

Pachyderm

January – June 2014

Number 55





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Pachyderm

Journal of the African Elephant, African Rhino
and Asian Rhino Specialist Groups

January – June 2014

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Cover: Angolan authorities rarely inspect the displays of ivory in Mercado do Artesanato in Luanda, resulting in the largest quantity of illegal ivory on sale in southern Africa.

Credit: Lucy Vigne

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Acknowledgements

The production of this issue of *Pachyderm* was possible through contributions from a number of organizations and individuals. In particular, we would like to thank the following:



CHAIR REPORTS

African Elephant Specialist Group report **Rapport du Groupe des Spécialistes des Éléphants d'Afrique**

Holly T Dublin, Chair/Président

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Africa's elephants continue to need our dedicated attention. With the African Elephant Summit concluded, 2014 gave us little time to breathe before the action started! A huge amount of work has been accomplished so far, not only by AfESG but by the many members and organizations out there, on behalf of the African elephant.

For the AfESG Secretariat, the dominant focus for the first half of 2014 has been on developing strategy and action plans for improving the structure and functionality of the African Elephant Database (AED). So, in line with our time commitment to the AED, this report focuses largely on this work.

The African Elephant Database (AED)

With the current pressures on the African elephant, a huge amount of attention has been coming from all quarters. All these interested parties rely on AfESG for accurate information on the status of the species. Therefore, it is vital that AfESG is enabled to continue to provide reliable and up-to-date information to enable well-informed decisionmaking and actions. Some of the new commitments and initiatives at local, national and international levels rely explicitly on verifiable evidence of the recovery of elephant numbers for financial assessments to be disbursed.

Fully cognizant of this growing need, I have been spending a significant amount of time working to ensure that the AED can meet these expectations, now and into the future. While the

Les éléphants d'Afrique continuent à avoir besoin de notre attention consciencieuse. Suite à la conclusion du Sommet sur l'éléphant d'Afrique, l'année 2014 nous a donné peu de temps pour respirer avant le commencement de l'action! Une énorme quantité de travail a été accompli jusqu'ici, non seulement par le GSEAf, mais aussi par de nombreux membres et organisations, au nom de l'éléphant d'Afrique.

Pour le Secrétariat du GSEAf, notre travail au cours de la première moitié de 2014 était surtout centré sur le développement de la stratégie et des plans d'actions visant à améliorer la structure et la fonctionnalité de la Base de Données sur l'Éléphant d'Afrique (BDEA). Étant donné le temps que nous consacrons à la BDEA, ce rapport se concentre principalement sur ce travail.

La Base de Données sur l'Éléphant d'Afrique

A cause des pressions actuelles sur l'éléphant d'Afrique, il y a une attention énorme venant de toutes parts. Tous ceux qui s'y intéressent dépendent du GSEAf pour des informations précises sur la situation de l'espèce. Par conséquent, il est essentiel que le GSEAf puisse continuer à fournir des informations fiables et actualisées pour permettre la prise de décisions et des actions bien informées. Certains des nouveaux engagements et initiatives aux niveaux local, national et international dépendent explicitement des preuves vérifiables du rétablissement du nombre d'éléphants pour les évaluations financières.

Pleinement consciente de ce besoin croissant, j'ai passé une quantité importante du temps de travail afin de m'assurer que la Base de Données sur les Éléphants

Data Review Working Group (DRWG), which oversees the AED, has never previously had a Chair, I decided that in this critical period it was important that it did so and appointed Dr Chris Thouless to this key role. I know Chris will bring new energy to the AED to progress in meeting the challenges we face.

We held a two-day meeting of the DRWG in early May, which was as always, a vibrant and dynamic meeting of minds ready with ideas and innovations for progressing the AED. In addition to a number of technical matters, the DRWG discussed the design and functioning of a process that would hope to bring in a wider group of reviewers to assist with the initial review of survey reports. We hope that this will not only relieve the overall workload on DRWG members but will also encourage a much wider group to gain familiarity with the way in which the AED is structured. Of course, all good things have their challenges and the DRWG agreed that while this may reduce workload on our volunteer members, it will definitely increase the workload on the Secretariat. As I report below, we are faced with a number of challenges but have initiated a significant fundraising push for the AED.

The meeting also discussed a number of new and changing survey methods, potential changes to the AED's analytical framework, our desire to progress further on trend analysis and the technical needs for the next *Red List* assessment. We also agreed on a set of improvements that are needed to enhance the current web interface of the AED to further its usefulness as a data management, conservation and communications tool. Finally, we discussed the potential addition of other important databases of African species, currently being compiled within the SSC membership, to the AED platform. The DRWG was excited by the prospects and agreed that this could bring considerable synergies—not least of which could potentially be real cost savings on all sides!

An immediate action item emanating from the meeting was the appointment of Howard Frederick, one of the most active survey experts in AfESG, to DRWG membership. Howard accepted this appointment and we are pleased to have him on the team. Other gaps were identified, and we will be issuing a call for nominations from within AfESG to fill those gaps.

d'Afrique (BDEA) puisse répondre à ces attentes, maintenant et à l'avenir. Alors que le Groupe de Travail sur la Révision des Données (GTRD), qui supervise la BDEA n'a jamais eu un président auparavant, j'ai décidé que, dans cette période critique, il était important de le faire et j'ai nommé le Dr. Chris Thouless à ce rôle clé. Je sais que Chris va apporter une nouvelle énergie à la BDEA pour relever les défis auxquels nous sommes confrontés.

Nous avons tenu une réunion du GTRD de deux jours au début du mois de mai, qui était, comme toujours, une réunion vivante et dynamique des esprits pleins d'idées et d'innovations pour faire progresser la BDEA. En plus de plusieurs questions techniques, le GTRD a discuté de la conception et du fonctionnement d'un processus qui ferait participer un plus grand groupe d'examineurs à l'examen initial des rapports d'étude. Nous espérons que cela servira non seulement à réduire le travail fait par les membres du GTRD, mais aussi à encourager un groupe de personnes plus large à se familiariser avec la façon dont la BDEA est structurée. Bien sûr, toutes les bonnes choses ont leurs défis et le GTRD s'est mis d'accord que même si ce processus pourrait réduire de travail de ses membres bénévoles, il va certainement augmenter le travail du Secrétariat, et comme je le rapporte ci-dessous, nous sommes confrontés à de nombreux défis, mais nous avons lancé une initiative importante de collecte de fonds pour la BDEA.

La réunion a également examiné un certain nombre de nouvelles méthodologies d'étude qui évoluent, des changements potentiels au cadre analytique de la BDEA, notre désir de progresser davantage sur l'analyse des tendances et les besoins techniques pour la prochaine évaluation de la *Liste rouge*. Nous nous sommes également mis d'accord sur un ensemble de changements qui sont nécessaires à l'amélioration de l'interface actuel du Web de la BDEA pour le rendre plus utile en tant qu'outil de gestion des données, de conservation et de communication. Enfin, nous avons parlé de l'ajout éventuel d'autres bases de données importantes des espèces d'Afrique, actuellement en train d'être compilées par les membres de la CSE, à la plate-forme de la BDEA. Le GTRD était impressionné par ces perspectives et a convenu que cela pourrait apporter des synergies considérables, sans parler des vraies économies sur tous les côtés!

Un élément d'action immédiate émanant de la réunion a été la nomination de Howard Frederick, l'un des experts en recensement les plus actifs au sein du GSEAF, comme membre du GTRD. Howard a accepté cette nomination et nous sommes heureux de l'avoir dans l'équipe. D'autres lacunes ont été identifiées, et nous publierons un appel de

The AED is now one of our highest fundraising priorities. We have no shortage of wonderful ideas for improvements and enhancements, but foremost we desperately need the resources to underpin the Secretariat's ability to implement them. We currently have only one full-time staff member on the AED—our database officer, Peter Mwangi. While our multi-talented, multi-tasking programme officer, Diane Skinner, has been spending a huge amount of time on the AED, this arrangement is not appropriate or sustainable and certainly not commensurate with our aspirations. Therefore, we must secure dedicated funds to allow us to hire a database manager to oversee the AED, including undertaking those infrastructural improvements that have been identified as essential. We also need to raise funds to publish a full *African Elephant Status Report*; 2015 is our current target date.

An exciting and promising initiative in which we are actively involved this year has been the Pan African Elephant Aerial Survey (PAEAS) (more information at <https://greatelephantcensus.com>). This survey effort will cover savanna populations throughout much of eastern and southern Africa, as well as some savanna areas in central and West Africa. A number of AfESG members have participated in two different planning meetings for this effort, and we are discussing the participation of our new DRWG Chair on the PAEAS's Technical Advisory Team, on behalf of AfESG. We are also working to put in place an institutional memorandum of understanding between AfESG and the PAEAS.

African Elephant Library

I wish to draw special attention to the great progress that has been made this year on the African Elephant Library (AEL). Late last year, we hired a short-term information management assistant, Francis Ngesa, to assist us with digitizing the AEL. Francis took on an elephantine amount of work, scanning close to 5,000 references from our dusty collection. Francis also researched a number of different online library solutions to allow us to share this wealth of information with the AfESG membership. With the help of AfESG member Julian Blanc and our partner in this project, Save the Elephants, we finally settled on Zotero, a commonly used online reference management

candidatures au sein du GSEAF pour combler ces lacunes.

La BDEA est maintenant l'une de nos priorités de financement les plus importantes. Nous ne manquons pas d'idées merveilleuses pour des améliorations, mais d'abord et avant tout nous avons désespérément besoin de ressources pour soutenir la capacité du Secrétariat à les mettre en œuvre. Nous avons actuellement un seul employé travaillant à plein temps sur la BDEA - notre chargé de la banque de données, Peter Mwangi. Notre chargé de programme, Diane Skinner, qui est multi-talentueuse et fait plusieurs choses à la fois, passe beaucoup de temps sur la BDEA ; ceci n'est pas approprié ou durable et ne correspond certainement pas à nos aspirations. Par conséquent, il nous faut obtenir des fonds dédiés pour nous permettre d'embaucher un gestionnaire de la base de données pour superviser la BDEA, notamment en faisant ces améliorations d'infrastructure qui ont été identifiées comme étant essentielles. Il faut également mobiliser des fonds pour publier un rapport complet sur la *Situation de l'Eléphant d'Afrique*: 2015 est notre date cible actuelle.

Une initiative très intéressante et prometteuse dans laquelle nous participons activement cette année est l'Etude Aérienne Panafricaine sur l'Eléphant (EAPE) (plus d'informations sur <https://greatelephantcensus.com>). Cette étude couvrira les populations de la savane dans une grande partie de l'Afrique orientale et australe, ainsi que des zones de savane en Afrique centrale et en Afrique de l'Ouest. Plusieurs membres du GSEAF ont participé à deux réunions de planification pour cet effort, et nous discutons de la participation de notre nouveau président du GTRD à l'équipe consultative technique de l'EAPE, pour le compte du GSEAF. Nous travaillons également à mettre en place un protocole d'entente institutionnel entre le GSEAF et l'EAPE.

Bibliothèque sur l'éléphant d'Afrique

Je tiens à attirer votre attention sur les progrès formidables réalisés cette année en ce qui concerne la Bibliothèque sur l'Eléphant d'Afrique (BEAF). L'année dernière, nous avons embauché un assistant en gestion de l'information, Francis Ngesa, à court-terme pour nous aider à la numérisation de la BEAF. Francis a entrepris un travail gigantesque en scannant près de 5000 références dans notre collection poussiéreuse. Francis a également étudié plusieurs solutions de bibliothèque en ligne pour nous permettre de partager cette richesse d'information avec les membres du GSEAF. Avec l'aide de Julian Blanc, membre du GSEAF et notre partenaire dans ce projet, Save the Elephants, nous nous sommes finalement fixés

system. After concerted work to finalize the management protocol, we launched the new AEL to the AfESG membership in May this year. It is an exciting new advance for this incredible resource and I welcome our readership to check it out and put it to work. The AEL can be accessed at <https://zotero.org/groups/ael>.

I cannot leave the topic of the AEL without taking the opportunity to thank Mary Rigby for her many years of dedicated service. This global asset would never have been possible without her.

Human–elephant conflict

There is also exciting news on the human–elephant conflict (HEC) front. The HEC Working Group co-Chairs, Noah Sitati and Richard Hoare, have agreed to set up an online network for HEC practitioners within the AfESG to interact, share their experiences and discuss emerging issues. I am hopeful that this will provide the invigoration that we need to get the HEC Working Group moving forward.

International attention to the African elephant

After the African Elephant Summit last December, attention to the plight of the African elephant has steadily increased. The London conference on the illegal wildlife trade took place in February, and the United Nations Environment Assembly in June, and both resulted in further strong declarations by participating governments to take immediate action. A number of international campaigns are under way to raise awareness; funding and interest continues to surge. We are now gearing up for the next meeting of the CITES Standing Committee in July 2014. As usual, we look forward to providing a report to the AfESG membership on those deliberations.

Departing Diane

And this brings me to the most important challenge facing the AfESG: our much-loved programme officer, Diane Skinner, will be departing at the end of August. Diane has been an extraordinary colleague, confidante and friend. Saying that

sur Zotero, un système de gestion de référence en ligne couramment utilisé. Après un travail concerté pour finaliser le protocole de gestion, nous avons lancé la nouvelle BEAf aux membres du GSEAf en mai de cette année. Il s'agit d'une nouvelle avancée passionnante pour cette ressource incroyable et je demande à notre lectorat de la vérifier et la mettre à l'œuvre. On peut consulter la BEAf sur <https://zotero.org/groups/ael>.

Je ne peux pas laisser le sujet de la BEAf sans profiter de l'occasion de remercier Mary Rigby pour ses nombreuses années de services dévoués. Cet atout mondial n'aurait jamais été possible sans elle.

Conflit homme–éléphant

Il y a aussi d'excellentes nouvelles en ce qui concerne le conflit homme-éléphant (CHE). Les coprésidents du Groupe de travail sur le CHE, Noé Sitati et Richard Hoare, ont convenu de mettre en place un réseau en ligne pour les praticiens du CHE au sein du GSEAf afin qu'ils puissent interagir, partager leurs expériences et discuter des questions émergentes. J'espère que cela créera la dynamisation dont nous avons besoin pour que le Groupe de travail sur le CHE fasse des progrès.

Attention internationale sur l'éléphant d'Afrique

Après le Sommet sur l'éléphant d'Afrique en décembre dernier, l'attention sur le sort de l'éléphant d'Afrique a augmenté de façon constante. La conférence de Londres sur le commerce illégal des espèces sauvages a eu lieu en février, et l'Assemblée des Nations Unies sur l'environnement en juin ; toutes ont donné lieu à des déclarations solides par les gouvernements participants de prendre des mesures immédiates. Un certain nombre de campagnes internationales de sensibilisation sont en cours; le financement et l'intérêt continuent à augmenter. Nous nous préparons maintenant pour la prochaine réunion du Comité permanent de la CITES en juillet 2014. Comme d'habitude, nous sommes impatients de fournir un rapport aux membres du GSEAf sur ces délibérations.

Le départ de Diane

Et cela m'amène au défi le plus important auquel fait face le GSEAf: le départ de notre chargé de programme bien-aimé, Diane Skinner, à la fin d'août. Diane a été une collègue extraordinaire, une confidente et une amie. Dire

every one of us will miss her would be a gross understatement. She has demonstrated her professionalism in every way: her attention to detail and content, her unparalleled ability to multi-task, her exceptional interpersonal skills and networking abilities, her never-ending commitment to maintaining dialogue even when there are differing views and opinions—and most importantly for me, her tenacity in teaching me day by day, for the past six years, that there is such a thing as work–life balance. All will know that this is not one of my strengths but even I have made some progress thanks to her dedicated tutelage!

While AfESG is losing an indefatigable champion, I know everyone whose life has been touched by Diane joins me in wishing her a well-deserved break and an exciting next chapter. Change can be challenging but always positive in the end and I know I will be supporting her every step of the way.

Conclusion

In ending, I ask for the full backing of our members, partners and friends to support my colleagues in the AfESG Secretariat and me through what promises to be a difficult few months of transitioning ahead.

qu'elle va manquer à nous tous serait un euphémisme. Elle a démontré son professionnalisme dans tous les sens: son attention au détail et au contenu, sa capacité inégalée de faire plusieurs tâches à la fois, ses compétences interpersonnelles exceptionnelles et ses capacités de réseautage, son engagement à maintenir le dialogue, même quand il y a des points de vue et des opinions divergents, mais plus important, sa ténacité en m'enseignant jour par jour, pendant les six dernières années, qu'il un équilibre entre le travail et la vie, ce qui, comme vous le savez, n'est pas un de mes points forts, même si j'ai fait des progrès grâce à sa tutelle dédiée!

Alors que le GSEAF perd un champion infatigable, je sais que tout le monde dont la vie a été touchée par Diane se joint à moi pour lui souhaiter un repos bien mérité et un prochain chapitre passionnant. Le changement peut être difficile, mais toujours positif à la fin et je sais que je vais la soutenir à chaque étape de son chemin.

Conclusion

En terminant, je demande à nos membres, nos partenaires et nos amis de soutenir mes collègues au Secrétariat du GSEAF et moi-même au cours des quelques mois difficiles de la transition à venir.

African Rhino Specialist Group report

Rapport du Groupe des Spécialistes des Rhinocéros d'Afrique

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Poaching update

Poaching of rhinos continues at a continental level. A total of 1,107 rhinos were reported poached in 2013, equivalent to a rate of 3.03 rhinos per day (Table 1). Encouragingly, the continental level of poaching in the first half of 2014 has levelled off.

South Africa with the largest share (82%) of Africa's rhinos continues to experience the greatest losses in absolute terms since 2009. In relation to the 2012 South African population total, the percentage of rhinos lost to poaching between 2013 and 2014 has remained constant at 4.8%. Analysis of the daily poaching rates per quarter for South Africa indicates that poaching appears to have stabilized over the last 15 months (Figure 1). After increasing exponentially since 2007, the recorded average poaching levels in the first half of 2014 were the same as the 2013 average levels of 3.00 rhinos poached per day. It remains to be seen whether this apparent levelling off in poaching in South Africa (and indeed also continental levelling off) will continue, or whether poaching will once again continue to trend upwards as happened after a period of about a year of relative stability in South Africa in 2010/2011. (Post script: With the loss of 122 rhinos in July 2014, there may be signs that the rate of poaching has increased again in the third quarter in South Africa).

Table 1 shows that in relative terms poaching levels in Kenya from 2012 to 2013 approximately doubled, from 2.8% to 5.8% of 2012 population totals respectively. Encouragingly, as in South Africa, poaching in the first half of 2014 has levelled off at 5.1% of the end 2012 numbers (Table 1). While poaching levels in both Kenya and South Africa are currently still at biologically sustainable levels (i.e. not currently leading to population declines, it may not be from a financial

Mise à jour sur le braconnage

Le braconnage des rhinocéros se poursuit au niveau continental. On a signalé le braconnage d'un total de 1.107 rhinocéros en 2013, ce qui équivaut à un taux de 3,03 rhinocéros par jour (Tableau 1). Fait encourageant, le niveau continental du braconnage dans la première moitié de l'année 2014 s'est stabilisé.

L'Afrique du Sud ayant la plus grande part (82%) des rhinocéros d'Afrique continue de subir les pertes les plus importantes en termes absolus depuis 2009. En ce qui concerne la population totale sud-africaine de 2012, le pourcentage des rhinocéros perdus au braconnage entre 2013 et 2014 est resté constant à 4,8%. L'analyse des taux de braconnage quotidien par trimestre pour l'Afrique du Sud indique que le braconnage semble s'être stabilisé au cours des 15 derniers mois (Figure 1). Après avoir augmenté de façon exponentielle depuis 2007, les niveaux de braconnage moyens enregistrés au cours du premier semestre 2014 étaient les mêmes que les niveaux moyens de 2013 de 3,00 rhinocéros braconnés par jour. Il reste à voir si cette mise à niveau apparente du braconnage en Afrique du Sud (et en effet une mise à niveau continentale) continuera, ou si le braconnage continuera une fois de plus à avoir une tendance à la hausse comme cela s'est produit après une période d'environ une année de relative stabilité en Afrique du Sud en 2010-2011. Post scriptum: Suite à la perte de 122 rhinocéros en juillet 2014, il y a des signes que le taux de braconnage a encore augmenté au cours du troisième trimestre en Afrique du Sud.

