Elephant-poaching weapons and new experiences from the Banyang-Mbo Wildlife Sanctuary, Cameroon

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Abstract

Although elephant poaching has been well studied there have been few reports of the equipment poachers use and the danger it poses to all forest users. Information about this equipment, especially the cheap, locally available inventions and innovations, would improve anti-poaching planning and the safety of all forest users including the elephants. This paper reports on confiscated firearms and cheap, locally made slugs, pin-board traps, cable snares; it explains the inventions, innovations and strategies poachers have used during the last 10 years of the anti-poaching campaign the Wildlife Conservation Society initiated in the Banyang-Mbo Wildlife Sanctuary in south-western Cameroon. Further, it identifies the origin of poachers and their driving forces and highlights the strategy the Wildlife Conservation Society uses to conserve forest elephants in the sanctuary.

Résumé

Bien que le braconnage des éléphants ait déjà été bien étudié, il existe peu de rapports sur l'équipement utilisé par les braconniers et sur les dangers qu'il représente pour tous les utilisateurs de la forêt. Des informations sur cet équipement, et particulièrement sur les inventions et innovations locales bon marché, amélioreraient le programme anti-braconnage et la sécurité de tous les utilisateurs de la forêt, y compris les éléphants. Nous faisons ici un rapport sur les armes à feu confisquées et les balles bon marché, fabriquées localement, les pièges, les lacets ; nous expliquons les inventions, les innovations et les stratégies que les braconniers ont utilisées au cours des dix dernières années et qu'a révélées la campagne anti-braconnage de la *Wildlife Conservation Society* dans le Sanctuaire de la Faune de Banyang-Mbo, au sud-ouest du Cameroun. De plus, nous identifions l'origine des braconniers et ce qui les pousse et nous mettons en lumière la stratégie de la WCS pour conserver les éléphants de forêt dans le sanctuaire.

Introduction

For the last two decades, poaching has been a well-known and well-studied conservation problem for both African and Asian elephants (Bell 1984; Cumming et al. 1984; Fay and Ruggiero 1986; Douglas-Hamilton 1987; Anon. 1989; Western and Cobb 1989; Ruggiero 1990; Dublin and Jachmann 1992; Bell et al. 1993; Fay and Agnagna 1993; Milner-Gullard and Beddington 1993; Dublin et al. 1995; Jachmann 1998; Mkanda 1993; Waithaka 1997, 1998; Mubalama 2000; Mubalama and Mapilanga 2001). These studies have examined poaching in terms of its magnitude, trends, serious negative effect on elephant populations (numbers and densities, structure and distribution) and elephant behaviour, or they have examined ivory trade and law enforcement.

However, only a few of these studies (such as Nishihara 2003) have addressed the equipment that is used for poaching. Knowledge of poaching weapons seems to be limited mainly to conservation agents—both non-governmental organizations (NGOs) and government departments—or the writers assume that the weapons are known. This could explain why most anti-poaching teams are ill equipped to face their enemy, the poachers. It is imperative that researchers and protected-area managers working in elephant conservation areas have good knowledge of this equipment, especially in forest ecosystems where visibility is poor. Otherwise, they risk being intimi-

dated, sustaining serious injuries, or even being killed if they are confronted by well-equipped poachers.

Poachers also use various camouflaged, familiar-looking traps and tools, often local inventions and innovations, making detection difficult. Acquiring good knowledge of this equipment and its application will improve the ability of forest users to reconnoitre the forest and detect traps—and hence improve their margin of safety. Therefore, it is important for researchers, protected-area managers and agencies funding anti-poaching efforts to know the different types of weapons and locally developed techniques that poachers use in various elephant conservation areas, so they can equip themselves or their anti-poaching teams against risk.

This article reports the different weapons and techniques used for capturing and killing elephants in the Banyang-Mbo Wildlife Sanctuary (BMWS) that poachers who have been arrested have used over the last 10 years, and local techniques recently developed for poaching. It does not, however, discuss anti-poaching operations and strategy or law enforcement and its effectiveness that lead to arrests; these are being reported in detail elsewhere (Anthony C. Nchanji and T.C.H. Sunderland, in prep.).

