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Law enforcement staff perceptions of illegal hunting and wildlife conservation in Gonarezhou National Park, southeastern Zimbabwe

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Abstract: Globally, pressure from the illegal harvesting of wildlife is a recurrent issue for protected area management. In order to ensure the effective conservation of wildlife resources, law enforcement has been identified as one of the most important components of protected area management. Our study aimed at addressing the following two research questions: (1) what are the perceptions of law enforcement staff in Gonarezhou National Park (GNP), Zimbabwe, about illegal hunting practices, illegal hunter's characteristics, wild animals commonly targeted and trends of poaching in the park; and, (2) what are the suggestions for reducing illegal hunting and enhancing wildlife conservation in GNP ecosystem? Data were collected using a semi-structured questionnaire administered through interviews from 42 law enforcement staff representing 47 % of the total law enforcement staff in GNP from February to May 2011. Our results showed that 76 % (n = 32) of the patrol rangers perceived that most illegal hunters were between 21 and 30 years. Nearly all respondents (95 %; n = 40) reported that most poachers were residents of villages situated within 20 km from the boundary of GNP. Medium to large wild herbivores were reportedly the most illegally animal hunted species whilst large carnivores were the least illegally hunted animals. Most of the respondents (79 %, n = 33) perceived that poaching activities had declined in GNP ecosystem between 2005 and 2010 due to an increase in arrests. Increasing conservation awareness and education in adjacent communal areas would help to further reduce illegal hunting and promote wildlife conservation.

Resumen: En todo el mundo, la presión ejercida por la cosecha ilegal de vida silvestre es un tema recurrente para el manejo de áreas protegidas. A fin de asegurar la conservación efectiva de los recursos de vida silvestre, la aplicación de la ley ha sido identificada como uno de los componentes más importantes del manejo de áreas protegidas. Nuestro estudio abordó las dos siguientes preguntas de investigación: (1) ¿cuáles son las percepciones del personal encargado de aplicar la ley en el Parque Nacional Gonarezhou (PNG), Zimbabue, acerca de las prácticas de cacería ilegal, las características del cazadores ilegales, los animales salvajes que son buscados comúnmente y las tendencias de la cacería furtiva en el parque; y (2) ¿qué sugerencias tienen para reducir la cacería ilegal y promover la conservación de la vida silvestre en el ecosistema del GNP? La obtención de datos se hizo usando un cuestionario semiestructurado administrado por medio de entrevistas a 42 miembros del personal encargado de aplicar la ley, quienes representaron 47 % del todo el personal con este cargo en el GNP, de febrero a mayo de 2011. Nuestros resultados mostraron que 76 % (n = 32) de los guardias de vigilancia percibieron que la mayoría de los cazadores ilegales tenían edades entre 21 y 30 años. Casi todos los

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respondientes (95 %; n = 40) afirmaron que los cazadores furtivos son residentes de poblados localizados a no más de 20 km del límite del GNP. Se reportó que los herbívoros silvestres medianos a grandes eran los animales más sujetos a la cacería ilegal, mientras que los carnívoros grandes eran los animales menos cazados de forma ilegal. La mayoría de los respondientes (79 %, n = 33) percibieron que las actividades de cacería furtiva habían declinado en el ecosistema del GNP entre 2005 y 2010 debido a un aumento en el número de arrestos. El aumento de la conciencia de conservación y de la educación en zonas comunales adyacentes ayudaría a reducir aún más la caza ilegal y promover la conservación de la fauna.

