe Elephant Park management. It is hoped, however, that a recommendation such as the above one will alleviate certain problems relating to sustainable use issues of the natural resources within the park. If the Sibonisweni community and the Tembe Elephant Park management were to agree to such a programme then the entire harvesting quota of reeds could also be harvested in the winter months. Manufacture of the prefabricated panels could largely take place in the summer months, thereby ameliorating the negative effects of a summer harvest on the reed beds in the Muzi Swamp, and result in an overall improvement in the reed quality. Moreover, by processing the raw resource the community can expect to receive larger financial benefits per harvested unit. Increasing the value of the resource will hopefully instil a greater respect for it, encouraging a community culture of conservation for the resource. Ultimately, it should be the community that sets the harvesting quota based on their own monitoring and insight as to how much the reed beds can offer whilst still providing for them in the future.

Livelihood strategies need to be modified to meet the needs of a rapidly growing population and monetary based economy. A subsistence economy in rural South Africa can possibly maintain small, isolated communities for a period of time as it has done for centuries. It will, however, ensure that such communities are neglected while other more innovative communities develop into thriving economically independent units. Community-based natural resource management programmes can be used effectively to raise living conditions, improve education levels and build capacity amongst the rural poor.

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REFERENCES

Barrow E and Fabricius C. ‘Do rural people really benefit from protected areas: Rhetoric or reality? Parks 2002;12:67-79.

Browning TC. Preliminary study of the socio-economic value of *Phragmites* reeds to the people neighbouring Tembe Elephant Park, KwaZulu-Natal. BA (Hons) Unpublished Report. Pretoria: University of Pretoria;2000.

Els H and Bothma J du P. Developing partnerships in a paradigm shift to achieve conservation reality in South Africa. Koedoe 2000;43:19-26.

Fabricius C. The fundamentals of community-based natural resource management. In: Fabricius C, Koch E, Magome H and Turner S, eds. Rights, Resources & Rural Development: Community-based natural resource management in Southern Africa. London: Earthscan; 2004:3-44.

Gaugris JY. Sustainable utilization of plants in the Manqakulane Conservation Area, Maputaland, KwaZulu-Natal. MSc (Wildlife Management) Dissertation. Pretoria: University of Pretoria; 2004.

Gaugris JY, Matthews WS, Van Rooyen MW and Bothma J du P. The vegetation of Tshanini Game Reserve and a comparison with equivalent units in the Tembe Elephant Park in Maputaland, South Africa. Koedoe 2004;47:9-29.

Mandela N. Reflections on 100 Years of conservation. In: Joseph E and Parris D, eds. Visions of change. Social Ecology and South African National Parks. Johannesburg:Branko Brkic; 2000:9-13.

Matthews WS, Van Wyk AE, Van Rooyen N and Botha GA. Vegetation of the Tembe Elephant Park, Maputaland, South Africa. South African Journal of Botany 2001;67:573-594.

Ostendorp W. 'Die-back' of reeds in Europe - A critical review of literature. Aquatic Botany 1989;35:5-26.

Tarr JA, Van Rooyen MW, and Bothma J du P. The response of *Phragmites australis* to harvesting pressure in the Muzi Swamp of the Tembe Elephant Park, South Africa. Land Degradation and Development 2004;15:487-497.

Van der Toorn J and Mook JH. The influence of environmental factors and management on stands of *Phragmites australis* I. Effects of burning, frost and insect damage on shoot density and shoot size. Journal of Applied Ecology 1982;19:477-499.

Van Wyk I. "Elephants are eating our money": A critical ethnography of development practice in Maputaland, South Africa. MA (Anthropology) Dissertation. Pretoria: University of Pretoria; 2003.

Weisner S.E.B and Granéli W. Influence of the substrate conditions on the growth of *Phragmites australis* after a reduction in oxygen transport to below-ground parts. Aquatic Botany 1989;35:71-80.

Incorporating local people in the design and implementation of conservation initiatives – lessons from the Futi-corridor.