Le Tableau 1 montre que, en termes relatifs, les niveaux de braconnage au Kenya entre 2012 et 2013 ont approximativement doublé, passant de 2,8% à 5,8% de la population à la fin de 2012. Il est encourageant que, comme en Afrique du Sud, le braconnage dans la première moitié de l'année 2014 s'est stabilisé par 5,1% des totaux de la fin 2012 (Tableau 1). Alors que les niveaux de braconnage au Kenya et en Afrique du Sud sont actuellement encore à des niveaux biologiquement viables (c'est à dire ne menant

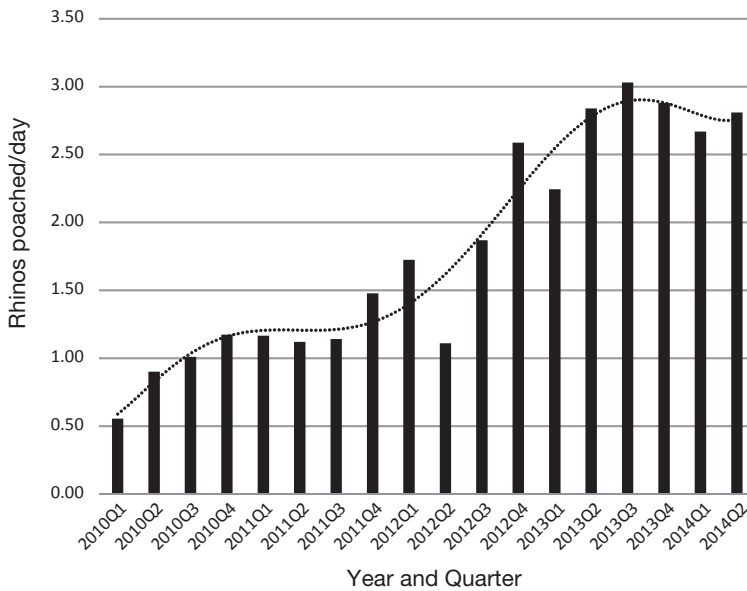


Figure 1. Reported South African rhino poaching by quarter from Jan 2010 to June 2014, with a fitted polynomial trend line (South African Department of Environmental Affairs/SANParks data)

Figure 1: Braconnage de rhinocéros d'Afrique du Sud rapporté par trimestre de janvier 2010 à juin 2014, avec une ligne de tendance polynomiale (Données du Ministère sud-africain des Affaires environnementales/SANParks ajustées)

perspective); both are approaching the tipping point where poaching will cease to be sustainable and deaths will start to exceed births.

The loss of a few animals from the small Malawi black rhino population makes this population particularly vulnerable to demographic anomalies (Table 1). While poaching in Namibia remains relatively low, Table 1 worryingly shows that poaching now appears to be increasing there. In addition to the number poached, some horns were also recovered in a bust at Windhoek airport in 2014.

Encouragingly, poaching in Zimbabwe has continued to decline since 2012 (Table 1). This arises from the implementation of dedicated, highly trained personnel engaged in anti-poaching activities in albeit a few focused populations, with close monitoring and a good working relationship with the local law-enforcement agencies.

Note that these figures in Table 1 are the minimum number reported poached, and the true figure is likely to be higher as some carcasses will not have been detected (especially in very large areas or in the case of very young animals).

pas actuellement aux déclinés de la population, peut-être pas d'un point de vue financier); les deux approchent le point de basculement où le braconnage cessera d'être viable et les décès commenceront à dépasser les naissances.

La perte de quelques animaux de la petite population de rhinocéros noir du Malawi rend cette population particulièrement vulnérable à des anomalies démographiques (Tableau 1). Alors que le braconnage en Namibie reste relativement faible, le Tableau 1 montre de manière inquiétante que le braconnage semble maintenant y augmenter. En plus du nombre braconné, des cornes ont également été retrouvées dans un raid à l'aéroport de Windhoek en 2014.

De manière encourageante, le braconnage au Zimbabwe a continué à diminuer depuis 2012 (Tableau 1). Ceci découle de la mise en œuvre d'un personnel dévoué, hautement qualifié engagé

dans des activités anti-braconnage, et dans quelques populations ciblées, avec une surveillance étroite et une bonne relation de travail avec les forces de l'ordre locales.

Notez que ces chiffres représentent le nombre minimum braconné déclaré, et le chiffre réel est probablement plus élevé car certaines carcasses n'auront pas été détectées (en particulier dans les très grandes aires ou dans le cas de très jeunes animaux). Les bébés rhinocéros qui ont disparu ou sont morts après que leurs mères aient été braconnés ou blessés et sont morts par la suite sont considérés comme des décès dus au braconnage. Quelques uns des animaux immobilisés qui avaient eu leurs cornes amputées ont survécu, mais ils ont aussi été comptés comme braconnés. Les animaux qui traversent la frontière vers le Mozambique à partir du Parc national Kruger continuent d'avoir une espérance de vie très limitée compte tenu de la pression du braconnage très élevé là-bas. Le braconnage total au Mozambique aurait aussi été beaucoup plus élevé s'il n'y avait pas eu des efforts des défenseurs de la nature locaux et les concessionnaires de chasse au Mozambique, qui ont refoulé de nombreux rhinocéros qui venaient du parc Kruger vers la frontière jusqu'en Afrique du Sud. Les informations sur le braconnage au Mozambique sont

Young calves that disappeared or died after their mothers were poached or injured and subsequently died are considered as poaching deaths. A few of the immobilized animals that had horns hacked off have survived but these too have been counted as poached.

Animals moving across the border into Mozambique from Kruger National Park continue to have a very low life expectancy given the very high poaching pressure there. The Mozambique poaching total would also have been much higher had it not been for the efforts of local conservationists and hunting concessionaires in Mozambique, who have chased back many rhinos that came in from Kruger Park across the border into South Africa. Poaching information for Mozambique is incomplete and true numbers poached could well be higher. Recent Tanzanian poaching information is also incomplete, especially for the Selous Game Reserve where information is lacking.

Responses, meetings and initiatives to address the poaching threat

United for Wildlife meeting

Between 11 and 12 February 2014 the United for Wildlife (UfW) partnership between international conservation organizations and the Royal Foundation convened a conference at the Zoological Society of London to seek solutions to the international illegal wildlife trade crisis and reduce the demand for illegal wildlife products, seen as the key driver of trade. The meeting was attended by about 250 delegates from about 30 countries (see <http://www.unitedforwildlife.org/#/>). The meeting recognized there was a need to strengthen site protection including the commitment to protection and patrolling; encourage local incentives for conservation and use new technologies; expose and suppress illegal wildlife trafficking; reduce consumer demand for illegal wildlife products; and make long-term financial commitment towards sustainable conservation. There was a commitment of actively pursuing these recommendations.

incomplètes et les vrais chiffres braconnés pourraient bien être plus élevés. Des informations récentes sur le braconnage tanzanien sont également incomplètes, en particulier pour la réserve de Selous où l'on manque d'informations.

Réponses, réunions et initiatives de lutte contre la menace du braconnage

Réunion de la fondation United for Wildlife (Unis pour la Faune Sauvage)

Entre le 11 et le 12 février 2014, United for Wildlife, un partenariat entre les organisations de conservation internationales et la Fondation Royale, a organisé une conférence à la Société Zoologique de Londres pour chercher des solutions à la crise du commerce international illégal de la faune et réduire la demande pour les produits de la faune sauvage, considérée comme le principal moteur du commerce. Environ 250 délégués de 30 pays ont assisté à la réunion (voir <http://www.unitedforwildlife.org/#/>). La réunion a reconnu qu'il fallait renforcer la protection des sites, y compris l'engagement à la protection et des patrouilles, promouvoir des incitations locales pour la conservation et l'utilisation des nouvelles technologies; exposer et réprimer le trafic illicite de la faune sauvage; réduire la demande des consommateurs pour les produits illicites des espèces sauvages; et faire un engagement financier à long terme en faveur de la conservation viable. Il y a eu un engagement de poursuivre activement ces recommandations.

La Conférence internationale sur le commerce illicite de la faune à Londres en février 2014

Cette conférence, qui a immédiatement suivi la réunion de la fondation United for Wildlife, a réuni de hauts représentants de plus de 50 pays et organisations internationales pour qu'ils se mettent d'accord sur des mesures nouvelles et audacieuses pour lutter contre le commerce illégal des espèces sauvages. La déclaration (voir https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/281289/london-wildlife-conference-declaration-140213.pdf) a mis en évidence les quatre actions principales suivantes:

- Eradiquer le marché des produits illicites des espèces sauvages
- Assurer des cadres juridiques et des dissuasions efficaces

International Conference on the Illegal Wildlife Trade (IWT) in London in February 2014

This conference, which immediately followed the UFW meeting, brought together senior representatives of over 50 countries and international organizations to agree on new and bold measures to tackle the illegal wildlife trade. The declaration (see https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/281289/london-wildlife-conference-declaration-140213.pdf) highlighted the following four main actions:

- Eradicating the market for illegal wildlife products
- Ensuring effective legal frameworks and deterrents
- Strengthening law enforcement
- Promoting sustainable livelihoods and economic development.

It was agreed that to successfully tackle the illegal wildlife trade and its effects, concerted political leadership, community engagement and international cooperation over a sustained period were needed. It was also realized that to support these efforts further research was needed into the scale of the environmental, political, social and economic implications of the trade, as well as an improved understanding of the illegal trade itself and the effect of measures taken to prevent and combat it.

Unfortunately, the meeting did not have representation from South Africa and India, the range States that together host the largest populations of three species of rhinos and of tigers, that were a focus of the IWT discussions.

A follow-up meeting to review progress on the IWT meeting is planned, to be held in Botswana in March 2015.

Rhino legislation and cases

We welcome Mozambique's decision to finally approve new legislation criminalizing rhino crimes with significantly increased penalties in April 2014. However, the extent to which this new legislation will be applied and what conviction rates and penalties will be handed down remain to be seen. Concern continues to be expressed

- Renforcer l'application de la loi
- Encourager des moyens de subsistance durables et le développement économique.

Il a été convenu que pour s'attaquer au commerce illégal de la faune et à ses effets avec succès, il fallait un leadership politique concerté, un engagement communautaire et une coopération internationale sur une période prolongée. Il a également été réalisé que pour soutenir ces efforts il fallait davantage de recherche sur l'échelle des conséquences environnementales, politiques, sociales et économiques du commerce, ainsi qu'une meilleure compréhension du commerce illégal lui-même et l'effet des mesures prises pour le prévenir et le combattre.

Malheureusement, la réunion n'avait pas de représentation d'Afrique du Sud ou de l'Inde, états de l'aire de répartition qui abritent les plus grandes populations des trois espèces de rhinocéros et de tigres, qui étaient au centre des discussions sur le Commerce illégal de la Faune Sauvage.

Une réunion de suivi pour évaluer les progrès de la réunion sur le Commerce illégal de la Faune Sauvage est prévue et elle se tiendra au Botswana en mars 2015.

Législation et procès sur le Rhinocéros

Nous saluons la décision du Mozambique d'approuver finalement en avril 2014 une nouvelle législation criminalisant les crimes sur les rhinocéros qui comprend une augmentation significative des amendes. Toutefois, il reste à voir dans quelle mesure cette nouvelle législation sera appliquée et les condamnations et amendes qui seront prononcées. Nous continuons à nous préoccuper au sujet du relâchement sans procès des suspects arrêtés au Mozambique et de ce qui s'est passé aux armes à feu et aux cornes de rhinocéros prises à des braconniers et remises aux autorités. En outre, des rapports inadéquats et tardifs du Mozambique à la CITES indiquent que très peu d'amendes prononcées par les tribunaux pour les infractions relatives aux rhinocéros ne sont jamais perçues. Cette surveillance insuffisante du paiement des amendes va continuer à donner aux criminels des motivations à faire le braconnage et le trafic de la corne. Il est aussi probable que les amendes seules représentent une petite taxe sur le chiffre d'affaires des criminels et donc vont cesser d'avoir un effet dissuasif. On aura la preuve réelle du changement d'attitude envers les crimes de rhinocéros par les autorités mozambicaines lorsque plusieurs braconniers et trafiquants seront condamnés à des peines d'emprisonnement importantes pour les crimes

about arrested suspects in Mozambique being released without trial and what has happened to firearms and rhino horns taken from poachers and handed to authorities. In addition, Mozambique's inadequate and late reporting to CITES indicates that very few of the fines handed down by the courts for rhino offences were ever collected. Inadequate policing of the payment of fines will continue to give incentive to criminals to poach and traffic horn. Fines alone also are likely to represent a small tax on criminal turnover and therefore cease to be much of a deterrent. The real proof of change in attitude towards rhino crimes by Mozambican authorities will be when multiple poachers and traffickers are given significant custodial sentences for the rhino crimes they commit.

Since CoP16, Kenya has also changed its legislation to include stiffer penalties to punish wildlife offenders. Its new Wildlife Conservation and Management Act was passed on 24 December 2013 and includes provision for penalties of life imprisonment or a minimum fine of Kenya shillings 20 million, equivalent to about USD 250,000, for poaching rhinoceros or African elephant (*Loxodonta africana*) or trafficking their parts or derivatives. The clause in the section that contains these new sentences has been considered ambiguous by some. What this means is that the new Wildlife Act, though better than the old one, is unlikely in practice to provide any deterrent to the big dealers. Currently there are deliberate efforts between some NGOs, Kenya Wildlife Service, the Directorate of Public Prosecutions, judicial officers and legal experts, to amend the Act to operationalize the clause containing these new sentences, Section 92, through a motion in parliament to strengthen it even further.

CoP16 Info Doc51 mentioned the trend of increasing arrests of poachers in South Africa in recent years. However, while most of the rhino cases that have been prosecuted have led to convictions (some with significant deterrent custodial sentences), concerns remain about the low case completion rate and the time it is taking for cases to come to court. Postscript: In a recent case, a poacher was sentenced to 77 years and was also convicted of murder of a co-poacher who was killed in a contact with field rangers.

de rhinocéros qu'ils commettent.

Depuis la CdP16, le Kenya a également modifié sa législation pour inclure des peines plus sévères afin de punir les contrevenants de la faune. Sa nouvelle loi sur la Conservation et la Gestion de la faune sauvage a été adoptée le 24 décembre 2013 et comporte des dispositions de peines d'emprisonnement à perpétuité ou une amende minimale de 20 millions de shillings kenyans, équivalant à 250.000 dollars américains, pour le braconnage du rhinocéros ou de l'éléphant d'Afrique (*Loxodonta africana*) ou le trafic de leurs parties ou leurs dérivés. La clause dans la section qui contient ces nouvelles peines a été jugée ambiguë par certains. Qu'est-ce que cela signifie, c'est que la nouvelle loi sur la faune, bien qu'elle soit meilleure que l'ancienne, dans la pratique n'est pas susceptible de fournir un élément dissuasif pour les gros trafiquants. Actuellement, il y a des efforts délibérés de certaines ONG, le Service Kenyan de la Faune Sauvage, le Procureur, les magistrats et les experts juridiques, pour modifier la Loi afin d'opérationnaliser la clause contenant ces nouvelles peines, l'article 92, par le biais d'une motion au Parlement pour le renforcer.

La CdP16 Infos Doc51 a mentionné la tendance à l'augmentation des arrestations de braconniers en Afrique du Sud au cours des dernières années. Cependant, alors que la plupart des procès concernant les rhinocéros qui ont fait l'objet des poursuites judiciaires ont abouti à des condamnations (certains avec des peines d'emprisonnement dissuasives importantes), des inquiétudes subsistent sur le taux faible d'aboutissement des procès et le temps qu'il faut pour que les procès viennent au tribunal. Post-scriptum: Dans une affaire récente, un braconnier a été condamné à 77 ans et il a également été reconnu coupable d'avoir assassiné un co-braconnier qui avait été tué dans un accrochage avec les écocardes sur le terrain.

Les Etats-Unis ont changé le statut d'espèce menacée pour le rhinocéros blanc du sud. Ces changements ont été mis en œuvre pour aider les agents de mise en application de la loi aux Etats-Unis à combattre la possession illégale, le mouvement et le trafic des cornes de rhinocéros aux Etats-Unis. Les changements, toutefois, ne cherchent pas à empêcher l'importation et la possession de trophées légitimes de chasse sportive comme des souvenirs non-commerciaux d'une chasse.

Sur une note positive au Zimbabwe, le taux d'aboutissement des procès s'est amélioré, mais des retards dans la finalisation de certains procès continuent. Un autre problème rapporté est que les criminels de rhinocéros s'enfuient souvent après avoir été libérés sous caution, certains retournant au braconnage de rhinocéros

The USA has changed its internal threatened status for southern white rhino. These changes have been implemented to help US law-enforcement officers deal with illegal rhino horn possession and movement and trafficking within the US. The changes, however, do not seek to prevent legal importation and possession of legitimate sport hunting trophies as non-commercial mementoes of a hunt.

On a positive note in Zimbabwe, the case completion rate has improved, but delays in finalizing some court cases continue. Another problem that has been reported is that rhino criminals frequently abscond after being granted bail, with some returning to rhino poaching and other crimes. Case management between the high court and the lower magistrate's courts appears to be a problem. It has been reported that some criminals who have been convicted in a lower court and later freed on bail after filing a successful appeal remain free as their appeals have not yet been heard in the high court due to a backlog of cases or filed papers being lost in the system. Thus it would help if case management between lower and higher courts was improved to ensure appeals are quickly heard in the higher court or bail of convicted rhino criminals was denied.

Strategic rhino-focused meetings

Second International Rhino Technology and Law Enforcement Meeting

During the reporting period, with funding from the US Fish and Wildlife Service's Rhino and Tiger Conservation Fund, Save the Rhino International, WWF-South Africa and South African National Parks, a second international experts meeting was held to discuss the latest patterns of rhino poaching and to identify tools and techniques to enhance wildlife protection and law enforcement. Wildlife security experts from 13 countries including 8 African rhino range States attended. The meeting allowed for improved cooperation and information sharing, following on from a very useful first of this series held in Namibia in 2012.

The aims of these technology and law-enforcement workshops were to 1) introduce field practitioners to others facing similar challenges, 2) allow field people to share knowledge on which techniques and technologies are working and which ones are not under what conditions and circumstances, and 3) provide the opportunity for field people to brainstorm and problem

ou aux autres crimes. La gestion des procès entre la cour d'appel et les tribunaux de première instance semble être un problème. Il a été rapporté que certains criminels qui ont été condamnés par un tribunal de première instance et plus tard libérés sous caution après avoir fait appel restent libres car leurs appels n'ont pas encore été entendus dans la cour d'appel en raison des retards de dossiers ou de la perte de documents déposés dans le système. Ainsi, il serait utile que la gestion des procès entre les juridictions inférieures et supérieures soit améliorée afin de s'assurer que les appels soient rapidement entendus dans la juridiction supérieure ou que la caution soit refusée pour les criminels de rhinocéros.

Réunions stratégiques axées sur les rhinocéros

Deuxième réunion internationale sur la technologie et l'application de la loi en ce qui concerne le rhinocéros

Au cours de la période considérée, grâce au financement du Fonds du Service de la Pêche et de la Faune Sauvage des Etats-Unis pour la Conservation des Rhinocéros et des Tigres, Save the Rhino International, WWF-Afrique du Sud et les Parcs nationaux sud-africains, une deuxième réunion internationale des experts a été organisée pour discuter des dernières tendances du braconnage de rhinocéros et identifier les outils et les techniques dans le but d'améliorer la protection de la faune et l'application de la loi. Les experts en sécurité de la faune de 13 pays, y compris 8 états africains de l'aire de répartition des rhinocéros y ont participé. La rencontre a permis d'améliorer la coopération et l'échange des informations, à la suite d'une première réunion très utile tenue en Namibie en 2012 sur la technologie ayant rapport au rhinocéros et à l'application de la loi.

Les objectifs de ces ateliers sur la technologie et l'application de la loi étaient 1) d'introduire des praticiens de terrain à d'autres personnes confrontées à des défis similaires, 2) de permettre à ceux qui travaillent sur le terrain de partager les idées sur les techniques et les technologies qui marchent et celles qui ne marchent pas et dans quelles conditions et circonstances, et 3) de donner à ceux de terrain l'occasion de faire un remue-méninges et de résoudre les problèmes ensemble en ce qui concerne les besoins des aires de la faune en général, et les besoins

solve together in order to troubleshoot needs for wildlife areas in general, and specific needs for particular rhino areas.