Resumo: Globalmente, a pressão da exploração ilegal de animais selvagens é um tema recorrente para a gestão de área protegida. A fim de garantir a efetiva conservação dos recursos faunísticos, a aplicação da lei tem sido identificado como uma das componentes mais importantes na gestão de áreas protegidas. O nosso estudo visou abordar as seguintes questões de pesquisa: (1) quais são as percepções da equipe de aplicação da lei no Parque Nacional do Goarezhou (GNP), Zimbabwe, sobre as práticas de caça ilegal, características dos caçadores ilegais,os animais selvagens preferencialmente visados e as tendências da caça furtiva no parque; e, (2) quais são as sugestões para reduzir a caça ilegal e melhorar a conservação da fauna no ecossistema do GNP? Os dados foram recolhidosentre Fevereiro a Maio de 2011mediante um questionário semi-estruturado, aplicado através de entrevistas a 42 agentes da aplicação da lei que representavam 47 % do total dos referidosagentes no GNP. Os nossos resultados mostraram que 76 % (n = 32) dos rangers percepcionam que a classe etária dos caçadores ilegais se situava entre os 21 e os 30 anos. Quase todos os entrevistados (95 %, n = 40) relataram que a maioria caçadores eram moradores de aldeias situadas a 20 km da fronteira do GNP. Os herbívoros selvagens de médio a grande porte teriam sido as espécies mais caçadas ilegalmente, enquanto os grandes carnívoros, foram os animais menos caçados ilegalmente. A maioria dos entrevistados (79 %, n = 33) tinha a percepção que entre 2005 e 2010 as atividades de caça furtiva tinha declinado no ecossistema do GNP devido a um aumento de prisões. Aumentar a consciência de conservação e educação em áreas comunais adjacentes ajudaria a reduzir ainda mais a caça ilegal e promover a conservação da vida selvagem.

Key words: Awareness, biodiversity, conservation, illegal hunting, law enforcement, perceptions, protected area, snaring, wildlife.

Introduction

Protected areas represent a central strategy in biodiversity conservation worldwide (Gaston *et al.* 2008; Naughton-Treves *et al.* 2005). Specifically, the International Union for Conservation of Nature (IUCN) defines protected areas as terrestrial and aquatic areas dedicated to the protection and maintenance of biodiversity, and natural and cultural resources, and managed through legal or other effective means (IUCN 1994). However, increasing human populations and poverty, mostly in developing countries, have been documented as a major threat to biodiversity conservation (Metzger *et al.* 2010; Newmark 2008; Singh & Sharma 2009), particularly through increases in illegal resource use, such as illegal hunting. Illegal resource use also includes extraction of prohibited resources, such as protected species (Gavin *et al.* 2009).

Managing an area such as a national park in Africa often entails dealing with human pressures from areas surrounding the protected area (Gray & Kalpers 2005; Lewis *et al.* 1990). Pressure from the illegal harvesting of wildlife, which is an important source of protein for the rural people in many tropical areas, is a recurrent issue for public and private protected area management (Kaltenborn *et al.* 2005; Lindsey *et al.* 2011; Mamo & Bekele 2011; Martin *et al.* 2012; Wato *et al.* 2006). Consequently, law enforcement has been identified as one of the most important components of protected area management (Fischer 2008; Hilborn *et al.* 2006) and includes the implementation of existing legal rules and a system comprising detection, apprehension, prosecution, and conviction of lawbreakers. In Zimbabwe, the 1975 Parks and Wildlife Act empowered the Department of National Parks and Wildlife Management staff to