Study area

The Banyang-Mbo Wildlife Sanctuary is in south-western Cameroon in central Africa (fig. 1); it extends from 5º8' to 5º36' N and 9º29' to 9º47' E and covers an area of about 66,200 ha. The climate is hot and humid with distinct but unequal dry and rainy seasons. The rainy season runs from about mid-March to the end of October. However, seldom is a month completely devoid of significant precipitation. Nchanji and Plumptre (2003) with weather data in Nguti from 1993 to 2002 show that the heaviest rainfall occurs between June and October. August with mean rainfall of 782 ± 178 mm is the wettest month while February with mean rainfall of 4 ± 3.6 mm is the driest. However, the months of June to September each have more days of rainfall (almost daily) than others. Annual rainfall ranges from 3438 to 5429 mm with a mean of 4526 mm. Relative humidity and daily temperature are fairly constant throughout the year and respectively range from 84% to 90% and 27ºC to 29ºC with means of 87% and 27ºC. Altitude ranges from 120 m in the northern part to 1756 m in the south-eastern part of the sanctuary. The sanctuary is drained with numerous permanent and seasonal streams that rise from the highlands in the south and flow into the Rivers Mbei (Mbu) and Mfi. Vegetation is generally evergreen rainforest; it falls within the Guinea-Congolian forest region as described by White (1983). Plant species diversity in the sanctuary is among the highest in Africa (T. Duncan, pers. comm.). Presently BMWS is the only submontane protected habitat in Cameroon with a potentially viable elephant population. This population of 200 to 400 remains probably the largest in the Cross–Sanaga Rivers region.

Ethnologically, BMWS is inhabited to the north by the Banyangi people, to the east by the Mbo and Banyui, to the south by the Bakossi and to the west by the Mbo and Bassosi. There are about 60 villages (fig. 1) with a total human population of about 25,000 within 5 to 20 km of the sanctuary boundaries; another 300 to 400 villages plus 5 suburban and 2 urban sites are within 30 to 150 km of the boundaries. Therefore BMWS is in a landscape dominated by humans. The economy of the entire region is predominately agriculture—small-scale cash crops (cocoa and coffee) and subsistence crops (oil palm, banana, plantain, cassava, coco yam, various vegetables)—widely supplemented by hunting and collection of several non-timber forest products.

The Wildlife Conservation Society and anti-poaching initiatives in Banyang-Mbo Wildlife Sanctuary

Wildlife Conservation Society (WCS) field biologists carrying out research in Korup National Park on the ecology of forest elephants from 1988 to 1991 were unsuccessful at radio collaring due to the low elephant population in the park, perhaps because of previous excessive poaching before the park's status was upgraded in 1986 to increase protection. In 1992 WCS extended the study area 80 km east to include the Banyang-Mbo Council Forest Reserve (BMCFR) where elephant density was found to be about five times higher than in the park (B. Powell, pers comm.); BMCFR also had high biodiversity. Within two search days in BMCFR, an elephant was successfully darted and radio collared, and later two more elephants were collared. However, active elephant poaching was serious in this unprotected forest. WCS instituted an anti-poaching campaign to protect the tagged ele-

phants while lobbying the government of Cameroon to increase protection of this forest for general biodiversity conservation and elephant protection.

In 1996 BMCFR, plus an additional adjacent forest to its south, was upgraded to become the Banyang-Mbo Wildlife Sanctuary (BMWS) with an area of about 662 km^2. WCS continued to implement anti-poaching activities, using informants, intelligence and sporadic interventions of gendarmerie and police in the area as government did not immediately appoint a conservator and guards. Meanwhile it worked with the government of Cameroon and local communities