In addition, new technologies and tools for protected area security as well as the enhanced use of information to reduce poaching and more effectively combat international trafficking in horn were discussed in depth. Technology companies were also invited for one day to demonstrate their products.

CITES Rhino Working Group feedback

The CITES Rhino Working Group (WG) corresponded intersessionally and produced a report with recommendations for consideration at the CITES Standing Committee meeting held in July 2014. The CITES Secretariat also produced a report on rhinos that also included a suite of recommendations.

Postscript: At the CITES Standing Committee (SC) meeting in early July 2014, the Rhino Working Group was, as expected, tasked by the SC Chair to produce a joint set of recommendations for SC to consider. The Rhino WG was ably chaired by the UK's Michael Sigsworth assisted by the CITES Secretariat's Ben van Rensburg. It met three times at SC65 to finalize joint recommendations that were then circulated, considered and ultimately approved by the SC. These recommendations maintained a focus on Vietnam and, especially, Mozambique. Specific deliverables and reporting timelines were set for Mozambique, which was criticized for its previous late and inadequate reporting. The SC also approved a clause mandating the CITES Secretariat, in consultation with the Rhino WG, to draw the attention of the SC intersessionally to any significant issues of non-compliance with the rhino recommendations approved at SC65. This then would allow the SC to act without having to wait for the next SC meeting. Shortly before CITES SC65, the International Rhino Foundation and the Environmental Investigation Agency submitted a joint application to the US government requesting it to impose Pelly Amendment sanctions against Mozambique for its failure to date to adequately deal with poaching and rhino horn trafficking by its citizens. The Fishermen's Protective Act allows the US government to prohibit the importation of wildlife and fish products from

spécifiques des aires de rhinocéros.

En outre, les nouvelles technologies et les outils pour la sécurité des aires protégées et aussi l'utilisation de l'information pour réduire le braconnage et lutter plus efficacement contre le trafic international de la corne ont été discutés en profondeur. Les entreprises de technologie ont également été invitées pour une journée afin de démontrer leurs produits.

Feedback du Groupe de travail de la CITES sur le Rhinocéros

Le Groupe de travail de la CITES sur le Rhinocéros a communiqué entre les sessions et a produit un rapport contenant des recommandations pour examen à la réunion du Comité permanent tenue en juillet 2014. Le Secrétariat de la CITES a également produit un rapport sur les rhinocéros qui comprenait aussi une série de recommandations.

Post-scriptum: Comme prévu, lors de la réunion du Comité permanent de la CITES au début de juillet 2014, le Groupe de travail sur le Rhinocéros a été chargé par le Président du Comité permanent de produire un ensemble de recommandations conjointes à être examinées par le Comité permanent. Le groupe de travail sur le Rhinocéros a été habilement présidé par Michael Sigsworth du Royaume-Uni appuyé par Ben van Rensburg du Secrétariat de la CITES. Il s'est réuni trois fois au cours de la SC65 pour finaliser les recommandations conjointes qui ont alors été diffusées, examinées et finalement approuvées par le Comité Permanent. Ces recommandations ont focalisé sur le Vietnam et surtout le Mozambique. Des objectifs spécifiques et les dates limites de rapport ont été fixés pour le Mozambique, qui a été critiqué pour son précédent rapport tardif et inadéquat. Le Comité Permanent a également approuvé une clause obligeant le Secrétariat de la CITES, en consultation avec le Groupe de Travail sur le Rhinocéros, d'attirer l'attention du Comité Permanent entre les sessions sur tous les problèmes importants de non-conformité avec les recommandations sur le rhinocéros approuvées à la SC65. Cela permettra alors au Comité Permanent d'agir sans avoir à attendre sa prochaine réunion. Peu de temps avant la SC65 de la CITES, la Fondation Internationale pour le Rhinocéros et l'Agence d'Enquête sur l'environnement ont présenté une demande conjointe au gouvernement américain lui demandant d'imposer des sanctions au titre de l'amendement de Pelly contre le Mozambique pour son échec à ce jour de traiter convenablement le braconnage et le trafic de la corne de rhinocéros par ses citoyens.

the offending nation. It was previously used to effect positive responses from Taiwan and South Korea to contain the illegal rhino horn trade. In the event that Mozambique's actions and reporting to CITES continue to be inadequate and considered as 'significantly non-compliant' by the CITES SC in terms of SC65 recommendations, this could presumably strengthen the case in the US for the imposition of Pelly Amendment sanctions against Mozambique.

The full SC65 rhino recommendations that were approved at CITES CoP65 can be found at <http://www.cites.org/sites/default/files/eng/com/sc/65/com/E-SC65-Com-03.pdf>. A short AfRSG information document was also prepared for delegates attending the SC65 meeting, which included the updated poaching statistics in Table 1. This information will be posted on the AfRSG webpage, courtesy of the IRF website at <http://www.rhinos.org/professional-resources/iucn-african-rhino-specialist-group>.

South African Panel of Experts

The South African Minister of Environment has established a panel of experts to provide the best available advice, opinions and recommendations on matters associated with the conservation of both rhinos and elephants. This information is to be assessed in preparation for any possible submissions to CITES CoP 17.

Namibian law-enforcement meeting

A Law Enforcement and Wildlife Crime Prevention workshop organized by the Ministry of Environment (MET) was held in May 2014 in Namibia to urgently discuss the recent escalation in wildlife crime in the country. The meeting was attended by representatives from all the critical government departments, rhino custodians, private land owners, professional hunting organizations, NGOS, and international law enforcement and rhino experts. The urgency of the situation was emphasized, as was the need for a strategic whole Namibian government response to the threat of organized crime and its impact on the country's wildlife resources. The importance of international cooperation, information sharing and proactive intelligence to disrupt organized

L'amendement Pelly de la Loi pour la protection des pêcheurs permet au gouvernement américain d'interdire l'importation des produits de la faune et de la pêche d'une nation contrevenante. Il a déjà été utilisé pour produire une réponse positive du Taiwan et de la Corée du Sud afin d'endiguer le commerce illicite de la corne de rhinocéros. Si les actions et les rapports du Mozambique à la CITES continuent à être inadéquats et considérés par le Comité Permanent de la CITES d'être d'une «non-conformité significative» aux termes des recommandations de la SC65, on peut supposer que cela renforcerait le cas aux Etats-Unis pour l'imposition des sanctions au titre de l'Amendement Pelly contre le Mozambique.

On peut trouver les recommandations complètes de la SC65 sur le rhinocéros qui ont été approuvées à la CdP65 de la CITES sur <http://www.cites.org/sites/default/files/eng/com/sc/65/com/E-SC65-Com-03.pdf>. Un court document d'information par le GSRAF a également été préparé pour les délégués participant à la réunion de la SC65, qui comprenait les statistiques mises à jour sur le braconnage dans le Tableau 1. Cette information sera affichée sur la page Web du GSRAF, grâce au site de la Fondation Internationale sur le Rhinocéros sur <http://www.rhinos.org/professional-Resources/iucn-african-rhino-spécialist-group>.

Groupe d'experts sud-africains

Le Ministre sud-africain de l'Environnement a mis en place un groupe d'experts pour fournir les meilleurs conseils disponibles, des avis et des recommandations sur les questions liées à la conservation des rhinocéros et des éléphants. Ces informations doivent être évaluées en préparation d'une soumission éventuelle à la CdP 17 de la CITES.

Réunion namibienne sur l'application de la loi

Un atelier sur l'application de la loi et la prévention du crime de la faune organisé par le Ministère de l'Environnement s'est tenu en mai 2014 en Namibie dans le but de discuter de toute urgence la récente intensification de la criminalité de la faune dans le pays. La réunion a été suivie par des représentants de tous les ministères importants, les conservateurs des rhinocéros, les propriétaires fonciers privés, les organisations de chasse professionnelle, les ONG et les experts sur l'application de la loi internationale et sur le rhinocéros. L'urgence de la situation a été soulignée, de même que la nécessité d'une réponse stratégique de tout le

criminal networks and stop poachers before actual killings was well recognized.

Feedback on 'The viability of legalizing trade in horn in South Africa' report

This report emanated from an identified need at the South African Minister of Environment's Rhino Summit held in October 2010 (see https://www.environment.gov.za/sites/default/files/docs/rhinohorntrade_southafrica_legalisingreport.pdf). A questionnaire survey of 104 rhino experts and rhino owners was undertaken, in addition to an assessment of current literature on the subject. The focus of the study was on the potential impact of the current national moratorium on trade in rhino horn in South Africa and whether it should be lifted. The study aimed to address the following: 1) analyse trends in local (national) trade in rhino horn before the moratorium came into effect in February 2009; 2) analyse trends in incidents of illegal killing before and after the national moratorium was declared; 3) assess the potential national market for rhino horn; 4) determine security risks relating to the lifting of the moratorium; 5) identify measures to be put in place to address the risks identified above, including a response strategy; 6) recommend systems to be developed and implemented to regulate national trade in rhino horn, including a tracking and monitoring system; 7) identify the legal requirements to be addressed in terms of a national trade system; 8) identify means to ensure rhino horn traded nationally does not enter international trade; 9) analyse similar situations in other countries and advise on best practices and interventions made in those countries.

Although there was mixed reaction to the survey, it did recommend that South Africa should not lift the current national moratorium on the trade in horn while an international ban in the trade of rhino horn existed. Although mainly opinion based, the survey indicated that lifting the national moratorium may possibly lead to greater laundering of horn on to the illegal market, tarnishing South Africa's conservation and compliance image. It was recommended that South Africa should immediately develop a secure national electronic permitting system to bring non-compliance issues under control. This should be

gouvernement namibien à la menace du crime organisé et son impact sur les ressources de la faune du pays. On a reconnu l'importance de la coopération internationale, l'échange d'informations et de renseignements proactifs afin de perturber les réseaux criminels organisés et arrêter les braconniers avant les abattages réels.

Feedback sur le rapport sur « La viabilité de la légalisation du commerce des cornes en Afrique du Sud »

Ce rapport émane d'un besoin identifié au Sommet sur le rhinocéros du Ministre sud-africain de l'environnement qui s'est tenu en octobre 2010 (voir https://www.environment.gov.za/sites/default/files/docs/rhinohorntrade_southafrica_legalisingreport.pdf). Une enquête par questionnaire des 104 experts du rhinocéros et des propriétaires de rhinocéros a été entreprise, en plus d'une évaluation de la littérature actuelle sur le sujet. L'objectif de l'étude portait sur l'impact potentiel du moratoire national actuel sur le commerce des cornes de rhinocéros en Afrique du Sud et à savoir s'il devrait être levé. L'étude visait à examiner les questions suivantes: 1) analyser les tendances du commerce local (national) dans la corne de rhinocéros avant le moratoire qui est entré en vigueur en février 2009; 2) analyser les tendances dans les cas d'abattage illégal avant et après que le moratoire national ait été déclaré; 3) évaluer le marché potentiel national pour la corne de rhinocéros; 4) déterminer les risques de sécurité liés à la levée du moratoire; 5) identifier les mesures à mettre en place pour traiter les risques identifiés ci-dessus, y compris une stratégie de réponse; 6) recommander des systèmes à développer et à mettre en œuvre pour réglementer le commerce national de la corne de rhinocéros, y compris un système de suivi et de surveillance; 7) identifier les conditions légales requises en termes d'un système de commerce national; 8) identifier les moyens de s'assurer que la corne de rhinocéros commercialisée à l'échelle nationale n'entre pas dans le commerce international; 9) analyser des situations similaires dans d'autres pays et donner des conseils sur les meilleures pratiques et les interventions réalisées dans ces pays.

Bien qu'il y ait eu des réactions mitigées à l'enquête, il a été recommandé que l'Afrique du Sud ne doive pas lever le moratoire national actuel sur le commerce des cornes tandis qu'une interdiction internationale du commerce de la corne de rhinocéros existait. Bien que principalement basée sur l'opinion, l'enquête a indiqué que la levée du moratoire national peut éventuellement conduire à un

linked to a rhino database that includes horn stockpile and DNA profile information. Private rhino owners should also be given incentive to continue protecting rhinos during this period. This could be achieved through government's general willingness to try to find solutions in support of the private sector concerns, such as offering secure sites to store horn and offering more streamlined permit procedures as an incentive for rhino owners to comply. In addition, it was urged that South Africa must continue to show full compliance with CITES Resolutions and if a proposal for legalizing international trade is to be submitted, a detailed proposal should be made available as soon as possible.

Rhino impact bonds

The AfRSG Secretariat and other AfRSG members have been working closely with the Zoological Society of London (ZSL), Social Finance and more recently also the AsRSG and other UfW partners to investigate, develop and try a new innovative form of funding of field conservation action. The Royal Foundation of Princes William and Harry and the Duchess of Cambridge is interested in exploring the possible value impact bonds as a rhino conservation-funding tool. The idea is that each project bond will have a set of measurable target deliverables (such as increasing rhino numbers by x or keeping poaching below y). The concept is that philanthropists provide initial funding for such impact bonds and, if the project is successful in delivering against the measurable objectives set out, the philanthropists will be reimbursed by other participating bodies such as the Global Environment Facility (GEF) or governments. Unlike traditional grant projects, governments only have to pay out on successes and philanthropists are also given incentive to back good projects likely to deliver so they can get their seed funding back and be able to re-invest it to achieve more.

Following a meeting in London coinciding with the London IWT Conference, the concept and a draft document jointly prepared by ZSL, Social Finance and AfRSG were presented to potential funders. The idea was welcomed by GEF and an initial Project Identification Form for USD 2 million to develop and test out the concept was

plus grand blanchiment de cornes sur le marché illégal, ternissant l'image de la conservation et de la conformité de l'Afrique du Sud. On a recommandé que l'Afrique du Sud élabore immédiatement un système national de permis électronique sécurisé pour mettre sous contrôle les questions de non-conformité. Il doit être lié à une base de données de rhinocéros qui comprend les stocks de cornes et les informations sur le profil d'ADN. Les propriétaires privés de rhinocéros devraient aussi avoir intérêt à continuer à protéger les rhinocéros au cours de cette période. Cela pourrait se faire par la volonté générale du gouvernement de tenter de trouver des solutions pour répondre aux préoccupations du secteur privé, par exemple en offrant des sites sécurisés pour stocker les cornes et en offrant des procédures de permis plus simplifiées pour motiver les propriétaires de rhinocéros de se conformer. En outre, on a demandé que l'Afrique du Sud continue à montrer un respect intégral pour les résolutions de la CITES et si une proposition de légaliser le commerce international doit être soumise, une proposition détaillée devrait être disponible dès que possible.

Impacts des Obligations sur le Rhinocéros

Le Secrétariat du GSRAf et d'autres membres du GSRAf travaillent en étroite collaboration avec la Société zoologique de Londres (ZSL), Finance sociale et, plus récemment, le GSRAf et d'autres partenaires de la Fondation Unis pour la Faune pour étudier, développer et essayer une nouvelle forme innovatrice de financement des actions de conservation sur le terrain. La Fondation royale des Princes William et Harry et la Duchesse de Cambridge s'intéresse à explorer l'impact de la valeur possible des obligations en tant qu'outil de financement de la conservation des rhinocéros. L'idée est que chaque obligation de projet aura un ensemble d'objectifs cibles mesurables (tels que l'augmentation du nombre de rhinocéros par x ou le maintien du braconnage en-dessous de y). Le concept est que les philanthropes fournissent un financement initial pour de telles obligations d'impact et, si le projet réussit par rapport aux objectifs mesurables prévus, les philanthropes seront remboursés par d'autres organismes participants tels que le Fonds pour l'Environnement Mondial (FEM) ou les gouvernements. Contrairement aux projets traditionnels de subventions, les gouvernements ne doivent payer que les succès et on donne également aux philanthropes une motivation pour soutenir de bons projets susceptibles de réussir afin qu'ils puissent obtenir leur financement de démarrage et être en

submitted to and approved by GEF. The various cooperating partners are assisting by developing a full GEF proposal and liaising with the Royal Foundation to seek support to boost the initial funding for the demonstration phase of the project up to a total of USD 5 million. If this funding model proves to work in practice the hope is that it could be rolled out on a bigger scale. At this initial stage it has been decided to focus on a few projects relating to a small number of *Key* black, white and greater one-horned rhino projects in Africa and Asia. At the time of writing those involved are working to review and decide on possible sites to fund.

Decline in live white rhino sale turnover in South Africa following upsurge of poaching and its implications

The AfRSG's scientific officer has collated live white rhino sale data from the three biggest sellers: Ezemvelo KwaZulu-Natal (KZN) Wildlife, South African National Parks (SANParks) and Vleissentraal Auctioneers. Figure 2 shows that inflation-adjusted annual turnover has declined considerably in recent years following the upsurge in poaching. After an initial rush to sell rhinos in 2009 soon after poaching had started to increase, turnover has declined considerably. This is primarily because the major conservation agencies have fewer surplus rhinos to sell due to the poaching. Figure 2 shows this significant decline in turnover is primarily due to the reduction in number of animals being sold. Fewer live sales have also significantly reduced funding for state conservation agencies such as Ezemvelo KZN Wildlife and SANParks. For example, the decline in turnover for these two conservation organizations (adjusted for inflation to 2013 South African rand [ZAR] values) from 2007 (the year before poaching started to escalate) to 2012 was almost ZAR 35.9m (close to US\$3.8m at prevailing exchange rates). In addition, the trend of increasing numbers of private sector owners in South Africa getting rid of some or all of their rhinos given increased security costs and risks that have accompanied the upsurge in poaching shows no sign of abating. This may reduce the range available for expanding rhino range and numbers.

mesure de le réinvestir pour obtenir plus.

Suite à une réunion à Londres qui a coïncidé avec la Conférence sur le Commerce International de la Faune Sauvage de Londres, le concept et un projet de document préparé conjointement par la Société Zoologique de Londres, Finance sociale et le GSRAf ont été présentés aux bailleurs de fonds potentiels. L'idée a été bien accueillie par le FEM et un premier PIF de USD2 millions pour développer et tester le concept a été soumis et approuvé par le FEM. Les différents partenaires de coopération aident à développer une proposition complète pour le FEM en liaison avec la Fondation Royale pour chercher un soutien afin de stimuler le financement initial pour la phase de démonstration du projet jusqu'à un total de USD5 millions. Si ce modèle de financement marche dans la pratique, l'espoir est qu'il pourra être déployé sur une plus grande échelle. A ce stade initial, il a été décidé de se concentrer sur quelques projets relatifs à un petit nombre de projets clés sur les rhinocéros noirs, blancs et unicorns en Afrique et en Asie. Au moment de la rédaction, ceux qui sont impliqués travaillent à revoir et à décider sur des sites possibles à financer.

Baisse du chiffre d'affaires de la vente des rhinocéros blancs vivants en Afrique du Sud après une recrudescence du braconnage et ses implications

Le responsable scientifique du GSRAf a rassemblé des données sur la vente des rhinocéros blancs vivants des trois plus gros vendeurs: Ezemvelo KwaZulu-Natal (KZN) Wildlife, les parcs nationaux sud-africains (SANParks) et le commissaire-priseur Vleissentraal. La Figure 2 montre que le chiffre d'affaires annuel ajusté à l'inflation a considérablement diminué ces dernières années suite à la recrudescence du braconnage. Après une poussée initiale pour vendre les rhinocéros en 2009 peu de temps après que le braconnage ait commencé à augmenter, le chiffre d'affaires a considérablement diminué. C'est principalement parce que les principaux organismes de conservation ont moins de rhinocéros en surplus à vendre en raison du braconnage. La Figure 2 montre que cette baisse significative du chiffre d'affaires est principalement due à la réduction du nombre d'animaux vendus. La réduction de ventes d'animaux vivants a également réduit de manière significative le financement des organismes de conservation de l'Etat tels qu'Ezemvelo KZN Wildlife et SANParks. Par exemple,

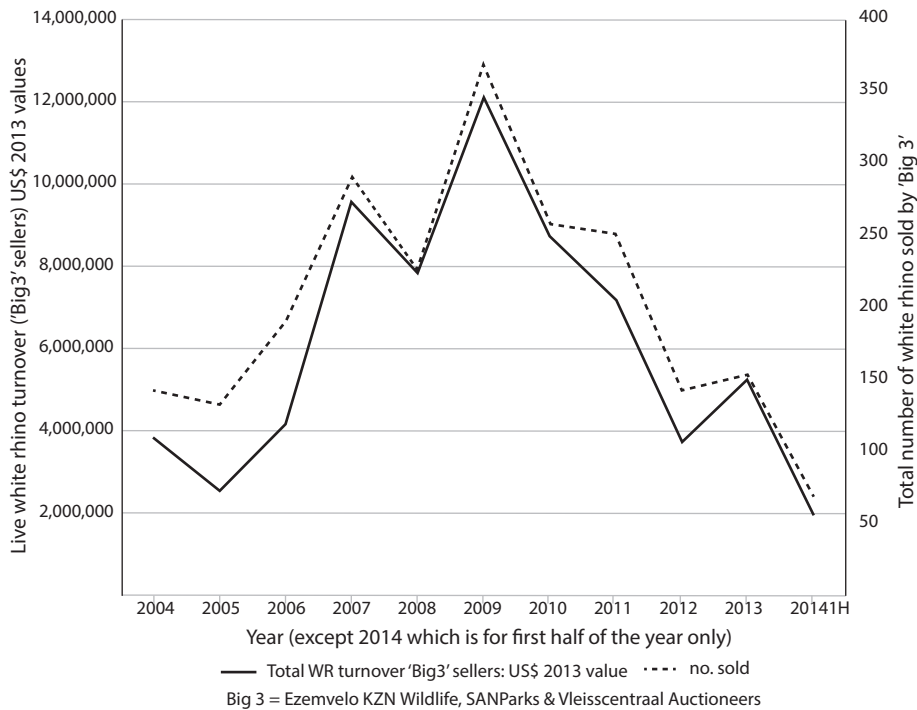


Figure 2. White rhino live sale turnover in South Africa by the three biggest sellers (based on data supplied by Ezemvelo KZN Wildlife, SANParks and Vleissentraal auctioneers).