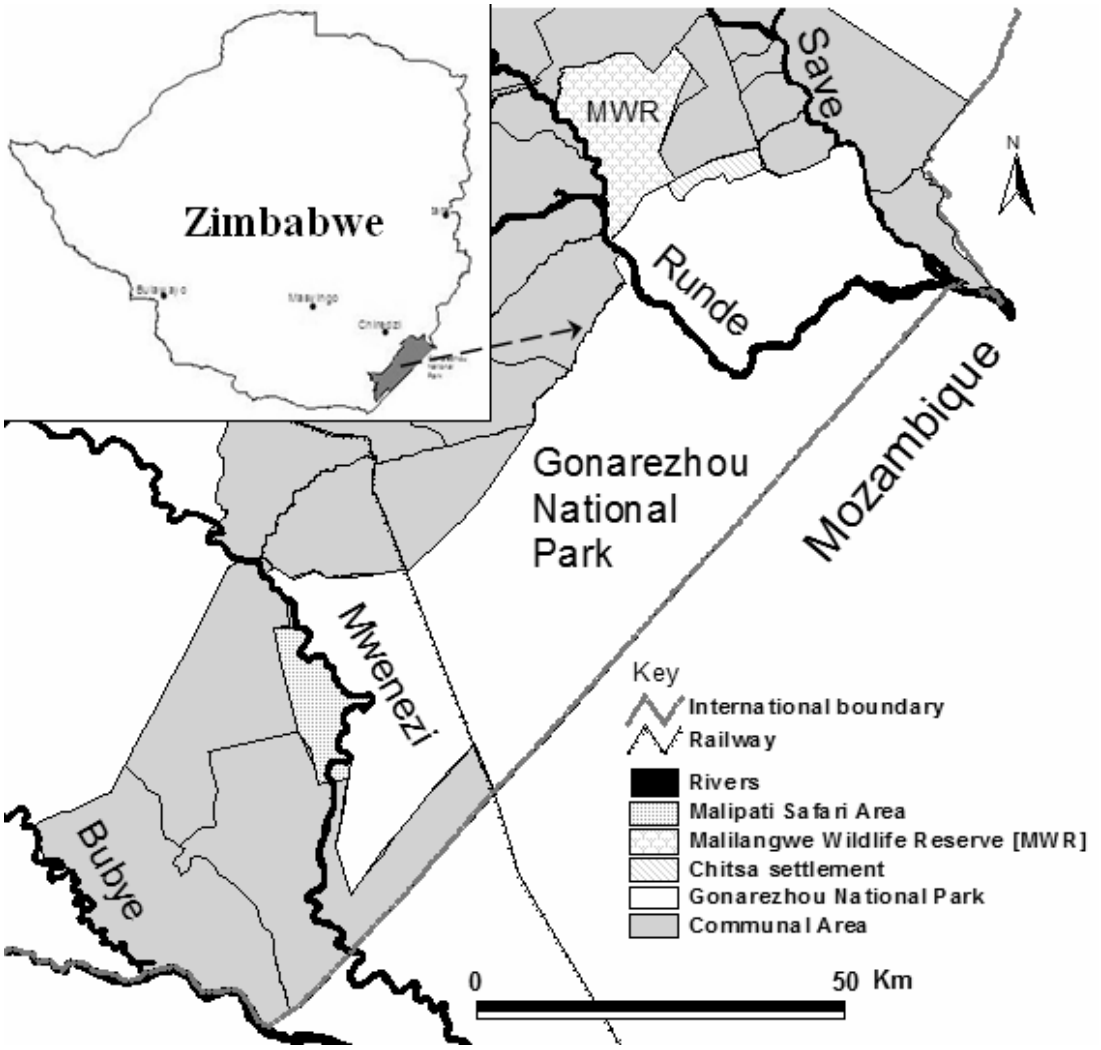

Fig. 1. Location of Gonarezhou National Park and surrounding areas in southeastern Zimbabwe.

undertake anti-poaching strategies aimed at reducing illegal harvests of wildlife (Duffy 1999).

Law enforcement has been poorly studied in Zimbabwe, despite a long history of illegal hunting in southeastern Zimbabwe, and especially in Gonarezhou National Park (GNP) (Duffy 1999; Gandiwa 2011; Mavhunga 2008). To increase our understanding of illegal animal harvests in Zimbabwe, we sought to address the following two research questions: (1) what are the perceptions of law enforcement staff in GNP about illegal hunting practices, illegal hunter's characteristics, wild animals commonly targeted and trends of poaching in the park; and, (2) what are the suggestions for reducing illegal hunting and enhancing wildlife conservation in GNP ecosystem? The findings of this study are intended to aid wildlife conservation and understanding of illegal hunting patterns in a protected area occurring in a savannah ecosystem.