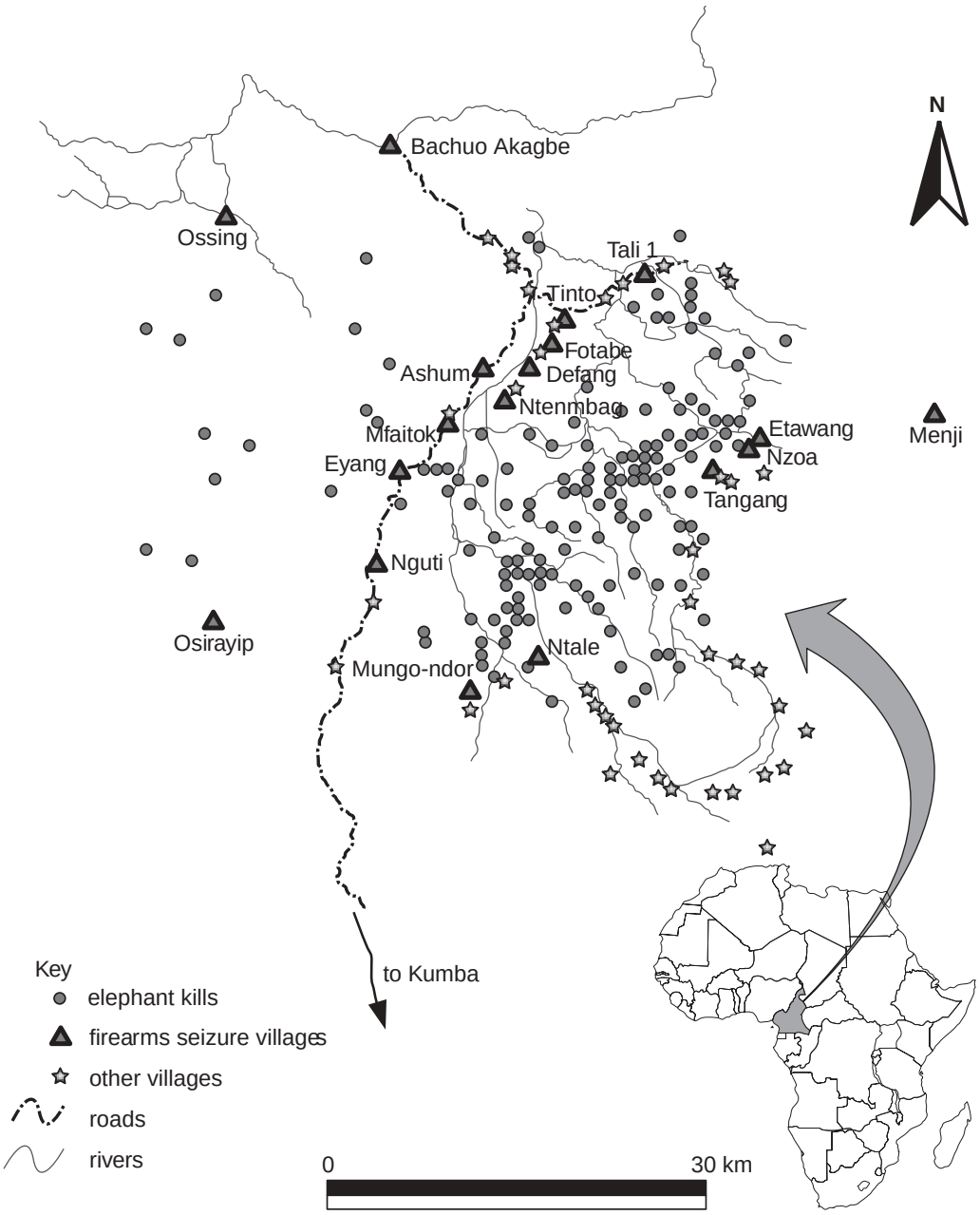

Figure 1. Location of elephants killed and villages where poaching weapons were seized, Banyang-Mbo Wildlife Sanctuary, 1993 to 2003.

to design a community-based conservation programme to protect the biodiversity and the elephants. Poaching, however, especially of elephants, continues to be a major threat to conservation in this sanctuary despite the serious commitment of the local communities and WCS. Nchanji (2004) reported 186 elephants killed in and around BMWS between January 1993 and June 2004 (fig. 1) and a remaining estimated population of 214 ± 159 elephants in the sanctuary. Despite the poaching, this sanctuary still holds the largest elephant population in south-western Cameroon. Poaching in this region is encouraged by the large domestic clandestine ivory market that flourishes in Douala, Cameroon, and the relative ease of smuggling ivory from this region into Nigeria.