The 2014 figure refers only to the first half of 2014; the total turnover for 2014 will be higher.

Figure 2: Le chiffre d'affaires de la vente de rhinocéros blancs vivants en Afrique du Sud par les trois plus gros vendeurs (basé sur les données fournies par Ezemvelo KZN Wildlife, SANParks et les commissaires-priseurs Vleissentraal).

Le chiffre de 2014 ne porte que sur le premier semestre de 2014; le chiffre d'affaires total pour 2014 sera plus élevé.

Achievement

I congratulate Benson Okita-Ouma (deputy chair) on receiving his PhD from Wageningen University, Netherlands. His dissertation is entitled 'Population densities of eastern black rhinoceros: unravelling the controls'.

Acknowledgements

I acknowledge and thank our various sponsors: WWF's African Rhino Programme (with funding from WWF Netherlands), US Fish and Wildlife's Rhino and Tiger Conservation Fund, Save the Rhino International, International Rhino Foundation and UK's Department for Environment, Food and Rural Affairs (DEFRA) for sponsoring the scientific officer's time. I also thank the Endangered Wildlife Trust for administrative assistance. I thank Dr Richard

la baisse du chiffre d'affaires de ces deux organisations de conservation (ajusté pour l'inflation du rand sud-africain à la valeur de 2013) entre 2007 (l'année avant la recrudescence du braconnage) et 2012 était presque 35,9 millions de rands sud-africains (près de USD3,8 millions aux taux de change en vigueur). En outre, la tendance du nombre croissant de propriétaires du secteur privé en Afrique du Sud à se débarrasser de tous leurs rhinocéros ou d'une partie étant donné les coûts accrus de sécurité et les risques qui accompagnent la recrudescence du braconnage ne montre aucun signe de ralentissement. Cela peut réduire l'habitat disponible pour augmenter l'habitat ou le nombre de rhinocéros.

Réalisation

Je félicite Benson Okita-Ouma (Vice-président) pour avoir reçu son doctorat de l'Université de Wageningen aux Pays-Bas. Sa thèse est intitulée « Les densités de

Emslie (scientific officer) and Dr Benson Okita-Ouma (deputy chair) for their inputs, constant support and advice. I also thank those who provided information towards this report.

population de rhinocéros noirs de l'Est: démêler les contrôles ».

Remerciements

Je reconnais et remercie nos différents sponsors: le Programme du WWF pour les rhinocéros d'Afrique (avec un financement du WWF Pays-Bas), le Fonds du Service de la Pêche et de la Faune Sauvage pour la Conservation du Rhinocéros et du Tigre, Save the Rhino International, la Fondation Internationale pour le Rhinocéros et le Ministère Britannique de l'Environnement, de l'Alimentation et des Affaires rurales (DEFRA) pour le parrainage du temps du chargé scientifique. Je remercie également le Fonds de la Faune Sauvage menacée d'extinction pour l'assistance administrative. Je remercie le Dr. Richard Emslie (responsable scientifique) et le Dr. Benson Okita-Ouma (Vice-président) pour leur contribution, leur soutien et leurs conseils constants. Je remercie également tous ceux qui ont fourni des informations pour la rédaction de ce rapport.

Asian Rhino Specialist Group report

Rapport du Groupe des Spécialistes des Rhinocéros d'Asie

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Second rhino security and monitoring meeting in South Africa

I attended a meeting, 'Using modern technology to protect Africa's rhinos: security and technology workshop' held 29 March–1 April 2014 at Mopani Rest Camp in Kruger National Park, South Africa. The meeting was organized by Save the Rhino International and WWF-South Africa, with additional substantial financial support from US Fish and Wildlife Service and the South African National Parks (SANParks). This was the second such meeting on rhino security; the first was held in Namibia in 2012. I delivered a paper on dehorning feasibilities in Assam, India, as a measure to protect rhinos from poachers. This meeting deliberated on the effectiveness of rhino horn poisoning, various rhino monitoring and security techniques, and the use of modern tools in rhino research, monitoring and security. The topics discussed at the meeting were useful; some can be replicated in the conservation and protection of rhinos in Asia.

Rhino poaching scenario in Asia

Poaching of rhinos during the first six months of 2014 has been reported only from Assam where poachers killed about 20 greater one-horned rhinos: one in Pabitora Wildlife Sanctuary (WLS) and the others in and around Kaziranga National Park (NP). Nepal was successful in achieving zero poaching for almost 15 months. A poacher killed one rhino in the buffer zone of Chitwan NP in early May 2014. There was no report of any poaching of the *critically endangered* Javan and Sumatran rhinos from Indonesia. Although the rate of rhino poaching in Asia may not be as high as in Africa, the growing rhino horn market in some Asian countries

2ème réunion sur la sécurité et la surveillance des rhinocéros en Afrique du Sud

J'ai participé à une réunion sur «L'utilisation des technologies modernes pour protéger les rhinocéros d'Afrique: atelier sur la sécurité et la technologie» qui s'est tenue du 29 mars au 1^{er} avril 2014 au Camp de Repos de Mopani dans le parc national Kruger, en Afrique du Sud. La réunion était organisée par Save the Rhino International et WWF-Afrique du Sud, avec un appui financier substantiel supplémentaire du Service de la Pêche et de la Faune Sauvage des Etats-Unis et de SANParks. Il s'agissait de la deuxième réunion sur la sécurité des rhinocéros; la première avait eu lieu en Namibie en 2012. J'ai fait une présentation sur la faisabilité de l'écornage dans l'Assam, en Inde, en tant qu'une mesure visant à protéger les rhinocéros des braconniers. Cette réunion a délibéré sur l'efficacité de l'empoisonnement de la corne de rhinocéros, diverses techniques de surveillance et de sécurité des rhinocéros, et l'utilisation des outils modernes dans la recherche sur les rhinocéros, la surveillance et la sécurité. Les sujets abordés lors de la réunion ont été utiles et certains peuvent être reproduits dans la conservation et la protection des rhinocéros en Asie.

Le scénario du braconnage des rhinocéros en Asie

Au cours des six premiers mois de 2014, le braconnage des rhinocéros n'a été rapporté que pour l'Assam où les braconniers ont tué environ 20 grands rhinocéros unicomés: un dans le sanctuaire de la Faune Sauvage de Pabitora et les autres dans le Parc national de Kaziranga et ses alentours. Le Népal a réussi à atteindre le braconnage zéro pendant presque 15 mois. Un braconnier a tué un rhinocéros dans la zone tampon du PN de Chitwan au début de mai 2014. Aucun braconnage des rhinocéros de Java et des rhinocéros de Sumatra en Indonésie, en

is worrying, and small populations of Asian rhino species face great danger from organized poachers and rhino horn traders. Thus, there is a great need to prepare rhino range countries in Asia to strengthen intelligence gathering and effectiveness of field patrols to unearth rhino poaching attempts and incidents and initiate the necessary steps to check rhino poaching.

Progress in India Rhino Vision 2020

India Rhino Vision 2020 was launched in 2005 by the government of Assam along with the International Rhino Foundation, WWF, US Fish and Wildlife Service and Bodoland Territorial Council. Under this programme, since 2008, 18 wild greater one-horned rhinos have been captured from Pabitora WLS and Kaziranga NP and translocated to Manas NP Park. Nine rescued rhinos from other areas have also been rehabilitated in Manas. In the past 2 years, 11 rhinos have been born in Manas although 7 rhinos have been killed by poachers in the same park since 2011. Currently Manas NP has about 31 rhinos. The next phase of translocating rhinos is likely to take place in the coming winter. This time captured rhinos from Kaziranga NP and Pabitora WLS will be translocated to Laokhowa-Burachapori Wildlife Sanctuary in Assam.

Likely threats to Chitwan National Park

Chitwan NP in Nepal holds the second largest global population of wild greater one-horned rhino (GOH) in South Asia. Chitwan NP—a World Heritage Site—has successfully conserved the GOH rhino over the years and currently holds about 500 rhinos. Currently, two proposed infrastructure projects—the East-West Electric Railway and the Terai Postal Road—have generated significant concern on the effect they are likely to have in fragmenting the core wildlife habitat of Chitwan NP. Conservationists anticipate that if built without care, these proposed projects would cause loss of key habitats leading to habitat fragmentation and, maybe, loss of the UNESCO World Heritage Site status, which will result in

danger critique d'extinction, n'a été rapporté. Alors que, par rapport à l'Afrique, le taux du braconnage des rhinocéros en Asie n'est pas aussi élevé, la croissance du marché de la corne de rhinocéros dans certains pays d'Asie est préoccupante, et les petites populations d'espèces de rhinocéros d'Asie pourraient faire face à un plus grand danger des braconniers organisés et des commerçants de cornes de rhinocéros. Ainsi, il y a un plus grand besoin de préparer les pays de l'aire de répartition des rhinocéros en Asie afin de renforcer la collecte des renseignements et l'efficacité des patrouilles sur le terrain pour révéler les tentatives et les incidents de braconnage des rhinocéros et prendre les mesures nécessaires pour empêcher le braconnage.

Les progrès de la Vision 2020 de l'Inde sur le Rhinocéros

La Vision 2020 de l'Inde sur le Rhinocéros a été lancée en 2005 par le gouvernement de l'Assam en partenariat avec la Fondation internationale pour le rhinocéros, WWF, le Service de la Pêche et de la Faune Sauvage des Etats-Unis et le Conseil territorial du Bodoland. Dans ce programme, depuis 2008, 18 grands rhinocéros unicorns sauvages ont été capturés dans le Sanctuaire de la Faune Sauvage de Pabitora et le Parc National de Kaziranga et ils ont été transférés dans le parc national de Manas. Neuf rhinocéros sauvés des autres régions ont également été réhabilités à Manas. Au cours des 2 dernières années, 11 rhinocéros sont nés à Manas bien que 7 rhinocéros aient été tués par des braconniers dans le même parc depuis 2011. Actuellement, il y a environ 31 rhinocéros dans le parc national de Manas. La phase suivante de la translocation des rhinocéros va probablement avoir lieu l'hiver prochain. Cette fois les rhinocéros capturés dans le parc national de Kaziranga et le sanctuaire de la Faune Sauvage de Pabitora seront transférés vers le sanctuaire de la Faune Sauvage de Laokhowa-Burachapori dans l'Assam.

Menaces possibles dans le parc national de Chitwan

Le parc national de Chitwan au Népal détient la deuxième plus grande population mondiale de grands rhinocéros unicorns sauvages en Asie du Sud. Le parc national de Chitwan - un site du patrimoine mondial - a réussi à conserver le grand rhinocéros unicolore au fil des années et détient actuellement environ 500 rhinocéros. Actuellement,

losses in tourism activity, marketing capacity and a significant amount of tourist-based income where both government and local communities are stakeholders. The recently concluded 38th session of the World Heritage Committee meeting held in Doha, Qatar, 15–25 June 2014, expressed concern about these proposed infrastructure projects and considered that if implemented as planned through Chitwan NP-cum-World Heritage Site, they would be a potential danger to its Outstanding Universal Value of a World Heritage Site. As a party to the Convention on Biological Diversity, Nepal has agreed to the strategic plan on biodiversity and its accompanying Aichi Biodiversity Targets. Naturally, appropriate protection and management of Chitwan NP are needed to ensure that by 2020 the extinction of known threatened species, including the greater one-horned rhino, has been prevented and their conservation status improved and sustained. What is needed now is to find a balance between infrastructure development and conservation of species and landscapes and the communities they support.

deux projets d'infrastructure proposés – le chemin de fer électrique est-ouest et la route postale de Terai – ont suscité une profonde inquiétude concernant l'impact qu'ils sont susceptibles d'avoir sur la fragmentation de l'habitat principal de la faune du parc national de Chitwan. Les écologistes prévoient que s'ils sont construits sans précaution, ces projets proposés entraîneraient des pertes d'habitats clés menant à la fragmentation de l'habitat et, peut-être, la perte du statut de site du patrimoine mondial de l'UNESCO, ce qui se traduira par des pertes dans l'activité touristique, la capacité de commercialisation et les revenus importants provenant du tourisme où le gouvernement et les communautés locales sont parties prenantes. La 38ème session récemment conclue de la réunion du Comité du patrimoine mondial qui s'est tenue à Doha, au Qatar, du 15 au 25 juin 2014, a exprimé sa préoccupation au sujet de ces projets d'infrastructure proposés estimant que s'ils sont réalisés comme prévu à travers le parc national de Chitwan-cum-site du patrimoine mondial, ils seraient un danger potentiel pour la Valeur universelle exceptionnelle d'un site du patrimoine mondial. En tant que partie à la Convention sur la diversité biologique, le Népal a accepté le plan stratégique d'Aichi sur la biodiversité et ses objectifs accompagnateurs de la biodiversité. Naturellement, la protection et la gestion appropriées du parc national de Chitwan sont nécessaires pour faire en sorte que d'ici 2020, l'extinction des espèces menacées connues, y compris le grand rhinocéros unicolore, soit évitée et leur état de conservation amélioré et maintenu. Ce qui est nécessaire maintenant c'est de trouver un équilibre entre le développement des infrastructures et la conservation des espèces et des paysages et les communautés qu'ils soutiennent.

RESEARCH

The African elephant and food security in Africa: experiences from Baringo District, Kenya

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Abstract

Elephants often impose costs including threats to human life and the destruction of crops and property on the people who share their range. Incidents of human–elephant conflict (HEC), especially crop destruction, are increasing in Africa, undermining efforts towards biodiversity conservation and food security. This study analysed the impact of crop destruction by African elephants on food security in Baringo District, Kenya. The study area was Mochongoi Division, which was stratified into three blocks: Kamailel, Mochongoi and Kimoriot. Data were collected through administering questionnaires to 40 households per block; 120 respondents were interviewed and data analysed using the Statistical Package for Social Sciences (SPSS). Results from this study showed that HEC in the study area had reduced by 15% in 2006, by 20% in 2007, and by 29% in 2008. In addition, HEC was found to reduce household income by 35.1%. The crop most raided by elephants was maize, which accounted for 65.5% of all the HEC losses, next was beans (23.8%), then cabbage and potato. This study establishes that elephant presence in non-protected areas jeopardizes local community efforts to food security and undermines local livelihoods. Conservation agencies need to lobby and support the locals to venture into other income-generating activities, such as curio shops and ecotourism facilities, that are compatible with elephant conservation. Alternatively, Mochongoi elephants could be translocated to parks and reserves earmarked for wildlife conservation.

Additional key words: cash income, crop destruction, human–elephant conflict, livelihood, poverty

Résumé

Les éléphants imposent souvent des coûts, y compris les menaces à la vie humaine et la destruction des cultures et des biens des gens qui partagent leur habitat. Les incidents de conflit homme-éléphant (CHE), en particulier la destruction des cultures, sont en augmentation en Afrique, ce qui compromet les efforts visant à la conservation de la biodiversité et la sécurité alimentaire. Cette étude a analysé l'impact de la destruction des cultures par les éléphants d'Afrique sur la sécurité alimentaire dans le district de Baringo au Kenya. La zone d'étude était la Division de Mochongoi, qui a été stratifiée en trois blocs: Kamailel, Mochongoi et Kimoriot. Les données ont été recueillies en administrant des questionnaires à 40 ménages par bloc; 120 personnes ont été interrogées et les données analysées en utilisant le Logiciel de statistique pour les sciences sociales (SPSS). Les résultats de cette étude ont montré que le CHE dans la zone d'étude s'était réduit de 15% en 2006, de 20% en 2007, et de 29% en 2008. En outre, on a trouvé que le CHE réduisait le revenu des ménages de 35,1%. La culture la plus maraudée par les éléphants était le maïs, qui représente 65,5% de toutes les pertes du CHE, suivi des haricots

(23,8%), puis les choux et les pommes de terre. Cette étude établit que la présence d'éléphants dans les zones non protégées met en péril les efforts de la communauté locale à la sécurité alimentaire et compromet les moyens de subsistance locaux. Les organismes de conservation doivent faire le plaidoyer auprès des habitants et les encourager à entreprendre d'autres activités génératrices de revenus, tels que les magasins de souvenirs et les services d'écotourisme qui sont compatibles avec la conservation de l'éléphant. Alternativement, on pourrait transférer les éléphants Mochongoi vers les parcs et les réserves destinées à la conservation de la faune.

Mots clés supplémentaires: revenus en espèces, destruction des cultures, conflits homme-éléphant, moyens de subsistance, pauvreté

Introduction

Conflict between humans and wildlife today undoubtedly ranks among the main threat to conservation in Africa. Alongside habitat destruction and commercially motivated hunting of wildlife to satisfy the demand for bush meat, conflict presents a real challenge to local, national and regional governments and non-governmental agencies in conservation (Treves and Karanth 2003). Human–elephant conflict (HEC) has become an important issue for conservationists during the last 30 years (Sarker and Roskaft 2010). HEC is a direct outcome of the excessive changes in land-use patterns and the continued conversion of natural elephant habitat to human use (Nelson et al. 2003). Recorded incidents of HEC, in particular crop raiding, are increasing in rural Africa as intensification and extension of cultivation lengthens the human–elephant interface (Hedges et al. 2005).

In addition, large populations of Kenya's elephants range outside protected areas and migrate between such areas and their environs as well as between habitats. Elephant movement is influenced by a number of factors, notably the search for food, water, minerals and in response to disturbance. This movement may be unpredictable and complex in certain situations (Blanc et al. 2003) as elephants tend to shift their movement patterns in response to availability of water and forage. At times the movement may be regular between dry and wet season ranges, in addition to other factors such as human settlement and infrastructure development (Masila 2004).

HEC is a growing concern, particularly in Kenya where elephant habitats are rapidly being converted to farmland and settlement, forcing elephants out of their ranges and into fragmented pockets of habitat. Despite this, elephant numbers in Kenya have risen in recent years due to anti-poaching policies enforced by the government (Omondi et al. 2002). As a result,

these re-expanding elephant populations frequently come into conflict with humans. HEC has both direct and indirect cost implications for people in many parts of Africa (Graham et al. 2010). Direct costs are relatively straightforward to quantify. However, indirect costs associated with time and money required to avoid HEC, such as the curfews on school-going children due to presence of elephants on roads leading to school, are more difficult to estimate (Hill 2004).

Despite the disruption of socio-economic activities, pastoral and agropastoral people living in adjacent park areas are denied access to protected areas but are expected to tolerate the presence of elephants wandering on their private and communal lands. This leads to anger and desperation because these communities have to bear the costs associated with hosting elephants. People often respond to HEC by taking actions such as injuring or killing elephants and other wildlife species or creating conflict with elephant authorities (Woodroffe et al. 2005). Most pastoral communities now weigh the costs of tolerating elephants against the profits to be made from selling their land or converting it to more profitable use (Gadd 2005). Not surprisingly, most pastoralists are now practising agropastoralism or leasing their land for intensive irrigation agriculture, such as is happening in Laikipia County. Despite these problems, many pastoral communities seem to tolerate the elephant menace with the hope that a solution will be found one day (Amwata et al. 2006). Therefore, for people and elephants to live in harmony, the importance of elephants in the study area needs to be evaluated.