Materials and methods

Study area

This study was carried out in GNP, southeastern Zimbabwe (Fig. 1). Established in the early 1930s, GNP was classified as a National Park in 1975 under the Parks and Wildlife Act of 1975. GNP and the surrounding adjacent areas have been part of the Great Limpopo Transfrontier Conservation Area (GLTFCA) since 2000. Covering an area of 5,053 km^2, GNP lies between 21° 00' - 22° 15' S and 30° 15' - 32° 30' E. The study area experiences three seasons: hot dry, hot wet and cool dry. Annual average rainfall for GNP is about

466 mm, with November to March being the wettest months (Mpofu *et al.* 2012). The vegetation of GNP in the southeastern Zimbabwe is typical of semi-arid and dominated by mopane (*Colophospermum mopane*) woodlands (Gandiwa *et al.* 2012). The park is home to a wide variety of large wild herbivores and carnivores (Table 1).

The conventional method of law enforcement in the GNP is carried out via foot patrols (Jachmann 2008). Briefly, in GNP, anti-poaching patrols are divided into three categories: (i) local or daily patrols which cover a maximum radius of 10 - 15 km, (ii) extended patrols consisting of between 10 and 21 days and covering a larger area, and (iii) strategic patrols which cover areas of specific interest, but sometimes in response to intelligence information. Overall, at least 20 extended patrols are conducted monthly in the entire GNP (Gandiwa 2011). A patrol team in GNP normally has four or five patrol rangers (Gandiwa *et al.* 2013a). This patrol team size is considered appropriate in savannah ecosystems (Jachmann 2008). The number of patrol rangers in GNP is 90, with a ranger density of 0.02 rangers km^{-2} (Lindsey *et al.* 2011).

Local residents in communities adjacent to the northern GNP practice two types of agriculture, namely crop farming and livestock rearing (Gandiwa 2012). The main crops include sorghum (*Sorghum bicolor*) and maize (*Zea mays*), grown for both subsistence utilisation and commercial sale, and cotton (*Gossypium* spp.) specifically grown for commercial sale. Livestock include cattle (*Bos taurus*), goats (*Capra hircus*), sheep (*Ovis aries*), donkeys (*Equus asinus*) and poultry. Wildlife conservation in communal areas adjacent to GNP is practiced under the Communal Areas Management Programme for Indigenous Resources (CAMPFIRE), a community-based conservation approach which allows for local communities to utilise wildlife resources in their areas (Child 1996). Anti-poaching patrols in the communal areas with CAMPFIRE programmes are conducted by resource monitors employed under the CAMPFIRE committees. The dominant ethnic group in the study area is Shangaan.

Data collection and analysis

We assessed the perceptions of law enforcement rangers with regard to illegal hunting patterns and wildlife conservation in GNP using a semi-structured questionnaire that was administered through interviews. The interviews were conducted between February and May 2011. Interviews took approximately 30 - 40 minutes to complete. Forty-two patrol rangers (from a total of 90) from the two management units of GNP, namely Chipinda Pools in northern GNP and Mabalauta in southern GNP, were interviewed. Patrol rangers were randomly selected through picking of numbers from a hat that corresponded to ranger names from staff time books. Our semi-structured questionnaire was guided by a previous survey of perceptions of illegal hunting in southeastern Zimbabwe (Gandiwa 2011).

Questions were framed to seek information on law enforcement staff perceptions, primarily based on their knowledge of previous arrests and other related incidences, of illegal hunting activities, hunting methods used by illegal hunters, wild animal species targeted, demographics of poachers, their perceptions on effects of illegal hunting on animal abundances, suggestions for improving conservation in GNP ecosystem and respondent's demographic variables (Table 2). Most questions were close-ended, with some open-ended contingency questions included to elicit more extensive discussions of several of the issues raised. The wording and ordering of the questions were also carefully thought out to avoid asking leading questions and/or directing the respondent towards particular responses to later questions.

We compiled questionnaire responses in Microsoft Office Excel 2010. Descriptive statistics were used to summarize the questionnaire response data set. Where multiple responses were possible on an open-response question, data are presented as the percentage of respondents giving each response, and may sum to over 100 %.