Types of weapons seized from arrested elephant poachers, 1993–2003

The WCS anti-poaching campaign in the BMWS region from 1993 to 2003 confiscated 21 weapons (fig. 1, table 1) of 6 types used in killing elephants: .458 rifles (33.3%), .404 carbine rifles (23.8%), .375 Winchester rifles (19.0%), English automatic assault rifles (4.8%), imported single-barrel shotguns (9.5%), and locally made single-barrel shotguns (9.5%). Nine other weapons of these types are known to still be used for poaching within the zone but have not yet been confiscated (table 1), as the legal system in place requires substantial evidence before action. Therefore, weapons can be seized only during the actual poaching. Cameroonian firearms legislation permits individuals to own and use firearms under specified conditions for hunting and self-defense. Four (19%) of the weapons confiscated were legally owned but were used illegally. Six categories of people were identified as owners of the seized weapons: businessmen (nationals and non-nationals (33.3%), poachers (any person who illegally kills animal species protected by law (23.8%), civil servants (in this paper a non-native state employee working in the BMWS area, 19%), elites (in this paper a rich and influential person who may or may not be a state employee) of the region, currently either resident in the area or not (19%), and farmers (4.8%). Most of the owners of the seized weapons were Cameroonians (90.5%), and only two were foreigners, who were operating businesses in Douala. Natives of the region were 42.9%, Cameroonian immigrants into the region 28.6%, and civil servants 19.0%. The poachers arrested were all Cameroonians. Three (14.3%) were from out of the region, one (4.8%) was a permanent resident (an immigrant) and the rest (80.9%) were natives of the area.

Newly found methods and experiences of elephant poaching

HUNTING AND KILLING ELEPHANTS WITH SHOTGUNS

Two types of firearms—shotgun and rifle—of varying calibres are used for game hunting. The single- or double-barrelled shotgun of 15-mm diameter bore designed to use 12-mm cartridges containing 3–9 large pellets or 10–34 small pellets is meant for killing small game at close range (10–20 m). Shotguns imported from Europe or America into Cameroon cost between CFA 400,000–750,000 (~USD 725–1365) and the cartridges CFA 750–1200 (~USD 1.4–2.2) each. Rifles meant for hunting big game such as elephant, buffalo and bongo are even more expensive—CFA 750,000–1,200,000 (~USD 1365–2200), and bullets cost CFA 5000–12,000 each (~USD 9–22). These amounts of money are not easily affordable by poor rural people

Table 1. Elephant-poaching weapons confiscated in Banyang-Mbo Wildlife Sanctuary, 1993–2003

Weapon	No.	Remarks
.458 rifle	7	Includes Czech and Winchester makes; all illegally owned
.404 carbine rifle	5	One legally owned, the others illegally owned
.375 Winchester rifle	4	Two legally owned, two illegally owned
English automatic	1	Illegally imported for trade; seized in transit assault rifle
Shotgun	4	Two imported single barrel; two locally made, a single and a double barrel
	Known but not yet confiscated in Banyang-Mbo Wildlife Sanctuary	
.458	4	Two legally owned, two illegally, but all known to be used for poaching
.404 carbine rifle	4	One legally owned; all known to be used for poaching
.375 Winchester rifle	1	Legally owned, but leased to poachers

who live with the elephants and wish to hunt or own firearms to protect their property and for self-defence. Therefore, only rich civil servants or businessmen interested in bushmeat and ivory can afford to buy rifles and shotguns and hire hunters (legally or illegally) to hunt, or lease guns to hunters on specified conditions, usually 50% of the hunting proceeds of tusks or meat.