Roelie J. Kloppers

This short communication is based on a research model of ten questions designed by Borrini-Feyerabend & Buchan (1997:58-67)[1]. The aim of these ten key questions is to assess the natural resource utilisation needs of local people in a conservation initiative. The results presented here consider important aspects for the planning of the *Usuthu-Tembe-Futi Transfrontier Conservation Area* in Southern Mozambique.

1. How do the natural resources of the conservation initiative contribute to the livelihood of local people?

The people in the research area[2] are extremely dependent on agriculture for their basic subsistence needs. They plant crops for both subsistence and commercial purposes, although few people actually sell the crops they cultivate. The most important crops are, in order of the number of people who plant those crops: cassava, maize, beans, sweet potatoes, sugarcane and groundnuts. People are thus extremely dependent on the soil in the area to make a living. Without access to areas that can be converted into agricultural fields, the local people of Matutuine[3] will not be able, given the present economic situation, to survive. For this reason it would be ethically irresponsible of the planners of the Transfrontier Conservation Area to remove people from the land without compensating them for their loss of a livelihood by implementing other forms of development.

Only a small minority of people rear domestic animals. This low figure can largely be attributed to the extreme poverty that prevails in the area. Poultry in the form of chickens are quite common, but very few people own goats and only a very small minority own cattle. Cattle are more common to the west of the Maputo River in the

[1] Borrini- Feyerabend, G. & Buchan, D. (eds.). 1997. *Beyond fences: seeking social sustainability in conservation*. Karachi: Rosette Printers.
[2] The area between the Rio Maputo and the Rio Futi extending northwards from the South African border to Maputo Bay.
[3] The research area falls within the Matutuine District of the Maputo Province of Mozambique.

area surrounding Catuane than anywhere else in the study area. Although so few people own cattle and goats, they still attached value to these animals, mostly due to their perceived utilisation value. Although there are very few domestic animals in the research area, the utilisation of these animals contribute greatly to the livelihoods of the local people and is thus important.

Since so few people own domestic animals such as chickens and goats, they also have to rely on game for meat. The most important wild animals in this regard, in order of the number of people who said that they ate the meat from those animals are: grey duiker, bushpig, reedbuck, red duiker, hippopotamus, cane rat, vervet monkey, impala, buffalo and nyala.

Wild animals cause several problems for people living in the Matutuine district with regard to the destruction of crops. The following animals were identified as problem animals because they damage crops or are perceived as dangerous animals, known to have killed people in the research area: bushpig, hippopotamus, elephant, buffalo, vervet monkey and cane rat. Bushpigs and hippos were found to be problem animals throughout the research area. Elephants were really only problematic at Salamanga, which is situated right next to the Maputo Elephant Reserve on the Futi River. Buffalo were only problematic near Catuane, which is situated just north of the Ndumo Game Reserve in South Africa.

Although people hunt and eat wild animals, their utilisation of these animals for food is limited by the fact that fauna in the research area have been depleted due to historical events, such as the tribute system that existed between the Ronga and the Zulu and the Mozambican Civil War. However, the utilisation of so-called bush-meat in the research area is a common practice where such meat can be obtained.

The fact that there are so few wild animals in the area increases people's reliance on fish as a source of food. Fish are caught for subsistence and commercial purposes in the sea, rivers and various lakes in the area. The main species of fish that are caught in the research area are: black tilapia, Mozambique tilapia and sharp-tooth catfish.

The poverty throughout the area and the fact that people cannot grow enough foodstuffs to meet their basic needs have made people extremely reliant on wild plants for their survival. Plants are used for various essential purposes.

As medicine the following species of plants were found to be important: sweet thorn acacia, moth fruit, broad leaved false thorn, cashew, wild custard apple, green thorn, coast silver oak, blue sweetberry, mitzeeri, pawpaw, sickle bush, African mangosteen, landolphia, umbrella tree, bursting beauty, broad-leaved resin tree, Natal karee, caustic vine, marula, tamboti, green monkey orange, black monkey orange, toad tree, silver cluster-leaf, Cape coffee, Natal mahogany, wild medlar, Natal sourplum and knobwood.