Results

Forty-two law enforcement staff in both the northern GNP (Chipinda Pools, n = 19) and southern GNP (Mabalauta, n = 23) were interviewed. Nearly all respondents were male (n = 40 male vs. n = 2 female). The mean age of the respondents was 38 ± 12 (SD) years with a mean working experience of 12 ± 12 (SD) years in National Parks. The ranger's experiences of past arrests indicated that most illegal hunters (76 %, n = 32) were between the ages of 21 to 30 years old, with those over 50 years old being the least common (5 %, n = 2). Nearly all respondents (95 %; n = 40) reported that most poachers were residents of villages adjacent to GNP (≤ 20 km); whereas about 5 % (n = 2) reported that only the commercial

Table 1. Population estimates of major wildlife species in Gonarezhou National Park, southeastern Zimbabwe (Dunham *et al*. 2010; Groom & Brand 2011).

Species	Scientific name	Population estimate	Confidence interval (%)
Buffalo	*Syncerus caffra*	2274	85
Common duiker	*Sylvicapra grimmia*	159	36
Eland	*Taurotragus oryx*	317	120
Elephant	*Loxodonta africana*	9123	21
Giraffe	*Giraffa camelopardalis*	251	62
Impala	*Aepyceros melampus*	6005	37
Kudu	*Tragelaphus strepsiceros*	2285	30
Nyala	*Tragelaphus angasii*	370	51
Steenbok	*Raphicerus campestris*	97	54
Warthog	*Phacochoerus aethiopicus*	267	79
Waterbuck	*Kobus ellipsiprymnus*	360	86
Wildebeest	*Connochaetes taurinus*	364	82
Zebra	*Equus quagga*	1385	30
Cheetah	*Acinonyx jubatus*	50	—
Leopard	*Panthera pardus*	315	—
Lion	*Panthera leo*	54	—
Small-spotted genet	*Genetta genetta*	456	—
Spotted hyena	*Crocuta crocuta*	421	—

Table 2. Sample semi-structured questionnaire.

Question	Response
1. Sex of respondent?	Male/Female
2. Age of respondent?	Open
3. What is your total experience (years) as an employee in National Parks?	Open
4. What are your perceptions about law enforcement in Gonarezhou National Park in the past 5 years? Give reasons for your opinion?	More effective/Less effective/No Change; Open
5. May you list the main hunting methods used by bushmeat hunters?	Open
6. May you list the main wildlife species usually targeted by bushmeat hunters?	Open
7. What are the age groups of bushmeat hunters mostly arrested in the park?	10–20/21–30/31–40/41–50/ >50 years
8. Who does most of the illegal hunting in the park?	People living far away/People from the neighbouring villages
9. How far in terms of average distance do local poachers mostly come from?	Open
10. In the last 5 years has poaching of wildlife increased or decreased? Why?	Increased/Decreased; Open
11. Do you think that illegal hunting is causing a decline in wildlife numbers in the park? Why?	Yes/No; Open
12. What do you think park management should do to further reduce illegal hunting and enhance wildlife conservation in GNP?	Open

poachers were those living far away from GNP (> 20 km).

All respondents (n = 42, 100 %) reported that snaring was the most common method used in illegal hunting activities in GNP. This was followed by hunting with dogs, using firearms, poisoning, and using spears, bows and arrows (Table 3). The common animal species that were illegally hunted were impala (*Aepyceros melampus*), kudu (*Tragelaphus strepsiceros*), buffalo (*Syncerus caffra*), zebra (*Equus quagga*) and elephant (*Loxodonta africana*). Large predators were reported as the least illegally

hunted animals (Table 4). Most of the illegal hunting in GNP is for subsistence purposes with a small component of commercial illegal hunting (Tables 3 & 4).

Table 3. Common hunting methods used by illegal hunters in Gonarezhou National Park, Zimbabwe. Total percentage exceeds 100 because the respondents were allowed to give multiple answers.