In the last three decades, local blacksmiths in both Cameroon and neighbouring countries have improved their ability to make shotguns—commonly from the steering arm of a Landrover, Peugeot or Hilux, and now produce good-quality guns that rival those imported. These are safe to use, cheap, costing CFA 50,000–80,000 (~USD 90–150), and are very effective for small game hunting. These amounts are affordable for average citizens. Many young people have such shotguns, especially farmers and people who have returned to rural areas from the city because of the existing economic recession and consider commercial hunting a fast remedy for scarce income. More than 98% of households in the eastern and northern parts of the sanctuary own a shotgun (Nzoaungo and Willcox 2000). Unfortunately these local blacksmiths operate their workshops and trade their products in secret. These guns are also used clandestinely.

Hunters in the BMWS region produce two types of forged bullets and use these in shotguns, both imported and locally made, to kill big game at close range, including even elephants and buffaloes. In the first type, the top of the plastic casing of a 12-mm cartridge is carefully opened and the bullets or missiles are emptied, melted and allowed to cool in an empty cartridge shell lined with plastic wrap structured to produce a clout with a sharply pointed end. The slug produced (fig. 2) is replaced in the case and loaded into the shotgun to kill elephants. In the second type, the plastic ends of the 12-mm cartridges are carefully opened and the pellets are replaced with metal construction rods 12 mm in diameter cut into pieces 3 cm long and well sharpened at one end (fig. 3). These are then sealed and loaded into a shotgun to kill elephants and other big game at close range, 15 to 20 m. Two elephants, aged about 23 and 34 years, were recorded killed with forged bullet type 1 and three of about 15, 21 and 28 years with type 2 during the reporting period. Carcass ages were determined from the skulls following the method of Laws (1966) with adjustments of Jachmann (1998).

Figure 2. Slug for a shotgun produced by melting bullets or missiles of 12-mm cartridges and solidifying them in a 12-mm plastic cup.

Figure 3. Forged bullets for a shotgun produced by cutting and sharpening 12-mm metal construction rods.

HUNTING ELEPHANTS WITH CABLE SNARES

Using vehicle tow ropes (fig. 4), poachers set up cable snares on regular elephant trails (around licks, drinking points, wallow points, fruiting trees) in BMWS in the way widely used in African forests to trap small game. One end of the tow rope is fastened to a large tree of diameter ≥ 50 cm and the other made into a knob and circle and attached to a trigger system. This is spread around a hole 35–40 cm diameter and 40–50 cm deep dug on an elephant trail and covered with leaves and forest litter. When the elephant steps on the tow rope, it is triggered and fastens on the ele-

Figure 4. Tow rope used as a cable snare for elephants.

phant's leg. The rope fastens further as the elephant agitates to free itself. The rope holds the elephant in place until the hunter returns several hours (or days) later and uses a shotgun as described above, or any other weapon, to kill the helpless victim. Two of these traps were observed in the sanctuary but their success or effectiveness was neither reported nor observed. Nevertheless, a poacher who developed this trap system explained that a friend with whom he hunted big game in the south-eastern forests of Cameroon has successfully killed buffaloes and bongos with the system in forests in Central African Republic. He is reproducing it in BMWS for elephants, but has yet to kill one.

HUNTING ELEPHANTS WITH PIN-BOARD TRAPS

The poachers rivet three thick, sharp triangular flat iron pins (sometimes poisoned) to a thick wooden board (fig. 5) and place the board covered with forest leaf litter on a regular elephant trail. The pin-board is attached to weak cables to hold it in position. Three or four of these pin-boards are placed on the trail in succession at intervals of about 30 to 50 cm (the probable length of an elephant footstep). The pins pierce the foot of the elephant and penetrate further as the elephant moves forward. The injured foot slows the victim and drains its strength, and the elephant leaves an easily tracked trail of blood, so that it can be shot later with relative ease. We have observed this type of trap on BMWS elephant trails on four different occasions and poachers explained its function. A farmer in Nguti on the west of the BMWS boundary confirmed that one female elephant was injured and then killed around his farm in March 2004 using this system.