Fruit also plays an important part in the diets of people in the area. Fruit is collected from trees that grow wild and from trees that people plant themselves. The most important trees that people plant themselves are mango trees, cashew trees, papaw trees and orange trees. Fruit are also collected from the following wild trees; wild custard apple, Zulu podberry, jackal-berry, African mangosteen, landolphia, forest milkberry, Lowveld milkberry, coastal red milkwood, sugarcane, marula, green monkey orange, black monkey orange, water berry, toad tree, Natal mahogany, wild medlar and Natal sourplum.

Besides collecting fruit to eat, the people also collect various kinds of wild fruit are also used to make alcoholic beverages. By far the most important alcoholic beverage drunk in the area is palm wine (*ubusulu*) made by tapping *ilala* palms. Other species from which alcoholic beverages are made are; cashew, pawpaw, African mangosteen, landolphia, forest milkberry, wild date palm, sugarcane, marula, green monkey orange, black monkey orange, waterberry and maize.

In the absence of generated electricity in the research area, people rely more heavily on trees for firewood than they would have had there been other sources of fuel suitable for cooking. Wood is collected to supply in the demand for fuel. Although most dead and dry woods are used as firewood, the following species were identified as those mostly used or preferred in this regard: horned thorn, sweet thorn acacia, umbrella thorn, pod mahogany, worm-bark false-thorn, cashew, Zulu podberry, sickle bush, eucalyptus, coastal red milkwood, marula, green monkey orange, black monkey orange, waterberry, Jambolan-plum, toad tree, silver cluster-leaf and Natal mahogany.

For construction, people in the research area are also extremely reliant on natural resources. Most houses in the area are constructed from the common reed, thatched with cottonwool grass. Other plants used to construct houses are: horned thorn, sweet thorn acacia, umbrella thorn, sisal, worm-bark false-thorn, cashew, coast silver oak, papyrus, Zulu podberry, sickle bush, eucalyptus, forest milkberry, tamboti, black monkey orange, waterberry, silver cluster-leaf, Natal mahogany, *Typha latifolia* and buffalo-thorn.

Plants are also used to craft various objects and utensils, such as baskets, spoons and mats. Some people make these objects for commercial purposes, but for the most part they are made for personal use. The craft objects are sold, mainly in the coastal area (Ponta do Oura and Ponta Malongane) to tourists who frequent the holiday resorts. The following plants are used in this way: sweet thorn acacia, pod mahogany, sisal, broad leaved false-thorn, papyrus, *ilala* palm, cottonwool grass, salt marsh rush, wild date palm, common reed and *Typha latifolia.*

Finally, plant species used to make traps to catch fish and wild animals were identified: sisal, worm bark false-thorn, sickle bush, lala palm, salt marsh rush, landolphia, forest milkberry, common reed, green monkey orange, black monkey orange and *Typha latifolia*.

Natural resources are thus extremely important for the everyday survival of the people in the research area. This becomes even more evident when one looks at the financial status of the people. The area has a high unemployment rate of 65%. There are very few job opportunities and most people are happy to find casual work at the holiday resorts of Ponta do Ouro and Ponta Malongane. As was also discussed, only a small minority of people receive financial help from people outside the area and even fewer people receive pensions. All these factors, together with the fact that many more non-local people are moving in (especially in the coastal part), increase the pressures on natural resources.

2. How do the natural resources of the conservation initiative help meet people's cultural, religious and identity needs?

This question is closely related to the previous one, except that the focus is on natural resources used for cultural and religious needs. Since medicine cannot be separated from religion in the lives of the local people who inhabit Matutuine, the plants used for healing are also relevant here.

Besides plants used for religious and medicinal purposes, it was also shown that both domesticated and wild animals are used in traditional religious practices. Cattle, goats and chickens are used to venerate the spirits of the ancestors. Body parts, mainly the fat, of the following wild animals are also used for religious and medicinal purposes: vervet monkey, crocodile, spotted hyena, hippopotamus, lion, baboon and bushpig.

Special mention must be made of the cultural importance of the marula (*Sclerocarya birrea*) in the research area. A special first-fruit festival is held at the time when the marulas ripen. No one is allowed to brew *buganu*, the alcoholic beverage made with marulas, before the special ceremony is held. During the festival the ancestors are thanked for the fruit and only after the *inkosi* has drunk *buganu* is everybody else allowed to brew and drink it. This ceremony is of special cultural importance because it ritually re-establishes the position of the *inkosi* and the unity of his people.