The elephant situation is particularly problematic because elephants compete with livestock and humans for resources, raid farmers' crops, and threaten livestock, people and property. For elephants to persist on pastoral rangelands, a costs and benefits analysis and its implications for local livelihoods is fundamental. Past studies have focused on elephant distribution, status, movement, and the nature and extent of conflicts

(Blanc et al. 2003) and spatial aspects (Sitati et al. 2003). Others have emphasized elephants in relation to agricultural conflicts. Most of these studies have shown the economic losses attributed to elephants, but few quantitatively approximate the monetary losses. These studies have shown limited interaction between elephant damage and household food security status. It was with this concern that we undertook this study to facilitate a better understanding of the nature, degree of conflicts, and how these conflicts impact household food security and wellbeing.

Materials and methods

Study area

This study was conducted in Mochongoi Division in Baringo County, one of the arid and semi-arid counties in the Rift Valley Province of Kenya (Figure 1). Mochongoi Division covers approximately 390 km² and has three main agro-ecological zones: lowland, medium highland and highland. The lowlands comprise the northern plateau, Lake Baringo and Kerio Valley basins (Lelon et al. 2010). The study area is influenced by the intertropical convergence zone, giving it a bimodal rainfall pattern with the long rains from March to July, and the short rains from mid-September to November (Amwata et al. 2006). Average minimum temperature is 20 °C and the maximum is 35 °C (Kaimba et al. 2011). Soils are tertiary volcanic in origin, dominated by porous volcanic sandy and clay soils. The soils become soggy and waterlogged in the wet season and rapidly dry and crack during the dry season. The main vegetation type is *Acacia* woodland dominated by *Acacia tortilis*, *Acacia reficiens* and *Boscia coriacea*. Other major plant species include *Olea africana*, *Croton megalocarpus*, *Juniperus procera*, *Podocarpus gracilor*, *Cordia sinensis*, *Salvadora persica*,

Balanites aegyptiaca and *Maerua angolensis*. The study area is inhabited by Pokot, Tugen and Njemps pastoral communities. The pastoralists in Baringo District are mainly transhumance pastoralists. They exemplify communities in arid and semi-arid lands that depend on livestock for their livelihood (Kaimba et al. 2011).

Methodology and data collection

Mochongoi Division formed the study area. It was divided into three blocks—Kamailel, Mochongoi and Kimoriot. Primary data were collected by administering questionnaires to 120 households (Figure 2); 40 households were interviewed in each block. Questions were sought on household size in adult equivalents, age composition, sources of livelihood, incidents of human–elephant conflict, household food consumption patterns, types of crops grown, and elephant-related property and crop losses. The questions were dichotomous, multi-choice and open ended to allow ease of capturing the diverse issues under investigation in the necessary detail. Secondary data were obtained from reviewing previous studies, government reports and manuals on land transformation, elephant conservation, land use and food security of the area. The primary data were analysed using the Statistical Package for Social Science (SPSS).

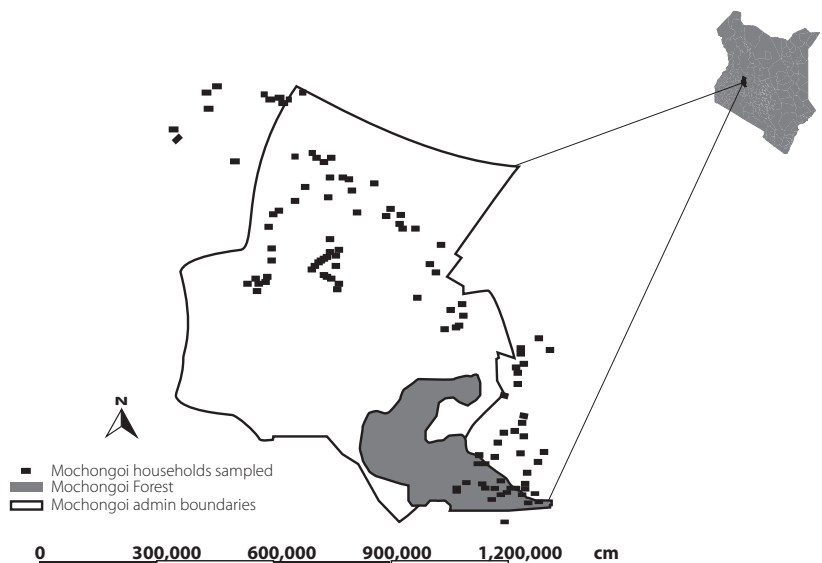


Figure 1. Location of Mochongoi forest and households sampled in Mochongoi Division

Results and discussion

Results obtained from this study show that HEC in the study area has considerably reduced: by 15% in 2006, by 20% in 2007, and by 29% in 2008 (Figure 2). This reduction could be attributed to improved service delivery that was achieved by relocating the Kenya Wildlife Service

(KWS) Mochongoi station from Kabarnet to Nyahururu Station. In addition, KWS rangers have been provided with the necessary equipment and facilities, such as motorbikes, spotlights, raincoats and gumboots, which boosted their work morale and motivated them to constantly patrol without waiting for alarm calls from the locals. These regular patrols have greatly reduced contact between people and elephants.

Figure 2 shows that the number of HEC incidents declined between 2008 and 2011. Results from this study suggest that with more motivation and provision of transport facilities, the likelihood is that HEC can be further reduced.

From the questionnaire survey and the KWS Occurrence Book, the most prevalent types of HEC were crop destruction, loss of property and threat to human life, in descending order. However, in addition to these types of HEC, Amwata et al. (2006) noted forms of HEC such as human deaths, disruption of school attendance and destruction of water points, which have ceased to occur in the area. Besides, evidence from KWS Occurrence Book for the period 2006–2011 shows that these forms of HEC were never reported (Figure 3).

Previous research studies in the study area by Amwata et al. (2006) noted four different types

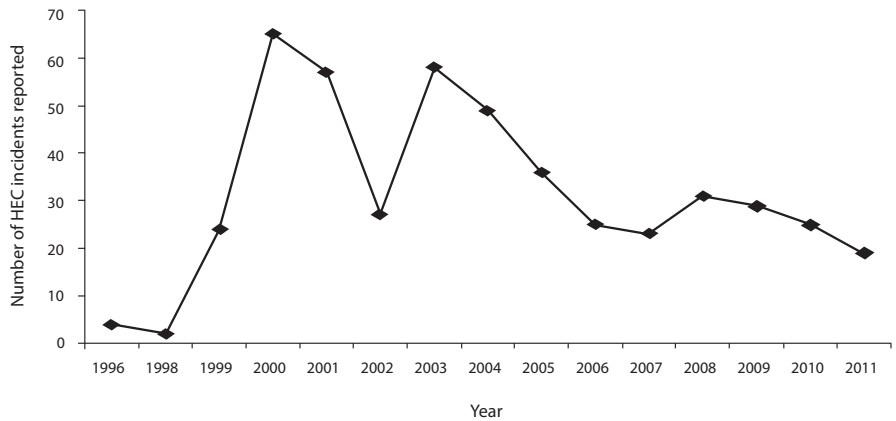


Figure 2. Trends in HEC in Mochongoi Division from 1996 to 2011. (Source: Modified from Amwata et al. (2006); KWS (2011))

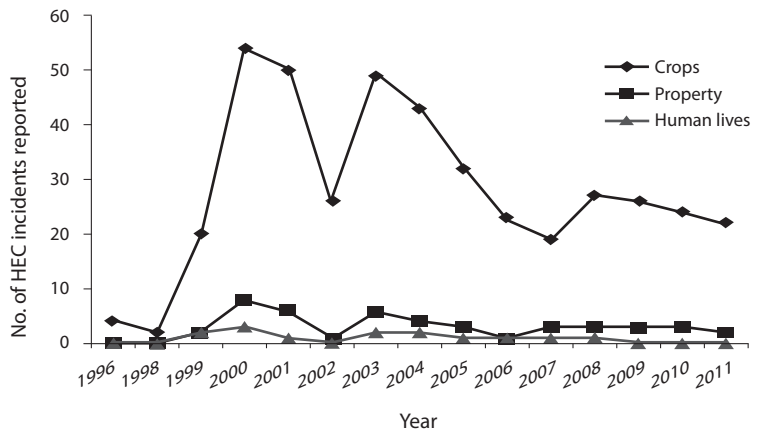


Figure 3. Incidence and different types of HEC, 1996–2011.

of land-use activities: livestock production, crop production, small-scale mixed agriculture, and charcoal burning in Mochongoi forest. Charcoal burning was later banned and the forest is recovering. Additionally, households living within the forest boundary were relocated.

All households interviewed in the study area practise some form of cultivation. Crops grown, in order of preference, were maize, beans, irish potato, cabbage, kale, sorghum, onion, banana, peas and carrot (Table 1). The contribution and economic loss of the most common crop types grown by all households to total income is shown in Table 2. Maize was the highest contributor to household income; next was beans, cabbage and lastly potato. Similarly, maize experienced the greatest losses due to HEC, leading to a 62.8% reduction in maize income.

Table 1. Distribution of crops grown by different households in the three blocks

Crop	Kamaillel	Kimoriot	Mochongoi	Respondents (n = 120)	% of respondents
Banana	2	1	6	9	7.50
Beans	27	29	31	87	72.50
Cabbage	14	9	18	41	34.17
Carrot	0	4	0	4	3.33
Irish potato	22	19	25	66	55.00
Kale	11	9	16	36	30.00
Maize	40	40	40	120	100.00
Onion	4	14	9	27	22.50
Pea	0	7	2	9	7.50
Sorghum	9	5	15	29	24.17

Table 2. Estimated contribution of selected crops to household income and associated HEC losses

Food type	Contribution to household income (%)	Loss in household income due to HEC (%)
Beans	13.7	23.9
Cabbage	5.1	4.8
Maize	65.2	62.8
Potato	8.9	3.2
Other crops	7.1	5.3

Table 3. Acreage of crops destroyed by elephants in the three blocks

Block	Maize (acres)		Beans (acres)		Cabbage (acres)	
	Cultivated	Destroyed	Cultivated	Destroyed	Cultivated	Destroyed
Kamaillel	192	48.50	72.50	25.50	13.50	10.50
Kimoriot	140	65.50	68.50	40.50	7.25	5.00
Mochongoi	126	32.25	58.50	19.50	4.50	2.25
Total	458	146.25	199.50	85.50	25.25	17.75

Table 4. Estimated value of elephant crop destruction in Kenya shillings (KES)

Block	Value (KES)			
	Maize	Beans	Cabbage	Total
Kamaillel	2,716,000	1,224 000	126,000	4,066,000
Kimoriot	3,668,000	1,944 000	60,000	5,672,000
Mochongoi	1,806,000	9,360 000	27,000	2,769,000
Total	8,190,000	4,104 000	213,000	12,507,000
% of total crop loss	65.5	32.8	1.7	100.0

USD 1 = KES 85

To estimate the economic implication of elephant destruction, the acreage destroyed for the three major crops: maize, beans and cabbage, was calculated (Table 3). Results from the survey established that average yields of the three major crops were 2,970 kg/acre for maize, 1,440 kg/acre for beans and 1,050 kg/acre for

cabbage. Similarly the average market prices per 90-kg bag during that season were Kenya shillings (KES) 2,000 for maize, KES 3,000 for beans and KES 800 for cabbage (USD 1 = KES 85). With these estimates, the economic loss associated with elephants in the 2007 March–August season is tabulated in Table 4.

The questionnaire survey showed that the economic loss from elephant crop destruction was high. Crop production was the main source of livelihood. In monetary terms these losses were approximately KES 12,507,000 annually for Mochongoi Division. This translates to a 35.1% loss in household income annually for the study area. Kimoriot block had the greatest losses; next was Kamailé. Amwata et al. (2006) estimated HEC losses in Mochongoi Division at approximately 48.6% in income per household annually. This difference in estimating losses is attributed to the fact that current estimates have been based on real market values while previous estimates were based on price approximation. Moreover, the number of incidents of HEC has reduced, implying reduced economic losses.

To understand the links between HEC and livelihood, it is critical to understand HEC influence on food security and household income. To investigate the household food security status in the study area, we established household food consumption as a function of minimum energy requirement (MER). The MER in the study area was taken to be 2,250 kcal per active African man equivalence (AAME) per day (Amwata 2004). Several methods have been used to estimate the economic welfare of households. These include head count ratio, poverty gap index, squared poverty gap index and *gini* coefficient. Of these, the head count ratio is commonly used in developing countries because it shows details of how poverty is widespread. Also, these countries have a high preference for food nutritional security, which is consistent with the behaviour of poor people. In this study the food poverty incidence (fpi) was used to proxy the household food security status. The fpi of a household refers to the number of individuals in that household who fall below the food poverty line, given to be 2,250 kcal/adult equivalent (Nyariki et al. 2002; Amwata 2004, 2013). Food-poor households are those that do not have access to enough food to supply 2,250 kcal per AAME per day. To calculate the food poverty incidence, we used the following equation:

$$fp = q/n$$

where fp is the food poverty incidence, *q* the number of households that fall below the food poverty line, and *n* the total number of sampled households (Amwata 2004, 2013).

Mochongoi Division depends on agriculture and local natural resources, and members of the community

in this division are unable to meet their basic needs, especially for food security, because of the elephants. All three blocks were food insecure. The overall fpi for Mochongoi Division was 0.2, which implies that only 20% of the households in the study area were food secure. Variations in fpi were noted among the three study blocks: Kamailé had the highest fpi of 0.3, next was Kimoriot with 0.2 while Mochongoi block had the lowest with 0.1. The fpi for the study area was found to lie within the ranges that have been reported from other parts of Kenya. In 1997 the fpi ranged between 18% and 70% with Kiambu District having an fpi of 18% (GOK 2000). However, the fpi for the study area was found to be lower than reported in other arid and semi-arid areas such as Kibwezi (46%) and Kilome (36%) (Nyariki et al. 2002), and Rendille in Marsabit District with an fpi of 61% during the wet season and 86% in the dry season (Sunya 2003).

Conclusion

Deforestation, increased human population and settlements have greatly reduced the area under forest cover in Mochongoi Division. This has tremendously contributed to the loss of elephant habitat and biodiversity. As a result, HEC incidents increase threats to the survival of communities inhabiting these areas. It is clear that the presence of elephants inflicts costs, leading to a negative attitude towards the elephants. The survival of both elephants and the local community is at stake. To resolve this problem, there is need to protect rural livelihoods and reduce their vulnerability to HEC. Mitigating losses with benefits derived from community-based conservation and natural resource management may be an effective option. Opportunities should include ecotourism ventures such as curio shops, eco-lodges and sportive destinations. The government could market Mochongoi Division as a tourist destination. This would motivate the locals since they could benefit directly and indirectly from elephants through tourism and its related activities such as curios and gate levies. Besides, tourism helps diversify livelihood sources, employment opportunities and income.

Acknowledgements

This project was supported by the Kenya Wildlife Service through its Elephant Programme and was funded by the Elephant Research Trust Fund. It would

have been difficult to conduct this study without this financial support. We are indebted to Patrick Omondi, assistant director, KWS, for guiding and supervising this work. We thank the divisional officer of Mochongoi Division and the game warden at KWS Nyahururu Station for their enthusiastic support, and our three field assistants, the six KWS rangers, the driver and all those who contributed to this study in one way or another.

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Luanda—the largest illegal ivory market in southern Africa

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Abstract

Luanda, the capital of Angola, has the largest illegal retail ivory market in southern Africa today. In early 2014 we surveyed the retail outlets in and around Luanda and counted 10,888 recently carved ivory items without proper documentation, and thus illegal. These pieces had been crafted in central Africa and Angola, mostly from poached forest elephants. The tusks can be obtained wholesale in Luanda for USD 150–250/kg. We estimated 92% of the total worked ivory on display was in Mercado do Artesanato in Benfica in the southern outskirts of Luanda. The vendors there are from the Democratic Republic of Congo, Republic of Congo and Angola. The buyers today are nearly all Chinese. There has been a huge increase in demand for worked ivory since 2005 due to the rising number of Chinese working in Angola, from 25,000 in 2006 to 260,000 in 2012. Items for the Chinese, such as jewellery, name seals, Buddhas and chopsticks, dominate the market. Retail prices can be a tenth of those in China, and construction workers go daily to Benfica market for worked ivory to bring back home. Not only is Angola acting as a main conduit for shipments of tusks wholesale to East Asia, but the blatant sale of ivory items in Benfica market encourages poaching as well. Angola needs urgently to enforce its domestic ban on ivory sales and the CITES ban.

Résumé

Luanda, la capitale de l'Angola, a aujourd'hui le plus grand marché de l'ivoire illégal au détail en Afrique australe. Au début de 2014 nous avons étudié les points de vente à Luanda et ses alentours et nous avons compté 10.888 articles en ivoire récemment sculptés sans documentation adéquate, et donc illégaux. Ces pièces avaient été fabriquées en Afrique centrale et en Angola, pour la plupart à partir des éléphants de forêt braconnés. On peut se procurer des défenses en gros à Luanda pour USD 150–250/kg. Nous avons estimé que 92% de tout l'ivoire travaillé sur le marché était dans Mercado do Artesanato à Benfica dans la banlieue sud de Luanda. Les vendeurs là-bas viennent de la République démocratique du Congo, de la République du Congo et d'Angola. Les acheteurs sont aujourd'hui presque tous Chinois. Il y a eu une énorme augmentation de la demande pour l'ivoire travaillé depuis 2005 en raison de l'augmentation du nombre de Chinois qui travaillent en Angola, qui sont passés de 25.000 en 2006 à 260.000 en 2012. Les articles pour les Chinois, tels que les bijoux, les sceaux avec des noms, les bouddhas et les baguettes, dominent le marché. Les prix de détail peuvent être un dixième de ceux de la Chine, et les travailleurs de construction vont quotidiennement sur le marché de Benfica pour chercher l'ivoire travaillé à ramener à la maison. Non seulement l'Angola sert de conduit principal pour les cargaisons de défenses de gros vers l'Asie de l'Est, mais la vente flagrante des articles en ivoire sur le marché de Benfica encourage aussi le braconnage. De toute urgence, il faut que l'Angola fasse respecter son interdiction nationale sur les ventes d'ivoire et l'interdiction de la CITES.

Introduction

Angolans have been crafting ivory for centuries. From independence in 1975 to the end of the Angolan civil war in 2002, insecurity prevented any study of Luanda's ivory markets although large numbers of elephants were reported being killed during those years. TRAFFIC carried out the first main survey of

the domestic ivory trade in Luanda in June 2005. The investigators carried out a two-hour survey in Mercado do Artesanato in Benfica (Benfica market) and did a partial count of ivory items observed, mainly the larger items. They also counted 568 ivory items in other smaller retail outlets, including at the airport. They estimated 1,573 kg of worked ivory was displayed for sale in Luanda at this time. They also investigated

Angola's legislation on the ivory trade, with the help of government officials (Milliken et al. 2006). In September 2013 scientists in Angola, while surveying the country's wildlife, conducted another partial count of ivory items in Benfica market: 2,056 objects, excluding 30–40% of the smaller items (Svensson et al. 2013; Bersacola et al. 2014).

Methods

From 26 February to 5 March 2014 we studied the retail ivory trade in Luanda, Angola's capital. We concentrated our time in Benfica market, as it is the most important retail outlet for worked ivory. We spent a morning and afternoon counting all the ivory items on display for retail sale in this market on Thursday, 27 February, and we returned the next day and on Sunday to collect further information. We priced the items and counted the number of stalls that were open on different days, and noted the origin of the ivory and where the items were carved. We also asked vendors—when we could, as often they were suspicious—about the prices of the raw material and about the nationalities of the craftsmen, vendors and customers. We observed, when possible, ivory items and raw tusks stored in metal trunks under the tables, but as these were not on display the items we saw were not counted in order to be consistent with our past survey methods.

We visited all Luanda's main hotels, souvenir shops and stalls and checked the airport for any ivory for sale. We interviewed two Angolan ivory carvers about their business and we learned about the economic boom and development occurring in Luanda and in Angola overall. We interviewed tour operators and souvenir shop vendors to ascertain their views on the ivory trade.