SLAYING AND BURYING

Usually poachers kill elephants in and around BMWS, extract the tusks, and sell the carcass cheaply— CFA 40,000–60000 (~USD 73–109) to villagers who butcher it for food. The conservation law in Cameroon (Cameroon Govt 1994) maintains that a person caught in possession of a whole or partial carcass of a protected species is deemed to have killed the animal and is responsible for the act unless proven otherwise. It has always been difficult to track down poachers in the BMWS area, earlier due to the absence of game guards and recently because the number of patrol guards WCS recruits is insufficient to patrol the area effectively. Therefore, this provision of the law is often applied to villagers who are found butcher-

Figure 5. The pin-board trap used for trapping elephants.

ing any elephant killed or in possession of elephant meat. These villagers usually reveal the identity of the poacher and necessary interventions are undertaken to apprehend the poacher, with the villagers as prosecution witnesses.

Consequently, poachers have resorted recently to two new strategies: 1) killing elephants, extracting tusks and abandoning the carcass to rot—*slaying and burying* (fig. 6), or 2) selling the carcass cheaply to villagers on condition that they do not report the matter to officials until two or three days after the poachers have left, as an act committed within their forest by unknown poachers. The carcass, by then already decomposing (fig. 7), is inspected and the villagers are authorized to butcher it, if it still interests them. This slaying-and-burying strategy has made anti-poaching more complex and wastes an already destroyed resource, depriving villagers of cheap fresh elephant meat, and discouraging them from active participation in conserving elephants that also sometimes raid their crops.

Discussion

Arrested poachers from whom weapons were confiscated in BMWS during the reporting period have indicated a variety of people involved in the poaching chain and some newly found methods of poaching in the area. Trapping elephants with vehicle tow ropes and pin-board traps as observed in the BMWS area confirm the use of elephant snare traps using metallic logging cables and a similar version of the pin-board trap observed in Gabon (Sally A. Lahm, pers. comm.). These trapping techniques are new in the African rainforests. They can be very dangerous for other forest users, both animal and human, especially the pin-board traps. Therefore human forest users should be extremely vigilant, because such new, camouflaged trap types could threaten their safety. Although the effectiveness of these new trapping systems has not yet been observed, they are cheap, locally available and potentially effective but dangerous. It is therefore of urgent importance to locate and eliminate them.

Figure 6. Slay and bury: carcass of an elephant abandoned by poachers and left to rot in the forest after they had removed the tusks.

Figure 7. Slay and bury: villagers butcher the decomposing carcass of an elephant that poachers abandoned in the forest after removing the tusks.

Slaying and burying, though a new experience in this region and one that complicates anti-poaching efforts, has been observed in north-eastern Nigeria (Bita 1988), Central African Republic (Ruggiero 1990), north-eastern Democratic Republic of Congo (DRC) (Vanleeuwe et al. 1997), Ethiopia (Demeke and Bekele 2000), Mouadjé in north-western Republic of Congo (Nishihara 2003) and Gabon (Sally A. Lahm, pers. comm.). However, human population densities in these areas are low, poaching is far from human habitation, and local people have a low preference for elephant meat. Therefore slay and bury is a technique that is becoming prominent in forest ranges of elephants; it indicates active, intensive commercial poaching of elephant for tusks. Consequently, this could be addressed by increasing patrols in areas where elephants are concentrated, especially those under protection, and stationing well-equipped guards at blocks on strategic roads and pathways, so that poachers are arrested before they kill the elephants. Unfortunately, many protected areas in the central African region including BMWS are grossly under

staffed and poorly equipped for this task, consequently patrolling outside protected areas is a myth.

Melting small and large pellets into slugs and using them in a shotgun in the BMWS area is similar to observations of Fay and Agnagna (1993) in Central African Republic, where slugs were made by melting lead into 14-mm socket spanners and double charging them into shotguns to kill elephants. The use of assault weapons such as the AK 47 and Kalashnikov rifles observed in Congo (Nishihara 2003), DRC (Mubalama 2000; Mubalama and Mapilanga 2001), Malawi (Mkanda 1993) and Central African Republic (Ruggiero 1990), which could be attributed to war circumstances in these and neighbouring countries, was not observed in the BMWS area. However, one assault weapon was confiscated from a Nigerian trader operating illegally in complicity with a villager in the region. Other such weapons may also be in use in Cameroon, possibly originating from fugitives of the Chadian war.