The sacred forest where this ceremony takes place is also of special cultural importance. It was shown that there are various sacred forests throughout the research area and that the sanctity and importance of these places to the indigenous people should be taken into account in any development planning in the region.

3. Do local people perceive any need to conserve natural resources, specific species, habitats, etc.?

The answer to this question was sought by asking people whether it is possible for the people who live in the research area to use up all the wild animals, fish and plants found there. The resounding answer to this question was that it would be impossible since there are too many plants, fish and wild animals. This answer should, however, not be taken to mean that people are against conservation, but rather that they see nature, as the eternal provider. African people in general believe that the universe was created for the sake of man, and because of that reason the creator ensures that man continually benefits from nature. Nature has always provided people with food and materials and people cannot conceive of any reason why this would end.

When spokespersons where asked about Transfrontier Conservation, most were very enthusiastic. However, this should not be taken to mean that people are necessarily pro-conservation, since most of them valued the idea primarily because they believe that it will bring employment opportunities to the area. The same amount of enthusiasm voiced for Transfrontier Conservation was also voiced for the development of a harbour at Porta Dobela, because people believe that it will bring employment opportunities to the area, despite the fact that this development will totally destroy the sensitive ecosystem of the research area.

What can be concluded is that the people in the research area do not value conservation *per se*, but that they value the benefits that will accrue from conservation developments, such as tourism (job opportunities). This is thus a classic example that conservation can work in Africa, and will be valued by African people, if they share in the benefits that accrue from conservation.

4. Are or were there indigenous customary resource management systems in the area and are they being affected by the conservation initiative?

The turbulent past of the people living in the research area has created a situation of confusion and disorder. If there was a customary resource management system, it has also been disrupted. As was discussed, it is not necessary for a person to obtain permission from the *inkosi* and to pay homage (*khonza*) to him in order to settle on a piece of land. This is especially true in the coastal areas surrounding Ponta Malongane. In the traditional system, the fact that a person paid homage to the *inkosi* would entitle him to utilise the communally utilisable natural resources. At present, there is no control over the people who settle in the area and thus there is no control over the utilisation of natural resources.

The present situation can thus be described as a free-for-all system where everybody takes what he/she needs from nature. The present relatively low human population in the area allows this system to function, seemingly without too much negative effect on the ecosystem. However, an increase in the human population, mostly due to the influx of people into areas such as Ponta Malongane where they hope to find work, can rapidly alter the situation. If the human carrying capacity of the area is exceeded, what Hardin (1968) termed the Tragedy of the Commons could ensue. This situation develops when people who use a resource base communally start using it for commercial gain. In the process the communal resource base is destroyed. In the fear that they will not have access to communally utilised natural resources since so many people depend on it (even people outside their own region), people start to harvest natural resources before the natural resources have an opportunity to replenish themselves. In other words, the natural resources are not harvested on a sustainable basis. Over time, this creates a situation where the poorest people knowingly destroy the very resource base they are dependent on for their future because they have no other choice if they wish to survive the present.

5. Does the conservation initiative affect access to land or resources and the control over them for one or more stakeholders?

The exact boundaries of the Lubombo Transfrontier Conservation Area have not yet been established. It is generally accepted that the area between the Futi and Maputo Rivers, the so-called Futi corridor, will become a conservation area to link the Tembe Elephant Park and the Maputo Elephant Reserve. This area is by no means densely populated, but approximately 130 families (households) are living there. If these people were forced to leave, then the conservation initiative would definitely affect their access to natural resources and it would affect the people living adjacent to this specific area. Plans would thus have to be made to ensure that resources can be utilised at sustainable levels by those people, or they should be first in line for employed by the management structures of the conservation area.

In order to persuade the local inhabitants to leave the areas they occupy at present, it would be necessary to buy or lease their land from them. This is a decision that will have to be made by the planners and developers of the conservation initiative. It was shown that 43% of the people in the research area are willing to make their land available for tourism development. This figure, however, was much higher on the coastal region where people have moved recently. People at places like Zitundo and Salamanga were not as willing to make their land available for development. This possibility therefore seems highly unlikely to bear positive results.