Background

Luanda, a city of five million people, has since 2002 become one of the most expensive cities in the world for expatriates. Lack of adequate conservation funds since the end of the civil war had precluded detailed ivory surveys, but some findings showed that Angola's ivory market was a significant problem that needed further investigating. Another deterrent to visiting Angola is the long time it takes to obtain a visa, putting off conservationists, tourists and businessmen alike.

Short history of the Angolan ivory trade

The Kongo people in central Africa and Angola have had a long tradition carving ivory. They have been famous in the African art world from the 16th century for producing intricately carved *oliphants*—musical instruments played as side-blown horns (Bassani and Fagg 1988). They also carved Roman Catholic figures for the Portuguese colonialists. The Pinde people in Angola were well known in the 18th century for carving ivory human figures for their own culture (Manuel Murteira Martins, art historian and antique dealer, Lisbon, pers. comm. to Esmond Martin, 24 September 2008). From 1830 to 1975 the Kongo and other tribes in Angola produced carved ivory items in increasing amounts, including carved tusks, to meet the demand of the Portuguese and other Europeans living in the country (Ross 1992; St Aubyn 1987). Tourists visiting Angola in the 1950s and early 1960s were advised to buy worked ivory as souvenirs in the open-air markets in the main cities and towns of Angola (Kane 1961).

In the early 1960s rebellions broke out leading to independence from the Portuguese in 1975. The government, a Marxist regime, nationalized many of the businesses and took people's land and possessions; some Portuguese retaliated by destroying the infrastructure they had developed (Stead and Rorison 2010). Many fled Angola after buying up ivory items, especially carved tusks and figures, to take with them to sell in Portugal where ivory was in demand (Martin 2009; Martin and Martin 2009). The Angolan civil war from 1976 to 2002 resulted in massive destruction of the economy and thousands killed. Retail ivory sales in Luanda dwindled but the export of raw ivory was considerable during this time.

The economy of Angola

In the early 1970s the country's economy performed reasonably well, based on agriculture (especially coffee exports) and oil products. In 1975 the new independent government nationalized plantations, factories, transport, communications and other sectors of the economy. During the following 27 years of civil war, the agricultural economy almost collapsed. In 2002 when the war ended, the government eased its policy of state ownership and management, and became more lenient to foreign investment. The economy took off with GDP growing at 11% a year

from 2001 to 2010, one of the highest in the world (economist 2011). The main exports were oil (50% of GDP and 90% of exports), gas and diamonds. To achieve its economic plan the Angolan government required a skilled workforce to implement large projects, such as high-rise office buildings, housing complexes and new roads, quickly and efficiently, at reasonable prices. East Asian contractors, especially Chinese companies, were chosen. The Chinese are known for working hard and long hours, even in the hot months in Luanda, and are transforming the cityscape. The Chinese population in Angola rose from about 500 in 2002, to 25,000 in 2006 and reached 260,000 in 2012 (Sautman and Hairong 2007; Dongye 2013). Two-way trade between China and Angola reached 35 billion dollars in 2013, a 50-fold increase from 2000 (*China Daily* 2014).

Legal aspects of the ivory trade in Angola

The export of worked ivory in one's personal luggage without proper documentation is illegal in Angola (Milliken et al. 2006). This TRAFFIC report stated that the 41 retail outlets in 2005 that sold ivory did not have proper documentation and concluded, 'there is an urgent need to review and update the substance of Angola's legislation that relates to wildlife in general and wildlife trade and CITES in particular'. In 2013, according to Svensson et al. (2013), 'possession and trade of ivory requires special permission'. Svensson et al. (2013) found that no enforcement or regular monitoring is conducted by Angolan authorities. In our survey in 2014 we found no evidence that the vendors possessed official documents allowing their trade in ivory. A Chinese man recently visiting Angola had taken photos of mounds of worked ivory for sale and said that one could pay supposedly a dollar for a stamp to 'legalize' the export of one's worked ivory.

In December 2013, Angola finally became the 179th member of CITES, which presently forbids commercial imports and exports of elephant ivory. Before this the Angolan government had never reported a single ivory seizure from 1989 to January 2013 to the Elephant Trade Information System (ETIS), a CITES monitoring programme (UNEP et al. 2013; Tom Milliken, ETIS director, pers. comm. April 2014).

In 2014, however, there have been official seizures of ivory from Angola in other countries. For example, in January officers in Changi airport in Singapore detected two bags containing about 45 kg of ivory in transit via Dubai and Singapore destined for Lao PDR.



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A typical display of worked ivory for sale in Benfica market.

The owners of the two bags, Vietnamese nationals, were arrested immediately. One said he had been paid USD 1,000 by an unknown Vietnamese man at a market in Angola to take the ivory to Lao PDR (Channel News Asia 2014a). In February officers in Siem Reap airport in Cambodia arrested three Vietnamese for smuggling 79.5 kg of tusks. They admitted they bought the tusks in Angola to take to Hanoi, Vietnam (*Shanghai Daily* 2014). In June, Hong Kong customs seized 790 kg of tusks in 32 pieces of luggage on its way to Cambodia that had originated in Angola; 15 Vietnamese smugglers were arrested. The Hong Kong officials said it was unusual for such a large consignment of tusks to be carried by air (Channel News Asia 2014b). This last seizure shows how blatant the smuggling of ivory from Angola to Asia has become.

Present situation

SOURCES OF IVORY AND PRICES OF RAW TUSKS IN THE LUANDA AREA

Relatively little of the ivory for sale in Luanda nowadays originates from recently killed elephants in Angola as few elephants are left. The country once had many thousands of elephants but latest published AfESG figures for elephants in Angola are only 818 'definite', 800 'probable' and '851' possible; savanna elephants are still being poached in the extreme southeast and forest elephants in the northwest of the country (Blanc et al. 2007). Most of the ivory seen in Benfica market is from recently killed elephants from central Africa where forest elephants are being poached at accelerating rates. Between 2002 and 2011 their population declined by about 62% (Maisels et

al. 2013). Milliken et al. (2006) noted that most ivory seen in the TRAFFIC survey in 2005 was from the Democratic Republic of Congo (DRC). Svensson et al. (2013) remarked that the shape and size of the tusks on display in Benfica market indicated that the ivory originated from forest elephants. Our findings corroborated this. We also found that many of the vendors in the market are French speaking from the DRC and Republic of Congo who bring their ivory from central Africa to sell in this market. A few other retail outlets in the city displayed much smaller numbers of ivory items, some carved earlier by Angolans from elephants poached during the civil war in Angola.

Two vendors in Benfica market told us separately that the wholesale price for a 1–3-kg tusk was USD 150/kg and USD 200/kg if slightly larger. In a workshop in central Luanda, an ivory carver told us the wholesale price for a 1–3-kg tusk that he recently bought was USD 250/kg, which is understandably higher due to less competition for raw ivory than in Benfica market. The wholesale price of USD 150–250/kg is credible as the retail price for a polished tusk in Benfica market averaged USD 433/kg without bargaining.

IVORY CRAFTSMEN IN THE LUANDA AREA

The carvers of the ivory items in Benfica market were from the DRC, Republic of Congo and Angola. Some ivory is carved in central Africa and some in Angola, especially in Zaire Province in the northwest. They produce items that are specifically in demand by the Chinese: Buddhas, chopsticks, dragons, jewellery and name seals. There are few ivory craftsmen in Luanda, according to the Benfica vendors. But they said their tusk tips on display could be carved, as requested by customers, into statues of their choice for USD 60–70.

In central Luanda we found two ivory craftsmen at their small workshop who produce a variety of items for their nearby shop. One was working on ivory earrings and pendants. They make objects for their main customers, notably the Portuguese who live in Luanda or visit on holiday. Items for sale here included African busts, Christian figures, European figures and a variety of different animals and fish.

RETAIL OUTLETS AND PRICES OF IVORY ITEMS IN THE LUANDA AREA

Of all the ivory items surveyed in and around Luanda, 92% were seen in Benfica market. This single-storey

simple market had a corrugated iron roof and was on sandy ground, with low or no walls. It consisted of two oblong sections: one with paintings, basketry, cotton material and old masks, the second section with dark wood carvings and worked ivory. The ivory items offered for sale were displayed on the top of robust concrete-block tables, totally open with no glass protection. Under or beside the stalls were metal trunks that contained perhaps a third more ivory items wrapped in cotton sheeting with similar items grouped together in pillow cases. At the end of the day the vendors, all men, returned their ivory into these padlocked trunks.

We carried out our count on an average weekday when there were 20 tables displaying ivory for sale. Nearly all these tables sold ivory almost exclusively. We counted 10,026 ivory pieces in this market. Necklaces, bangles and pendants made up 61% of the total (Table 1). Almost all the items on display were of similar designs and newly carved. In general, items were of generous size. There were no antique ivory items, and vendors made no attempt to pretend any worked ivory was old or antique. On the first day we counted 20 stalls with ivory, the next day we counted 25 stalls, including two small displays among the wood carvings. On the Sunday, when most people have their day off, more vendors had opened their stalls with 30 displays of ivory: about 20 had nearly all ivory, sometimes with a few reptile skin wallets and handbags; 5 displays were half ivory and half jewellery items, often consisting of malachite or wooden-beaded necklaces; and 5 other stalls had smaller selections of fewer than 50 ivory items displayed among other souvenirs.

Table 1. Ivory items for retail sale in Benfica market in late February 2014

Item	Percentage of total
Necklace	23
Bangle	19
Pendant	19
Name seal	7
Cigarette holder	7
Ring	6
Figurine	5
Hairpin	4
Chopsticks (pair)	3
Miscellaneous	7

The ivory items in this market were fairly crudely carved, had a dull light beige tint and were not polished; they lacked variety in design. The bangles were wide, thick and usually plain; there were also medium- and large-beaded bracelets, as well as many medium- and large-beaded necklaces, and smaller bead necklaces with a large pendant many lying in mounds on the tables. Although they had fasteners, most necklaces were long enough to wear directly over one's head. Pendants were commonly round or oblong with a simple carving of Buddha or of animals from the Chinese zodiac on them, while others were shaped as hearts and tiger claws.

There were many squat Buddha figurines and also some thinner, taller Guanyin figures, but virtually no African figures or busts, and almost no European or Christian figures in this market. Stalls had a variety of simply carved animal figures, especially dragons, rhinos and elephants, and more could be produced on request from the trunks under the tables.

While jewellery, cigarette holders, name seals and figurines dominated the displays, sometimes there were other items, such as Chinese chess pieces, Chinese hand balls, cocktail sticks, combs (mostly with handles), drum sticks, fruit, hair fasteners, key rings, pen holders, pipes with dragon designs, tusk tips, and walking sticks with dragon handles.

In Benfica market, vendors gave prices in either US dollars or kwanza, as the customer preferred (Table 2). No items had a marked price. Customers new to the market with little experience were charged higher prices, but with bargaining, items could be bought for half the price, especially if bought in bulk. Vendors at different stalls varied their initial prices considerably; for example, an ivory walking stick was offered for USD 1,000 at one stall and USD 4,000 at another. The prices of a 15-cm figurine varied hugely, depending on the diameter and weight of the ivory. Customers prefer shorter, chunkier carvings; very few figures reached 30 cm. There were also very few bridges and carved tusks.

In central Luanda only six retail outlets displayed ivory, offering 862 items for sale. Two were outlets on Ilha do Cabo, a popular beach area with restaurants

Table 2. Retail prices for ivory items seen in Benfica market, February/March 2014

Item	Size (cm)	Average price (USD)
<i>Jewellery</i>		
Bangle, plain or carved	1	25
	2	100
	4	180
Bracelet, 1-cm beads		32
	2-cm beads	90
Hair fastener	8 x 3	23
Hairpin	20	22
Necklace, beaded	Various	30
Pendant	5	15
	8	25
Ring	0.5	3
<i>Figurines</i>		
Animal	5	60
	10	177
	15	400
	20	800
	30	1,250
Human / religious	10-15	325
	25	527
<i>Tusks</i>		
Bridge	25	375
Tusk tip	10	60
	15	225
	30	650
<i>Others</i>		
Cigarette holder	8	12
	13	18
Chopsticks, pair	20	87
Comb	15	47
Fruit, lifesize		180
Name seal, plain or partly carved	7 x 2	60
	12 x 5	225
Pipe, plain	16	100
Pipe, carved	16	150
Walking stick, all ivory	90	2,167

USD 1 = 100 kwanza, February–March 2014.
These prices were before extensive bargaining.

and bars; one had 445 items and the other 312 items. Two more large souvenir shops, both well established, displayed ivory objects, the bigger one displaying 68 objects; the other, with 16 items, was owned by a Portuguese woman for 60 years. A street vendor who

had for many years sold souvenirs beside a large hotel had 14 ivory pendants. The sixth outlet was in a luxury hotel with just 7 items, the only hotel we found with ivory for sale.

There were fewer Chinese-style items in the central Luanda retail outlets and more items attractive to the European market, such as religious figurines. The most common items were jewellery, which made up 74% of the total items (Table 3).

The prices for bangles and necklaces were higher in the central Luanda outlets compared with Benfica market where often they are sold in bulk. The figurines were less expensive in central Luanda, however, as they were generally thinner in diameter than in Benfica market, and the turnover is slow compared with accessories (Table 4). Vendors said small accessories were popular as souvenirs as they were easier to take out of the country. We saw no old or antique ivory items and no vendors tried to sell us ivory as antiques, but a number of items looked dusty and appeared to be old stock. Four outlets had price labels but generally some bargaining was possible.

Main customers for worked ivory in the Luanda area

In Benfica market all the buyers of worked ivory we saw were Chinese. Sometimes Vietnamese or other southeast Asians working in the country buy worked ivory. By far the most items cater to the Chinese; many vendors displayed the same objects, sometimes opening their storage trunks to reveal more, and allowing the Chinese to examine many items while indulging in their bargaining skills. Some Europeans were seen looking at wood carvings but were not generally interested in looking at ivory. There are very few foreign tourists in Angola and most visitors to the market are foreign residents. We were told Angolans do not buy worked ivory for themselves, and we saw no Angolan customers. The vendors all agreed that the Chinese had become their biggest customers, and apart from speaking Portuguese and French, some had learned and spoke fluent Chinese as opposed to English, to communicate with their main clients.

The Chinese in the market are mostly male contract workers who usually visit in groups of three or four, sometimes accompanied by Chinese women. Some were seen with a piece of paper listing the items they wished to buy. The Chinese are notorious for severe haggling and testing of the ivory. We saw Chinese

Table 3. Ivory items for retail sale in central Luanda in March 2014

Item	Percentage of total
Bangle	25
Necklace	25
Figurine	17
Ring	14
Pendant	10
Name seal	5
Miscellaneous	4

Table 4. Retail prices for ivory items seen in central Luanda in March 2014

Item	Size (cm)	Av. price (USD)
<i>Jewellery</i>		
Bangle, plain or carved	1	103
	2	149
Hair fastener	8 x 3	38
Necklace, beaded	various	68
Pendant	5	18
Ring	1	10
<i>Figurines</i>		
Animal	5	105
	10–15	138
	25	400
	30	700
Tusks		
Bridge	40	500
<i>Other</i>		
Cigarette holder	10	18
Comb	15	39
Name seal, plain or partly carved	7 x 2	90
	10 x 4	225

USD 1 = 100 kwanza, February–March 2014

customers smelling and biting ivory objects, and examining beads very closely in great detail, then walking away with nothing, until they finally would accept a price at a later stage. We sometimes saw groups of Chinese walking back to their vehicles with packages of ivory or wearing bracelets and bangles themselves. Nowhere else did we see anyone wearing ivory while we were in Luanda.

In central Luanda the smarter retail souvenir shops cater for Europeans and Americans, with Portuguese being the main customers; after the Chinese the Portuguese are the most numerous expatriates and



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Chinese are by far the main buyers of ivory items in Benfica market.

main holidaymakers in Angola. They prefer to shop in the comfort of central Luanda where items are clean and neatly laid out, unlike in the untidy market. Most of the Chinese in Luanda do not visit these more expensive souvenir outlets, which sell an array of other African crafts also, as they prefer to concentrate on the much larger displays of ivory and better bargaining possibilities in Benfica market.

Discussion

Benfica market is one of the largest retail markets for illegal ivory items in Africa, if not the world. It ranks with the Lekki market in Lagos and the Khartoum and Omdurman outlets that display for sale thousands of recently carved ivory items illegally.

Compared with 2005 (Milliken et al. 2006), in 2014 there were relatively more small items and fewer large figures or carved tusks in Luanda. This is because it is easier for the Chinese buyers to smuggle out small items back to China, so these are in greater demand. Most tusks are nowadays smuggled wholesale from Africa to East Asia in their raw form in large consignments to be carved there. The main buyers of worked ivory in the world today are Chinese and this is also the case in Angola. In 2005 the main buyers were southern Europeans, Americans and Asians (Milliken et al. 2006). From 2006 to 2012 there was a tenfold increase in Chinese coming to Angola, largely as contract workers, and they keep flooding in as Angola's development projects expand.

The Chinese we saw in Benfica market spent much time selecting large pieces of plain jewellery and plain utilitarian objects, such as combs and name seals, rather than carved accessories and figurines, which are roughly made compared with those made in China. There are now few Christian figurines or African busts for sale. Instead, Buddhas, dragons and animals are the main figurines, made especially for the Chinese.

In 2005 of all the ivory items estimated by weight in Luanda, Benfica market sold 92% (1,428 kg). In 2014 of all the ivory items estimated by number in Luanda, Benfica market sold 92% (10,026 items). In 2014, storage trunks under the tables had at least an additional one-third more items, some including whole polished tusks. Thus, including these, the number of ivory items available was considerably higher than our survey count of displayed ivory in 2014.

In 2005 small raw tusks sold wholesale in Luanda for USD 35–100/kg (Milliken et al. 2006) compared with USD 150–250/kg in 2014. The wholesale price for raw ivory in 2012 in the cities of Bauchi, Gombe and Jos in Nigeria was USD 110/kg in 2013 (Martin and Vigne 2013), while in Kenya in 2013 poachers received USD 175–190 (informants in Kenya, pers. comm. 2013). Thus, Luanda's raw ivory is relatively cheap, suggesting the ease of obtaining tusks in the city. In China small tusks sold wholesale for USD 2,100 in 2014, tenfold higher than in Angola (Martin and Vigne 2014). This demonstrates the large profits that can be made smuggling raw ivory. Similarly for worked ivory, the retail prices are at least 10 times more in China in 2014 than in Luanda for similar uncarved objects, such as chopsticks and personal name seals (Martin and Vigne 2014).

In 2005 vendors said it was easy to smuggle items out of the country; in 2014 they reiterated this. There has been little effort to reduce the illegal sale of worked ivory, and the vendors were generally fairly relaxed about photographs, compared with vendors in many other cities. The international airport, however, had no ivory for sale, unlike in 2005. Yet compared with countries such as Cameroon, Gabon, Kenya, Rwanda and Tanzania, where you hardly ever see worked ivory for retail sale, there seems little fear of inspections, confiscations or arrests in Luanda. In Benfica market other wildlife products were also on open display, including leopard skins, turtle shells and crocodile skins. We saw no signs or notices against ivory or other illegal wildlife in the markets, shops, hotels or airport.

Conclusion

All ivory for sale in Luanda without special official documentation is illegal, but none of the ivory items for sale that we saw had any such documentation, suggesting no improvement in law enforcement since the 2006 TRAFFIC report (Milliken et al. 2006). On the contrary, the number of newly made ivory items has increased with the rising demand for ivory by the soaring numbers of Chinese residents in Angola. The country has the second largest Chinese population in Africa today, with a tenfold increase since 2005, and no priority is given to or by the Chinese contractors to stop their workers from buying ivory. The open, illegal trade in worked ivory is fuelling demand and putting pressure on the survival of elephants in central Africa. Angola's laws against the domestic ivory trade have not been enforced, and similarly, tusks continue to be shipped out of Angola to East Asia, as seizures in 2014 in Asia indicate, even though the country finally became a member of CITES in December 2013. Some other African countries with growing numbers of Chinese residents, and also Chinese tourists, have successfully enforced their domestic bans on worked ivory. Angola must take action to follow suit.

Acknowledgements

Thanks are due to The Aspinall Foundation and Columbus Zoo Conservation Fund for funding our fieldwork.