Hunting method	Number of respondents	Percentage (%)
Wire snaring	42	100
Hunting with dogs	28	67
Use of firearms	20	48
Poisoning	7	17
Spears, bows and arrows	1	2

Between 2005 and 2010, 79 % (n = 33) of the respondents reported that poaching activities had declined, whereas 21 % (n = 9) reported that poaching activities had increased in GNP. The main reason for the perceived decline in illegal hunting activities was attributed to an increase in the number of illegal hunters arrested across the GNP. Respondents reported that the provision of more law enforcement resources (14 %, n = 6), increase in staffing levels (12 %, n = 5), increased anti-poaching patrols (58 %, n = 25) and increased sightings of wild animals (14 %, n = 6) were factors and indicators pointing to a decline in wildlife poaching in GNP. Furthermore, approximately 86 % (n = 36) of the respondents perceived that law enforcement had become more effective whereas only 14 % (n = 6) of the respondents perceived that it had become less effective. Half of the respondents (n = 21) reported that illegal hunting was causing a decline in animal abundances whereas 50 % (n = 21) of the respondents reported illegal hunting was not impacting negatively on animal abundances in GNP.

When asked to suggest strategies for the further reduction of illegal hunting and enhancement of wildlife conservation in GNP, three main responses were given. First, about 45 % (n = 19) of the respondents suggested that increasing patrols in prime wildlife areas and advanced training would help strengthen law enforcement activities together with the continuous provision of sufficient anti-poaching resources. Second, 33 % (n = 14) suggested the need to increase conservation education and awareness campaigns in the neighbouring communities as a way of engaging the local communities. Third, 21 % (n = 9) of the respondents suggested that there was need to increase the number of law enforcement staff to ensure increased park coverage.

Discussion

Our results suggest that illegal hunting is perceived to be a common phenomenon in the GNP ecosystem, which corroborates previous findings (Gandiwa 2011; Mavhunga 2008). Young to middle aged men between 21 and 40 years old were reported to constitute the majority of illegal hunters. Only a few individuals younger than 20 years old or over 50 years old were reported to be involved in illegal hunting. Furthermore, most illegal hunters were located within communities close to GNP, with the majority residing within 20 km from the park boundary.

We found an overall decline in poaching activities within GNP that was primarily attributed to an increase in illegal hunter's arrests. Recent evidence suggests that the number of illegal hunter arrests declined in northern GNP since 2004 following the increase in patrol ranger's numbers (Gandiwa *et al.* 2013a). Elsewhere, it has been reported that the catchment zone for local illegal hunters was < 41 km from the Serengeti National Park boundaries, Tanzania (Holmern *et al.* 2007). We attribute the small catchment area for GNP as compared to the Serengeti National Park to the fact that GNP is almost entirely surrounded by communal areas on the Zimbabwean side with the only exception being Malipati Safari Area, Malilangwe Wildlife Reserve and the border with Mozambique.

Illegal hunting in the GNP was most commonly conducted using wire snares and hunting with dogs. Illegal hunters were primarily hunting medium to large herbivores. Notably, however, the number of animals and species harvested may be representative of the animals available in specific locations of the park as snares are primarily unselective among animal species (Kümpel *et al.* 2009; Wato *et al.* 2006). Illegal hunting in GNP appears to be mainly for subsistence and to some extent commercial purposes, which is similar to other recent studies in southeastern Zimbabwe (Gandiwa 2011; Lindsey *et al.* 2011) and from other protected areas in Africa (Gibson & Marks 1995; Holmern *et al.* 2007; Loibooki *et al.* 2002; Obioha *et al*. 2012).

Table 4. Animal species commonly hunted (illegal) in Gonarezhou National Park, Zimbabwe. Total percentage exceeds 100 because the respondents were allowed to give multiple answers.