Poaching in the BMWS region appears to be a complex activity sponsored by members of the elite group, civil servants and rich foreign businessmen who reside far from the region. This activity is most likely driven by the underground ivory market flourishing in Douala, where most of these sponsors live or have relations who understand the network. Subverting such a market might be a more rewarding anti-poaching strategy than merely targeting and arresting culprits at site. About 48% of the weapons confiscated in arrests belonged to natives of the BMWS area. Hence the very local people who are most likely to benefit from conservation in the area are promoting poaching more than anyone else.

It would appear that people of this region consider killing elephants as their customary right, despite long-time conservation efforts of the government in collaboration with conservation agencies. Given this fact, it may be necessary to strictly implement the conservation law so that culprits suffer maximum sentences, with the intent to deter others. However, continued poaching may also indicate that local people are yet to perceive benefits from conservation. Therefore anti- poaching efforts in BMWS and elsewhere must not only concentrate on arresting poachers on site but extend to sensitizing the indigenous elites and local population at all levels, so that they perceive conservation as beneficial to them locally. Combating poaching thus requires a more educational approach than merely pursuing and arresting poachers.

The WCS programme at BMWS has witnessed much anti-poaching success by confiscating 21 poaching firearms (average of 2 a year) from the region with the collaboration of the state counsels, gendarmerie and police, local administrators, some traditional leaders, informants and intelligence agents during the last 10 years. This ensued with minimal involvement of the competent Cameroon ministry in charge of conservation. This ministry has recently appointed a conservator who will organize, coordinate and supervise anti-poaching activities with direct financial support of WCS, which will provide a team of well-trained patrol guards and logistics. In addition WCS has so far established village forest management committees (VFMCs) in 29 of 60 villages around the sanctuary and registered them by the Cameroonian law of association as 'common initiative groups'. These VFMCs are already organizing their own patrols for surveillance of their territorial forests in the sanctuary and reporting poachers and other defaulters.

VFMCs are also being trained to write proposals and raise funds so they can handle microprojects that open opportunities for alternative livelihoods, with particular focus on poachers and hunters. Nature Cameroon, a local NGO created by WCS, identifies the microprojects through needs-assessment analyses. It coordinates the VFMCs and fundraises locally so that such projects may be carried out. Such activities make local people fully aware of the benefits conservation brings to their area.

Crop raiding by elephants from the sanctuary is still a problem, but poachers aggravate it in two ways. 1) Poachers kill deep in the forest, forcing elephants into farmland vicinities where they are left more peacefully—and where they sporadically raid crops. 2) Cameroonian conservation law allows for killing of protected animals to protect human life and property but emphasizes that the slaughter must be reported within three days. Hence poachers subtly herd elephants from the forest to kill them illegally near farmlands or villages in the pretence of applying this law, but they never report their kill. This has frustrated all attempts to mitigate elephant crop raiding in the region. Consequently poaching is the major cause of crop raiding at the moment around BMWS. Therefore anti-poaching in BMWS is a dual programme—to protect the elephants and to mitigate their crop raiding.

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References

Anon. 1989. The ivory trade and the future of the African elephant. Summary of the interim report of the Ivory Trade Review Group. IUCN/SSC/AfESG. *Pachyderm* 12:32–37.

Bell RHV, Jachmann H, Chimbali DM, Mulonda EY. 1993. Illegal activities and law enforcement in the Central Luangwa Valley, Zambia from 1979–1992. *Pachyderm* 16:81.

Bell RHV. 1984. Monitoring illegal activities and law enforcement in African conservation areas. In: Bell RHV and McShane-Calusi E, eds. *Conservation and wildlife management in Africa*. US Peace Corps, Washington, DC.

Bita BB. 1988. The rising spate of elephant poaching in the Lake Chad area. A situation report submitted to the Ministry of Agriculture and Natural Resources, Borono State, Nigeria.

Cameroon Government. 1994. Law No. 94-1 of January 1994 to Lay Down Forestry, Wildlife and Fisheries Regulations. Official Gazette Department, Presidency of the Republic of Cameroon.