6. Are there major economic activities (e.g. mining, timber extraction) in the area which do or could affect the conservation initiative?

The proposed Sappi programme for timber extraction in the area has been halted. The programme provided by Mr Blanchard for tourism development in the area has been halted due to his death in 1999. Blanchard's concession, encompassing the entire area, has since been subdivided into smaller concessions. However, there is a great deal of confusion regarding the sizes and boundaries of these concessions. The conservation initiative can only be implemented once this confusion has been cleared up.

A positive point is that many concessionaires in the area with whom interviews were conducted have the same aims for the area as that of the Peace Parks Foundation. They also envision restocking of the area with fauna and developing eco-tourism. It may therefore be possible to work with these people to ensure the successful implementation of the Lubombo Transfrontier Conservation Area.

The most problematic development in the area is the planned multi-million dollar development of the harbour at Porta Dobela on the southern boundary of the Maputo Elephant Reserve. When one looks at the situation at Ponta Malongane, with people from all over Mozambique moving there in the hope of finding employment, the projections for Porta Dobela are alarming. The development of the harbour will create many job opportunities. This will increase the number of people in the area and will in turn increase the pressures on the natural resources. These developments will not only destroy the natural beauty of the area and therefore the tourism potential of the area, but will also attract a landless mass of people living in squatter camps with accompanying levels of extreme squalor and poverty.

7. Are there incentives or disincentives to conservation in the local context?

As has been shown throughout the study, the local inhabitants of the research area are extremely reliant on natural resources for their survival. If conservation of these resources were to be defined as preventing people's access to them, then there would certainly be a disincentive to conservation in the local context. However, it has also been shown that there are no real employment opportunities for local people in the area. Therefore, if the conservation initiative were to create jobs and a further integrated rural development approach were to be followed for the local inhabitants, there would certainly be an incentive for conservation in the local context. Conservation would therefore be regarded in a positive light if it was geared to meeting the needs of local inhabitants.

8. What are the actual costs and benefits of the conservation initiative and how are they distributed among the stakeholders?

It is still too early in the process to answer this question in detail. The primary costs of the conservation initiative may be a loss of access to natural resources for local people. However, at the same time, they might benefit from tourism development in the area. Whether the cost (loss of access to resource utilisation) will be outweighed by the benefit (employment and development) is difficult to project. The natural beauty of the area and a dedicated effort to restock the area with wild animals will certainly make it a prime tourism attraction in Southern Africa. If the local inhabitants were to share in those benefits, then surely that will outweigh the costs they have to pay for nature conservation in their environment.

9. What contributions can the stakeholders make to the conservation initiative?

The major contribution that can be made to the conservation initiative by the local inhabitants is the provision of labour, due to their low levels of education and skills training. The local people should be employed to construct tourist facilities and other endeavours necessary for the realisation of the conservation initiative. They should also be employed as labourers once the conservation initiative has been established.

They can be employed as washers, cleaners, gardeners, mechanics and tradesmen. Local people can also be trained as game rangers. Initiatives like the Southern African Wildlife College, near the Orpen Gate of the Kruger National Park, provide local people with skills and enable them to benefit from nature conservation. The Peace Parks Foundation supports the Southern African Wildlife College, which is partly funded by the United States Agency for International Development and whose aim it is to train protected areas managers to manage those areas and their wildlife populations sustainably and in cooperation with local people (Peace Parks Newsletter 2000). The problem, however, is to establish a system whereby it can be ascertained that the local people are the benefactors and not people moving in from other areas. This aspect will determine the successful outcome of such an endeavour.

10. Are there solid social and economic opportunities to link conservation objectives with providing for local needs?

This question has already been answered in this concluding discussion. There are indeed opportunities to link nature conservation and socio-economic development in the establishment of the Lubombo Transfrontier Conservation Area. The Peace Parks Foundation has also committed itself to this goal. If the resource utilisation needs of the local people are fully comprehended and considered, then the local people can benefit from the Lubombo Transfrontier Conservation Area by the creation of employment opportunities and tourism development in the Matutuine district.