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Evaluation of a low-tech method, pepper-grease, for combatting elephant crop-raiding activities in Kakum Conservation Area, Ghana

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Abstract

A low-tech method for preventing elephants from destroying farms around Kakum Conservation Area in Ghana was assessed to evaluate its efficacy in warding off marauding elephants. Sixty fenced and 60 unfenced farms located at the peripheries of the protected area were selected and each inspected regularly for 12 months. One hundred twenty farmers were interviewed on the use of the pepper-grease fence to determine their level of knowledge of the efficacy of the method. In 75% of the fenced farms, elephants came close to the fence but never crossed it; they never visited 20% of these farms and only 5% attempted to break through or enter. Of the farms that were not fenced at all, elephants raided 75% completely. Most of the respondents (76.7%) had good knowledge of the pepper fence. Their major sources of information were the staff of the Wildlife Division and agricultural extension agents (54.5%); 31.1% had heard about it from other farmers. Only 14.4% got their knowledge from observing other farmers. In practice, 26.7% said they used it effectively, 22.2% partially, and 51.1% did not practise the method at all. Cost and difficulty of acquiring materials were the main issues affecting lack of adoption. The results support the recommendation that government and non-governmental agencies supply inputs to farmers consistently.

Résumé

On a examiné une méthode de technologie élémentaire pour empêcher les éléphants de détruire les fermes autour de la zone de conservation de Kakum afin d'évaluer son efficacité d'écarter les éléphants en maraude. Soixante fermes clôturées et soixante fermes non clôturées situées à la périphérie de la zone protégée ont été sélectionnées et chacune inspectée régulièrement pendant 12 mois. On a également interrogé cent vingt agriculteurs sur l'utilisation des clôtures enduites de graisse de poivre pour voir leur niveau de connaissance de l'efficacité de la méthode. Sur 75% des fermes clôturées, les éléphants se sont approchés de la clôture, mais ne l'ont jamais traversée; ils n'ont jamais visité 20% de ces fermes, mais ils ont tenté d'enfoncer ou d'entrer dans 5% d'entre elles. Parmi les fermes qui n'étaient pas du tout clôturées, les éléphants ont complètement maraudé 75% d'entre elles. La plupart des sondés (76,7%) avaient une bonne connaissance de la clôture de poivre. Leur principale source d'informations était le personnel de la Division de la faune et les vulgarisateurs agricoles (54,5%), alors que 31,1% en avaient entendu parler par d'autres agriculteurs. Seulement 14,4% ont obtenu leur connaissance en observant d'autres agriculteurs. En pratique, 26,7% ont dit qu'ils pratiquaient cette méthode effectivement, 22,2% partiellement et 51,1% ne l'avaient pas pratiqué du tout. Le coût et la difficulté d'acquisition du matériel étaient les principaux problèmes qui affectaient le taux d'adoption. Les résultats appuient la recommandation que le gouvernement et les organisations non gouvernementales doivent fournir des intrants aux agriculteurs de manière cohérente.

Introduction

Human–elephant conflict occurs wherever elephants and people share the same habitat. This situation is no different in Kakum Conservation Area (KCA), where many farms are cultivated near the area's boundary (Thouless 1994; Kangwana 1995; Barnes 1996; Barnes et al. 2005). The increasing number of crop-raiding incidents, and hence human–elephant conflict, is manifest in the increase in reported cases and complaints from farmers whose farms are located at the frontiers of the park boundaries (Oppong et al. 2008; Monney et al. 2010). Consequently, various efforts and methods have been used over the years to reduce this conflict generated by elephant crop raiding. First, the culling system. Whenever a crop-raiding incident was reported, the wildlife authority unit (Game Control Unit, Goaso) was asked to kill the problem animal and give the meat to the local people to placate them. As a result, between June 1987 and August 1988 (a 16-month period), six elephants were culled in KCA after crop-raiding incidents that were estimated to cost USD 1,920.23 (Parren and de Graaf 1995). The deficiencies of this method were untimely delivery, expense, and threat to the elephant population as well as it being a post-mortem solution to the raiding problem. Moreover, often the problem animal was not identified but rather any individual conveniently near the site was killed to satisfy the demand for action and revenge by the aggrieved community (AWF 2005) and to provide meat as compensation for crop damage.

Disturbance shooting followed after it was realized that culling was not yielding any long-lasting solution to the problem. The disturbance method involves firing guns over the heads of crop-raiding elephants. But they became habituated to hearing the gunshots and were no longer getting scared off. This was coupled with logistical constraints and the long response time on the part of the wildlife guards who were mandated to carry out that activity (Azika SA, pers. comm.; Osborn and Parker 2003).

In an attempt to reduce the level of elephant crop damage and to further inspire the local community to co-exist with elephants, the Wildlife Division initiated a project 'Improve food security and farmers' livelihood' around KCA in December 2003. The project involved installing the pepper fence. Elephants are known not to eat the fruits of the chilli pepper plant as it is thought to irritate their sensitive nasal tissue. Once confronted

with a chilli experience, the combined smell from the oil, chilli and the fence rope becomes a psychological barrier. The project was supported by the Food and Agriculture Organization (FAO), the World Bank's High Forest Biodiversity Project and the International Fund for Animal Welfare (IFAW) in series. Phase 1 of the project was supported by FAO, phase 2 by the Global Environment Fund's High Forest Biodiversity Project and phase 3 by IFAW.

The objectives of the study were to evaluate 1) the efficacy of the pepper fence to ward off elephants from entering into adjacent farms to raid, and 2) the adoption rate by the farmers.

Study area

Kakum Conservation Area is made up of two adjoining wildlife reserves: Kakum National Park and Assin Attandaso Resource Reserve located between longitudes 1°30'W–1°51'W and latitudes 5°20'N–5°40'N (Figure 1). Rainfall distribution shows a bimodal pattern with an annual average between 1,500 and 1,750 mm (Wildlife Department 1996). Fifty-two communities border KCA and it is estimated that at least 36,620 people are living there. The structure of the population shows it is quite dependent, with persons aged less than 15 years forming 45% and those aged 65+ forming 4.6% of the total KCA population. The literacy rate among adults is high (Monney et al. 2010). The main occupation of the people living around KCA is farming and the area is thus surrounded by agricultural crops. The main crops cultivated are cassava, cocoa, maize and plantain (Wildlife Department 1996).

Materials and methods

Installing the fence requires these materials: wooden poles to peg around an entire farm, nylon rope tied to the pegged poles, hot dried pepper, grease or dirty oil (a used lubricant) and rags. The dry pepper is ground to a fine powder and mixed with old engine grease. If no grease is available palm oil residue or used car oil will work just as well. The pepper–grease or dirty oil mixture is smeared on bits of cloth or rags and hung on the fence; it is also smeared on the rope itself. The pepper deters elephants from touching the fence. When the elephants encounter the ropes, they either are repelled or walk round them (Parker et al. 2007).

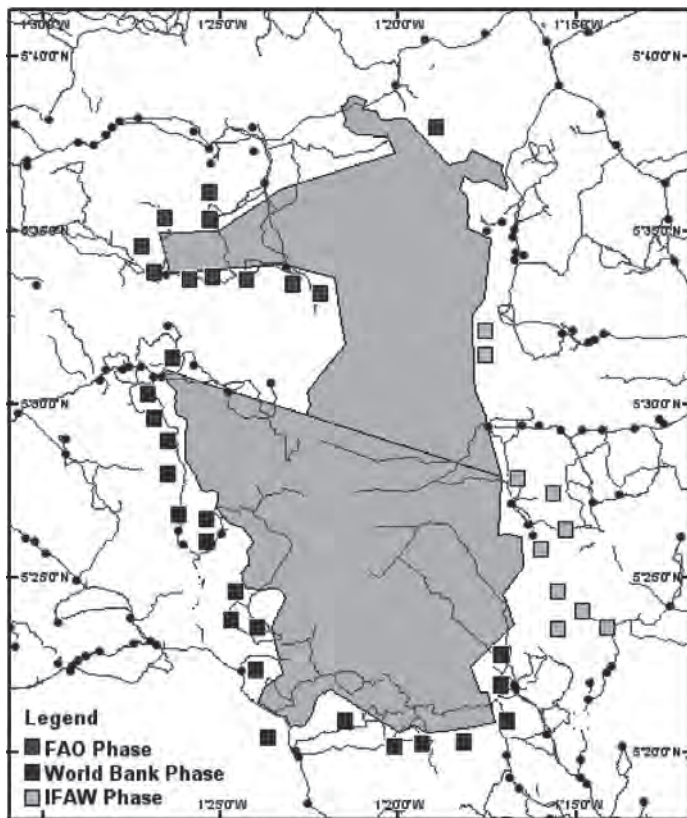


Figure 1. Kakum Conservation Area showing the implementation phases of the pepper fence.

Evaluation of farms

Sixty fenced and 60 unfenced farms located at KCA peripheries were selected and each inspected regularly for 12 months. One hundred twenty farmers were also interviewed on the use of the pepper–grease fences to find out their level of knowledge on the efficacy of the method.

Three categories of farms were identified:

- farms where best practices are being applied, for example, use of required proportions of pepper and grease, good fence with regular maintenance, etc.
- farms that partially applied the method, for example, use of less pepper and more grease, poor fence, etc.
- farms with no pepper fence deterrent

Thirty selected farms in each category were visited and observed to see whether after the fence was constructed elephants had visited the farm, had come close to the fence, and had destroyed any part of the fence.

Results and discussion

Elephant reactions towards pepper-fenced farms

Fenced farms. Elephants came close to 75% of the fences but never crossed them; they attempted to break through or enter 5% of these farms through different routes; they did not visit 20% of the farms.

Farms not fenced at all. Elephants raided 75% of these farms completely; they visited 16% but did not consume anything; they did not raid crops on 9% of these farms.

Farms with partial protection. Elephants raided 62%; they came close to 20% but did not enter or destroy anything; no elephant presence was registered on 18% of these farms.

Farmer attitude towards the pepper fence

Knowledge of the pepper fence method. Most of the respondents (76.7%) had good knowledge of the pepper fence; 23.3% had heard about it but had scant knowledge.

The major source of the information was from the Wildlife Division staff, from where 37.8% of the respondents said they got the message; 16.7% said they heard about the pepper fence from agricultural extension agents; 31.1% heard about it from other farmers; only 14.4% got their knowledge from observing other farmers.

Of the farmers who practised the method, 26.7% said they practised it effectively and 22.2% practised it partially. However, 51.1% did not practise the method at all.

Factors facilitating adoption of pepper fence. Three main issues emerged as factors that facilitate adoption of the pepper fence: 55.6% of the respondents said acquiring materials was easy and that motivated them to adopt; 23.3% said it was difficult so they felt reluctant to adopt; 21.1% attributed the poor rate of adoption of the method to the high cost of buying materials.

Evaluating the influence of source of information on adoption rate. Of the 34 (37.7%) respondents who received information on the pepper fence from the

Wildlife Division staff, 44.0% practised the method while 66% did not. Of the 15 respondents (16%) who received the message from agricultural extension officers, 33.3% practised it effectively, 33.3% partially and 33.3% did not practise it at all. Out of 28 (31.1%) farmers who received the knowledge from other farmers, 14.8% practised it effectively, 32.2% did not practise it while 53.6% practised it partially. In addition, the source of information was found significant in positively influencing the effectiveness of practising the pepper fence method ($\rho = 0.33, p = 0.00$) (Figure 2).

Reasons for adopting the pepper fence method. 31.1% of the respondents said their farm produce was safe from elephant raiding; 24.4% said acquiring materials was relatively easy, 20.0% practised it because of its ability to deter elephants, and 24.4% adopted the method because of the fence’s subsequent effect of improving crop harvests, which means their farm produce was safe and their harvests assured. Table 1 provides details of how the various reasons influence the adoption of the pepper fence method. Spearman’s correlation indicated a significant relationship and explains about 45% of the model ($\rho = 0.45, p = 0.00$).

Reasons for farmer reluctance to adopt the pepper fence. 21.1% of the respondents blamed their reluctance to adopt the pepper fence on lack of subsidies from

the government, 22.2% did not believe that the method deterred elephants, 26.7% said it was very costly for them, and 30% said the method required extra labour. Table 2 provides details of how reasons for reluctance to adopt the pepper fence influenced the farmers who practised the pepper fence method.

Conclusions and recommendations

If well constructed and maintained regularly, the pepper–grease fence has proved to be effective in warding off elephants from entering farms adjacent to

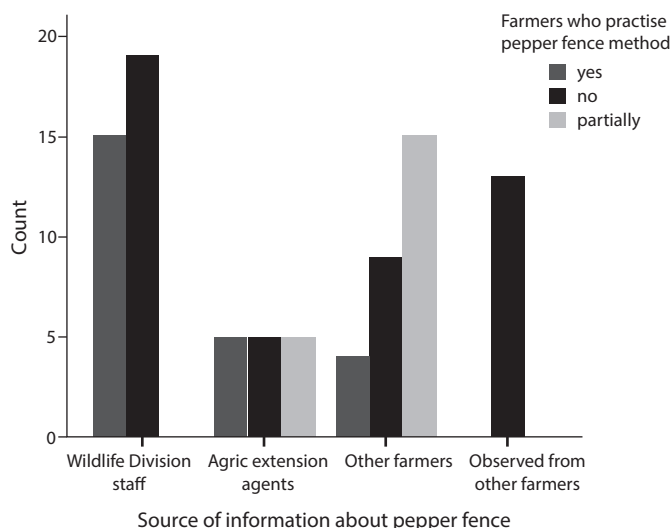


Figure 2. Influence of source of information on practice of pepper fence.

Table 1. Reasons for adopting the pepper fence method that influenced farmers who practised the method

Reasons for adopting the method	Farmers who practised pepper fence method		
	Influenced	Not influenced	Partly influenced
All farm products are secured	13	15	0
Easy to acquire materials	4	14	4
Able to deter elephants	4	10	4
Improves crop harvest	3	7	12

Table 2. Reasons for reluctance to adopt the pepper fence method that influenced farmers who did not practise it

Reasons for reluctance	Farmers who did not practise pepper fence method		
	Influenced	Not influenced	Partly influenced
No support from government	7	8	4
Don’t believe it deters elephants	0	15	5
Costly	7	9	8
Extra labour	10	14	3



Wildlife staff demonstrate how to construct a pepper fence.

KCA. Massive destruction was recorded on farms that did not use this method. The resultant benefits were factors that motivated farmers to adopt the method, but lack of encouragement and support in supplying equipment and materials was a disincentive.

Respondents who received information on the pepper fence from wildlife officers and agricultural extension officers used the fence more effectively than those who received their information from other farmers, or where farmers observed the practice on their own.

Much as the respondents appreciated that using the pepper fence was beneficial to their crops and economy, they incurred extra costs than did other farmers in areas where there were no elephants. Hence they were not ready to adopt the pepper fence quickly or easily.

The Wildlife Division staff must be well resourced to educate farmers on the proper construction and use of the pepper fence. It is recommended that the KCA authority construct the pepper fence around the forest and manage it regularly to keep elephants in the forest.

Acknowledgements

Thanks to the manager and staff of Kakum Conservation Area for their assistance during data collection. We also thank the Presbyterian University College for financial assistance.

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MANAGEMENT

The last chance for the Sumatran rhinoceros?

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Abstract

The Sumatran rhino (*Dicerorhinus sumatrensis*) is very close to extinction in Indonesia. Three major ad hoc meetings, not two as generally reported, to discuss ways to save the Sumatran rhino were held in 1984, 1993 and 2013. Their targets have never been achieved. Despite the great efforts of the participants and other parties, the world population of *D. sumatrensis* has collapsed during the last 30 years from over 800 to fewer than 100. Besides worldwide phenomena like habitat loss and poaching, other specific causes lie behind this tragedy. The status of the Sumatran rhino has been optimistically overestimated. Precious time is being wasted in finding theoretical solutions rather than implementing the recommendations of these meetings. Political will to save the habitat and protect the species is lacking. After carefully evaluating the present Sumatran rhino conservation status, a breeding project greater than those so far managed has to go ahead as soon as possible to support the ongoing in situ programme and form a viable population in controlled environments for future reintroductions into the wild.

Résumé

Le rhinocéros de Sumatra (*Dicerorhinus sumatrensis*) est très proche de l'extinction en Indonésie. Il y a eu trois grandes réunions ad hoc et pas deux comme on l'a généralement signalé, organisées en 1984, 1993 et 2013 afin de discuter les voies et moyens pour sauver le rhinocéros de Sumatra. Leurs objectifs n'ont jamais été atteints. Malgré les efforts des participants et d'autres parties, la population mondiale de *D. sumatrensis* s'est effondrée à partir de plus de 800 rhinocéros à moins de 100 rhinocéros au cours des 30 dernières années. Outre les phénomènes à travers le monde comme la perte de l'habitat et le braconnage, il existe d'autres causes spécifiques derrière cette tragédie. La situation du rhinocéros de Sumatra a été surestimée avec optimisme. On gaspille un temps précieux dans la recherche des solutions théoriques plutôt que dans la mise en œuvre des recommandations de ces réunions. La volonté politique de sauver l'habitat et de protéger l'espèce fait défaut. Après avoir soigneusement évalué l'état actuel de la conservation du rhinocéros de Sumatra, un projet de reproduction plus grand que ceux gérés jusqu'ici doit être mis en place dès que possible pour soutenir le programme in situ déjà en cours et former une population viable dans des environnements contrôlés en vue des réintroductions futures dans la nature.

Introduction

This paper focuses on the plight of the Sumatran rhinoceros (*Dicerorhinus sumatrensis*) in Indonesia. I hope to show that only immediate action will save this

rhino species from extinction, and that a large-scale capture operation of isolated animals is feasible with existing expertise, and presently is the only course of action with a chance of success.



© Cincinnati Zoo

Andalus, the first-ever conceived and captive-bred Sumatran rhino, Cincinnati Zoo, 13 September 2001.

The importance of ex situ conservation next to in situ preservation continues to be controversial: a number of conservationists completely oppose the former, while others concede that removing animals from their habitat should be the 'last resource'. Some NGOs affirm that the animals need massive in situ investments and that if you take them into captivity (ex situ) you lose the argument for habitat protection. Their concern is correct but remains unsubstantiated. As far as the Sumatran rhino is concerned, much funding was made available for in situ conservation during the period 1984–1993 of the first project aimed to establish an ex situ metapopulation (Rabinowitz 1995), and more funding continues to be raised especially for in situ projects (rhino protection units, patrolling vehicles and boats, etc.). New ex situ programmes have to be funded by new specific subscriptions.

What happens in 'emergency situations' when the decline of a species is so rapid as to require final decisions and immediate action? Dalton (2000) suggested that rapid responses, 'emergency rooms', in many cases need to be the policy norm rather than the exception. The last 30 years witnessed the extinction of several Sumatran rhino populations. In Indonesia, the situation is rapidly declining, and more advanced field technologies demonstrate that both wild and captive populations have reached a deep crisis and call for major interventions (Ahmad et al. 2013; Puspardini et al. 2013).

In the course of the last 30 years I have personally experienced the tragic decline of the Sumatran rhino. I believe that the only remaining chance for the species is to promptly move all isolated in situ survivors into

ex situ environments. This process should be considered as the best available (possibly temporary) solution, rather than risking to end up with no Sumatran rhino at all. Ex situ promoters are not to be blamed, though someone could say that there is a risk that the result would be to end up with Sumatran rhinos in captivity only and none in the wild. Ongoing in situ protective measures have to be continued and reinforced.

Only nine Sumatran rhinos are kept ex situ in large, natural fenced areas—five in Indonesia, three in Sabah and one in an appropriate enclosure in the USA (Cincinnati Zoo)—where they can be carefully monitored and protected. Three offspring have been born (2001, 2004, 2007) so far in Cincinnati Zoo and one (2012) at Way Kambas Rhino Sanctuary (Roth 2013), improving the skill of both Indonesian and American personnel involved.

Extinction is imminent. According to Martin et al. (2012): '1) informed, empowered, and responsive governance and leadership is essential, 2) processes that ensure institutional accountability must be in place, and 3) decisions must be made while there is an opportunity to act. The bottom line is that unless responsive and accountable institutional processes are in place, decisions will be delayed and extinction will occur.' It is a matter of months, because it may simply become too costly to locate and collect remaining individuals. Time is running out fast and time has come for all committed parties to take full responsibility, not to avoid it, if not for mere future liability (Brechin et al. 2002).