Cumming DHM, Martin RB, Taylor RD. 1984. Questionnaire survey on the management and conservation of elephants and rhinos. In: Cumming DHM and Jackson P. *The status and conservation of Africa's elephants and rhinos.* IUCN Gland, Switzerland. p. 46–62.

Demeke Y, Bekele A. 2000. Study on the elephants of Mago National Park, Ethiopia. *Pachyderm* 28:32–48.

Douglas-Hamilton I. 1987. African elephant population trends and their causes. *Oryx* 21:1–24.

Dublin HT, Jachmann H. 1992. *The impact of the ivory ban on illegal hunting of elephants in six range states in Africa*. WWF International Research Report. WWF, Gland, Switzerland.

Fay MJ, Agnagna M. 1991. Forest elephant population in the Central African Republic and Congo. *Pachyderm* 14:3–19.

Fay MJ, Agnagna M. 1993. Elephants and ivory in Congo since the ban: the lull before the storm? *Pachyderm* 16:51–58.

Fay MJ, Ruggiero RG. 1986. Poaching and anti-poaching in Manovo-Gounda St Floris National Park. Unpublished report to WWF/IUCN and government of Central African Republic.

Jachmann H. 1988. Estimating age in the African elephant: a revision of Laws's molar evaluation technique. *African Journal of Ecology* 22:51–56.

Laws RM. 1966. Age criteria for the African elephant, *Loxodonta africana africana*. *East African Wildlife Journal* 4:1–37.

Millner-Gulland EJ, Beddingon JR. 1993. The relative effects of hunting and habitat destruction on the elephant population dynamics over time. *Pachyderm* 17:75–90.

Mkanda FX. 1993. Status of the elephants and poaching for ivory in Malawi: a case study in Liwonde and Kasungu National Parks. *Pachyderm* 6:36–41.

Mubalama L. 2000. Population and distribution of elephants (*Loxodonta africana africana*) in the central sector of the Virunga National Park, eastern DRC. *Pachyderm* 28:44–55.

Mubalama L, Mapilanga JJ. 2001. Less elephant slaughter in the Okapi Faunal Reserve, Democratic Republic of Congo, with Operation Tango. *Pachyderm* 31:36–41.

Nchanji AC. 2004. Threats, constraints and critical issues facing the conservation of Banyang-Mbo Wildlife Sanctuary. Unpublished report submitted to Ministry of Environment and Forestry, Yaounde, and the Banyang-Mbo Wildlife Sanctuary Steering Committee, March 2004.

Nchanji AC, Plumptre AJ. 2003. Seed germination and early seedling establishment of some elephant-dispersed species in Banyang-Mbo Wildlife Sanctuary, south-

western Cameroon. *Journal of Tropical Ecology* 19:229–237.
Nishihara T. 2003. Elephant poaching and ivory trafficking in African tropical forests with special reference to the Republic of Congo. *Pachyderm* 34:66–74.
Nzouango D, Willcox SA. 2000. Bushmeat extraction survey within the Banyangi and Mbo tribes in the Southwest Province of Cameroon. Unpublished report submitted to the Wildlife Conservation Society, Bronx, New York, and Cameroon Biodiversity Programme, Banyang-Mbo Wildlife Sanctuary Project, Yaounde.
Ruggiero R. 1990. The effects of poaching disturbance on elephant behaviour. *Pachyderm* 13:42–44.
Vanleeuwe H, Gautier-Hion A, Cajani S. 1997. Forest clearings and the conservation of elephants (*Loxodonta africana cyclotis*) in north-east Congo republic. *Pachyderm* 24:46–52.
Waithaka J. 1997. Elephant poaching in Kenya. *Pachyderm* 24:66.
Waithaka, J. 1998. Trends of elephant poaching in Kenya: the elephant mortality database. *Pachyderm* 25:40–41.
Western D, Cobb S. 1998. The ivory trade review. *Pachyderm* 11:1–12.
White F. 1983. The vegetation of Africa. UNSCO, Paris.