Animal species	Scientific name	Number of respondents	Percentage (%)
Impala	*Aepyceros melampus*	37	88
Kudu	*Tragelaphus strepsiceros*	29	69
African buffalo	*Syncerus caffer*	27	64
Burchell's zebra	*Equus quagga*	17	40
African elephant	*Loxodonta africana*	17	40
Warthog	*Phacochoerus africanus*	7	17
Giraffe	*Giraffa camelopardalis*	7	17
Waterbuck	*Kobus ellipsiprymnus*	7	17
Blur wildebeest	*Connochaetes taurinus*	2	5
Eland	*Taurotragus oryx*	2	5
Lion	*Panthera leo*	1	2
Leopard	*Panthera pardus*	1	2
Spotted hyena	*Crocuta crocuta*	1	2

Commercial and subsistence poaching are forms of resistance to certain types of wildlife policy and thus anti-poaching messages have been a consistent theme in conservation policy in Zimbabwe (Duffy 1999). Budget constraints often prohibit protected area managers in developing countries from completely deterring extraction and the resulting resource degradation (Albers 2010). This situation is also similar in non-protected and partially protected areas which also experience a slow but steady degradation of their resources, mainly owing to a general shortage of funds and human capacity in the environmental sector, together with a lack of proper incentives for landholders to conserve these areas (Du Toit 2002). However, in GNP law enforcement budgets were boosted beginning in 2007 following the involvement of the Frankfurt Zoological Society in the management of the park which led to the increased law enforcement efforts (Gandiwa *et al.* 2013a).

There has been a growing realization that the conventional 'gun and guard' method of conservation is not effective in dealing with the socio-ecological complexity and political dimensions of biodiversity conservation (Mishra *et al.* 2009). Consequently, integrated approaches that recognize the interconnectedness of social and ecological systems and attempts to link science, policy and societal goals through interdisciplinary methods of problem solving and multi-stakeholder decision making have been suggested to be important in promoting conservation and development (Mishra *et al.* 2009). For example, it has been reported that the rate of illegal hunting has decreased since the inception of the CAMPFIRE programmes in some areas in Zimbabwe as a result of direct benefits from wildlife resources and an increase in anti-poaching activities in the areas with CAMPFIRE programmes (Child 1996; Taylor 2009). Animal abundance data in GNP support the perception that animal populations have been increasing and/or maintaining their populations in recent years (Dunham *et al.* 2010; Gandiwa 2012; Gandiwa *et al.* 2013b; Zisadza *et al.* 2010). However, currently the CAMPFIRE programmes in the study area are recovering from the economic decline that Zimbabwe experienced between 2000 and 2008 (Balint & Mashinya 2008). Elsewhere, in Tanzania, 'The Grumeti Fund' initiative is an example of a successful conservation method which also led to the eradication of subsistence poaching in communities where economic incentives were provided to local people adjacent to protected areas (Knapp *et al.* 2010).

Based on our findings we suggest two strategies that may contribute to the further reduction in illegal hunting and at the same time enhance the protection of resources in GNP. First, GNP management needs to: (i) enhance the use of local intelligence networks, (ii) increase patrol effort in prime wildlife areas, (iii) expand patrol ranger's training and capacity building programmes, (iv) increase the number of patrol rangers, and (v) strengthen regional cooperative network in order to minimise cross-border illegal

hunting activities. Furthermore, in line with the role of regional cooperative network, the GLTFCA initiative provides an opportunity for collaboration between GNP and other protected areas in Mozambique and South Africa. Presently, there is active engagement within the GLTFCA in terms of collaborative law enforcement across wildlife areas in the three partner countries.

The second strategy would be to develop and implement conservation education and awareness campaigns in communities adjacent to GNP. Presently, GNP does not have a well-structured conservation education and awareness campaign programme that covers the entire villages adjacent to the park. Therefore, integrating GNP's conservation education and awareness campaign activities with CAMPFIRE programmes and other local non-governmental organisations would help in reducing illegal hunting activities in GNP. To start with, having quarterly conservation awareness campaigns in all communities adjacent to GNP would be ideal.

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