Status of *D. sumatrensis* in Indonesia

The present small Sumatran rhino population in Indonesia is fragmented in pockets found throughout Sumatra with a total estimate of 90–100 individuals, and possibly in Kalimantan, the Indonesian part of Borneo. (For safety reasons these data are not disclosed further.) Estimates on the number of *D. sumatrensis* vary considerably and this uncertainty is of great concern.

The total number of Sumatran rhinos in Bukit Barisan Selatan National Park (150,000 ha, MoF 2007) was estimated to be 250–390 in 1993 (Puspardini

et al. 2013), which had dwindled to 147–220 in 2007 (MoF 2007) or even 60–70 (Rubianto et al. 2008; Talukdar et al. 2010). Using the Royle/Nichols heterogeneity model, Pusparini et al. (2013) estimated the presence of 21 rhinoceros, fragmented in three distinct populations: Sukaraja, Way Ngaras and Kubu Perahu areas—just 32% of suitable rhino habitat. Despite the government’s good intention to achieve a 30% rhino population growth (MoF 2007), the development of an asphalt road crossing rhino core areas is likely to bring in human disturbance and jeopardize the target.

The population of rhinos in Way Kambas NP (50,000 ha) was 15–25 rhinos (MoF 2007). A current figure indicates 30–35 animals (Widodo, pers. comm. at the 2013 Singapore Summit).

There were 60–80 rhinos in Gunung Leuser NP (80,000 ha) in 2007 (MoF 2007). Hopes are that a good number of *D. sumatrensis* not isolated remain in Gunung Leuser NP, but lack of information and even hostility by local people have not made it possible to ascertain their actual number (Widodo 2012, pers. comm.). However, Hadiansyah Putra (2013) states that 50 rhinos thrive in the core area and 10–20 in the surrounding forest. Once verified, this information would change the general in situ status considerably, and hence a field survey is valuable now.

These figures suggest that there are about 50–55 Sumatran rhinos left in Bukit Barisan Selatan NP and Way Kambas NP, while the population in Gunung Leuser needs further verification (Figure 1). Delegates at the Sumatran Rhino Summit in Singapore in 2013 suggested a total of 100 Sumatran rhinos on the island. I suggest that it is realistic to consider that 75 rhinos are available for in situ conservation in Sumatra. This number represents the two distinct, identified viable populations in Bukit Barisan Selatan and Way Kambas, let’s say at 25 animals each. The status in Gunung Leuser is too poorly known to suppose that more than 25 animals would be available for in situ conservation. Other rhinos living in tiny groups or

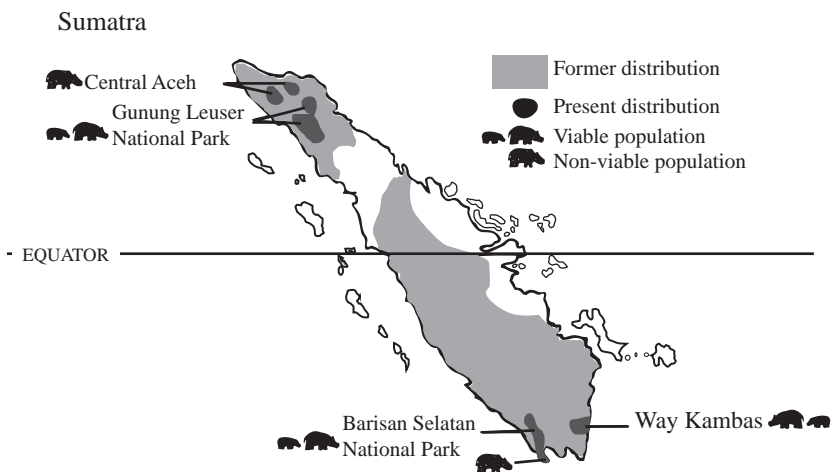


Figure 1. Sumatran rhino *Dicerorhinus sumatrensis* distribution (Nardelli 2014).

isolated circumstances could be ‘ghosts’ or doomed if not ascertained, and abandoned to their fate. The addition of such rhinos can only make sense once they are physically transferred into the viable populations or to ex situ facilities via operative conservation programmes.

First meeting on Sumatran rhino conservation in 1984

Three major meetings in 1984, 1993 and 2013 have marked the recent history of the Sumatran rhino; all were convened by the International Union for Conservation of Nature and Natural Resources (IUCN). The first was an ad hoc Sumatran rhinoceros meeting held 3–4 October 1984 in Singapore. At this convention, aptly termed ‘ad hoc’, 20 participants gathered to evaluate the already complex status of *D. sumatrensis*. In situ conservation was the primary objective and proposals for improvements were presented and discussed among government representatives of Indonesia, Malaysia and Sabah as well as committed NGOs and specialists. The option of ex situ breeding was debated for the first time in depth. The majority decided in favour of a coordinated ex situ breeding project (Foose 1984; Nardelli 1984). Two surveys to locate isolated (doomed) individuals in Sumatra preceded the meeting: one carried out by WWF field specialist Raleigh Blouch in the Torgamba area, Riau Province, and the other by Perlindungan Hutan dan Pelestarian Alam (PHPA) official, Widodo Ramono, in the Gunung Patah area, Bengkulu Province. Since



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Base camp of the first Sumatran Rhino Project in Torgamba. On the left are the rhino shelters. The paddocks in the foreground were constructed under trees to keep the animals shaded and cool.

Blouch stressed the urgency to rescue the rhinos in Torgamba, literally surrounded by palm oil plantations, it was determined to start the capture in that locality (Strien 1985a).

As a direct outcome of the meeting, two agreements were signed: the first in 1985 between the Indonesian government and Howletts & Port Lympne Wildlife Parks (H&PL), UK, and the second in 1986 between the Indonesian government and the Sumatran Rhino Trust, USA, the latter a consortium of four major American zoological institutions (New York Zoo, San Diego Zoo, Los Angeles Zoo and Cincinnati Zoo). For various (undisclosed) reasons, Malaysia and Sabah started separate programmes for capturing rhinos within their territories. Hence the first ever captive breeding projects were set in motion. At the same time, substantial funding was made available to the Indonesian government for in situ protection of the viable *D. sumatrensis* populations identified in Gunung Leuser NP, Kerinci-Seblat NP and Bukit Barisan Selatan NP, to accommodate 400–500 Sumatran rhinos (Nardelli 1986a,b; Khan 1989).

Subsequent to the Singapore meeting of 1984, between 1984 and 1986, I was involved as negotiator of both agreements between the various parties, acting as executive director of H&PL and the Sumatran Rhino Trust until 1992 (Nardelli 1984, 1985). While the outcome of the project has been assessed by Rabinowitz (1995), Zafir et al. (2010), Ahmad et al. (2013) and others, their analyses have been somehow one-sided. A more balanced view was given in a short note by Sumardja (1995). Therefore, it is useful to present a short description of that operation in this paper.

Data about the ecology and conservation of *D. sumatrensis* were found in two theses by Markus Borner (1979) and by Nico van Strien (1985b). These authors presented much information on feeding habits and other ecological parameters, even though direct observations of individuals, most no longer than a few seconds, could be counted on the fingers of one hand due to the well-known elusiveness of the species. There was little or no information about procedures that would assist in ex situ breeding. Rookmaaker (1998) made available a list of all instances in which Sumatran rhinos were kept in captivity.

Due to the scarcity of data, the Sumatran rhino was considered to be a browser and treated accordingly by all the people involved in ex situ projects (author included) both in the field and in zoos, regrettably for several years (Dierenfeld et al. 1994). However, this rhino is a megafolivore that, like langurs and colugo, belongs among those species feeding almost exclusively on foliage, with approximate percentages of leaves and twigs at 90%, and fruit and grasses at 10% (Nardelli 2013).

The capture of doomed rhinos in Torgamba forest in Riau Province, Sumatra, was carefully planned in cooperation with Tony Parkinson, world renowned expert in catching wildlife, who directed the field operations, and Raleigh Blouch, WWF representative. During my stay in Indonesia from 1985 to 1992, we managed to capture 18 *D. sumatrensis* safely. All arrived at their destinations in perfect condition, already used to a browser diet.

The continuous presence of a qualified veterinarian, either from the USA or the UK, at the base camp in Torgamba proved particularly useful as four of the captured rhinos had infected lesions from wire snares deeply embedded in their legs. These animals were literally saved ‘at the very last moment’ by the well-equipped and experienced veterinarians on duty. At the base camp six trained people were collecting fresh leaves for the animals, watering them and properly cleaning the paddocks daily.

The experience gained during these operations provided much-needed expertise on the transfer, care and breeding of *D. sumatrensis*. In fact, through ex situ breeding it has been ascertained that, unlike other rhino species, Sumatran rhino females ovulate only if and when induced by males (Roth et al. 1998; Roth 1999).



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Holding pen in the forest, attached to the trap, for rhino adaptation lasting 15–20 days.

My experiences while with the project convinced me that two missteps were made in the absence of data. Both revealed critical consequences after the rhinos looked well adapted to their diet and settled in their final accommodations.

First, as a megafolivorous mammal, *D. sumatrensis* is strictly linked to rainforest food supply (Nardelli 2013), with a digestive system comparable to that of other leaf-eating mammals. As it was unanimously considered to be an undemanding browser in 1985, the animals were fed an unsuitable diet similar to the one fed to the black rhino, *Diceros bicornis*, a typical browser. Although Radcliffe et al. (2004) were close to a complete solution on the optimum diet for *D. sumatrensis*, it was the staff in charge of Cincinnati Zoo who solved this vital crisis, supplying ad libitum fresh ficus leaves acquired from San Diego (Romo 2011)—just in time for three *D. sumatrensis* to breed successfully (Roth 2013)!

This problem is solved.

Second, the Sumatran rhino suffers from an anthropogenic Allee effect (AAE), which was not properly recognized at the time. In many animal and plant species, individual reproduction and survival are diminished in small populations through various mechanisms including mate shortage, failure to optimize the environment, or lack of conspecific cooperation. When populations are enduring human exploitation, this can be called anthropogenic Allee effect (Courchamp et al. 2006). AEE may exhibit negative population growth rates at low densities, which drives them to even lower densities and

ultimately precipitate into an extinction vortex. A typical example of a species sensitive to AAE is an obligate cooperative breeding species like *D. sumatrensis*. This rhino species is an induced ovulator; reproduction fails to be efficient when their numbers drop to such a low level that males and females simply don't meet each other anymore, leading to tumours of the uterus and probable too-low activity of the sperm (Hermes et al. 2006; Agil et al. 2008).

The AAE problem remains unsolved and it is likely to become the major threat to wild and captive populations of *D. sumatrensis*. No doubt a number of both males and females were already infertile at the time of their capture due to those pathologies, as autopsy revealed. Although today we could assess the medium-term probable survival of species using population viability analysis, we will never determine the consequences of stochastic phenomena like AAE (Lee 2013).

Second meeting on Sumatran Rhino Conservation, 1993

A Sumatran rhino population and habitat viability analysis workshop was held 11–13 November 1993 in Bandar Lampung, Indonesia, attended by about 50 delegates. Considering the high mortality rate of the captured Sumatran rhinos in some of the zoos, it was decided to discontinue the capture of isolated (or doomed) rhinos (Tilson 1993). Hence, we need to understand why capture of doomed animals was never resumed for 21 years (1993–2014). Have we allowed too much time to waste?

However, two major achievements were implemented as a direct result of the workshop. First, the Sumatran Rhino Sanctuary was constructed within Way Kambas NP, in Lampung Province, Sumatra, for semi-ex situ breeding *D. sumatrensis* in very large enclosures (Foose et al. 1995). Second, in situ protection was much strengthened with the institution of special Rhino Protection Units, formed by dedicated armed guards to control rhino areas (Foose et al. 1997). The management was handed over to the Indonesian Government.



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D. sumatrensis mother Ratu with male Andatu, born in Way Kambas on 23 June 2012, the first birth ever in Indonesia, the seventh in captivity.



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Male *D. sumatrensis* Rokan, in the pit trap.

Third meeting on Sumatran Rhino Conservation, 2013

The Sumatran Rhino Crisis Summit (SRCS) was convened 31 March–4 April 2013, again in Singapore, gathering over 100 specialists from different governments, NGOs, institutions and independent conservationists. Among various topics, managed breeding was examined in depth.

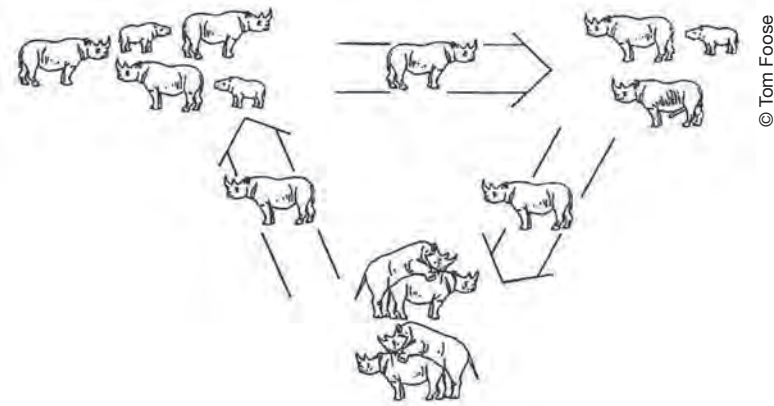
Summarizing the discussions on population modelling, Putnam (2013) showed that ‘the best scenario would be with two groups; bring in 2.2 animals within 10 years per group, breeding every three years, and the probability of extinction drops to 7%. If things go on as they are, the captive population will be extinct within 50 years—100% probability.’ This conclusion is similar to one reached in 1984 at the first Sumatran rhino meeting (Strien 1985a).

Action followed the first and second meetings, more pondering the third (Crosbie 2013; Ellis 2013; Goossens et al. 2013; Hegener 2013; Payne 2013; Roth 2013; Brook et al. 2014; Hance 2014b,c; Ip 2014; Kolbert 2014; McDonnell 2014; Vaz 2014; among others). Since its conclusion, two outcomes were publicized: the female Iman falling into a pit trap in Sabah on 20 March 2014 and safely moved to facilities in the Borneo Rhino Sanctuary (Hance 2014a), and the signing of the Bandar Lampung Declaration in October 2013 (IUCN 2013) by the respective ministers of Bhutan, India, Indonesia, Malaysia and Nepal at the First Asian Rhino Range States meeting. This event was marked by its promising goal: The populations of the Indian, Javan, and Sumatran rhinos will each be managed for an annual growth rate of at least 3%.

Discussion

It’s time to go by phases and priorities. The three meetings of 1984, 1993 and 2013, in my opinion, should have taken place in a reverse order to justify the quantity of recommendations: in 1984, with population figures around 800 rhinos, there would have been time to put into practice several of the actions proposed in 2013 at the SRCS. In 2013, or today, with a population of 75 viable animals, we have time only to execute a few rapid schemes (e.g. listed in the 1984 ad hoc meeting). We cannot afford to implement all conservation methods efficiently as we all would like, unless all resources increase 10-fold.

We still have before our eyes the saga of the Nile rhino or northern white rhino (*Ceratotherium cottoni* or *Ceratotherium simum cottoni*): common just a century ago, down to a few dozen in the 1980s, four in 2006, extinct today in the wild despite millions spent for their protection. Seven, likely not reproductive individuals, can still be seen in captivity or in similar condition—four in Ol Pejeta Conservancy in Kenya, one in Dvur Kralove Zoo in Czech Republic and two in San Diego Zoo in the USA—and most of these are candidates to hybridize with southern white rhinos (Ol Pejeta Conservancy 2014). As rightly stated by Hermes et al. (2006): ‘Intensive efforts to propagate specifically the northern white rhinoceros have been very limited. The dismal outlook for this subspecies in the wild makes successful ex situ breeding programmes paramount.’



Managed migration among populations of rhino.

We may have personal ideas as far as conservation problems are concerned, with possible inaccuracies arising when a specific action is considered the only possible one. The results of ‘unfortunate’ initiatives have made today’s governments (not only the Indonesian) reluctant to take decisions. The 1984 project was declared a failure by major NGOs. In 1995, with a population of a little more than 300 individuals left, Rabinowitz (1995) wrote that ‘captive breeding would have led to extinction.’ Which government will take the initiative after such statements by prominent NGOs and outstanding specialists?

Recommendations

Today with, in my opinion, a total population of only 75 viable *D. sumatrensis* left, there are action plans, proceedings, papers, etc., concluding that the species can still be saved. However, in my estimation such a goal cannot be achieved unless a new rescue project starts off immediately. Simply, in situ control has proved to be inadequate on its own. A programme giving priority to artificial propagation to save *D. sumatrensis* would be to keep our eyes ‘wide shut’, ignoring the scarce successes this practice has so far achieved, although it should be kept high in consideration to support natural breeding. In Sabah, for example, where Sumatran rhino numbers are so low—three in captivity and a few more in the wild—artificial insemination is the best option to increase their number.

I propose a strategy of seven practical steps to achieve a major objective: save the Sumatran rhino. Based on my experience, I suggest we restrict our aim, at present, to the following undertakings and in this

progression:

1. Negotiate and sign long-term bi- or multilateral agreement(s) between the Indonesian government and conservation institution(s). This is to call a halt to meetings and transform their existing relevant conclusions into action.

2. Capture isolated rhinos, following the successful 1984 protocol and logistics, to enhance semi-ex situ breeding programmes, first in Way Kambas. Semi-ex situ breeding, sometime wrongly termed in situ breeding, is proving

to be the optimal solution, not only for *D. sumatrensis*. For instance, the Javan rhino or the Saola could benefit too. The advantages are evident: food, temperature, humidity are natural and low workforce costs.

3. Allow regular movements between closely monitored managed populations, as the need is urgent to expand present facilities and construct new ones in Bukit Barisan Selatan NP. At the meeting in Singapore in 2013, Indonesian representatives declared that a facility similar to Way Kambas Sanctuary is in their progress schedule to be realized in the southern part of Bukit Barisan Selatan (now almost cut off from the northern part), where a few isolated Sumatran rhinos still exist. Most participants supported the plan.

4. Complete—preferably within 10 years—two facilities in Indonesia, one in Sabah and one in the USA, holding between them possibly 20 viable pairs (Foose in Khan 1989) or at least 26 viable individuals (Putnam 2013).

5. Move part of future progeny, in unrelated pairs, to selected zoos that can afford a new management and breeding protocol to fulfil requirements specific for *D. sumatrensis* (Dierenfeld et al. 2000; Radcliffe et al. 2004; McNeely 2005; Nardelli 2013).

6. Create large fenced areas (> 1000 hectares) in well-protected rainforest. Such pre-reintroduction areas would allow the rhinos to breed in complete natural conditions, prior to their release in well-protected national parks.

7. Fence Way Kambas NP to keep people outside and rhinos inside. This is not relevant for ex situ breeding but it is essential to preserve the integrity of at least one national park for in situ medium- to long-term conservation of one viable rhino population.



© Way Kambas NP

Which is going to be the final result? Sumatran rhino birthday party (above)...or more photos like: The last known Javan rhino poached in Vietnam (right).



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Managing this species requires a significant amount of time. Pairing individuals, pregnancies and inter-calving periods are just some of the long-time processes. Whichever the approach, breeding Sumatran rhinos is a lengthy course of action, so time is of the essence (Martin et al. 2012). To emphasize the positive effects to manage the rhinos as a single population (Ellis et al. 2011), it is necessary to ensure the possibility of fast cross-border movement of rhinos with existing international protocols, to achieve a truly fluid captive metapopulation. Indispensable arrangements and agreements between governments related to ownership of adults or offspring and their transfer should be agreed upon now to ensure future population flexibility. It is essential that the efficiency of the whole process is enhanced by political will, know-how and experience.

The specific status that the Sumatran rhino suffers today warns that only a collaborative and resolute ex situ conservation programme will keep the species from extinction. Brook et al.'s (2014) paper on the last days of *Rhinoceros sondaicus annamiticus* spells out clear deficiencies of management, and there is a disappointing similitude to *D. sumatrensis* state of affairs: 'The failure at the site level to protect the rhinoceros population ultimately resulted in its demise. Low political will to take decisions required to recover the species and inadequate focus from the conservation and donor community further contributed to the subspecies's extinction, in part due to a lack of knowledge on population status. Lessons from this example should

inform the conservation of other very threatened large vertebrates, particularly in Southeast Asia.'

And NOW? We do risk saying farewell forever to the Sumatran rhino!

Acknowledgements

I am particularly grateful to Dr Kees Rookmaaker for corrections to the manuscript and his invaluable work in keeping the outstanding Rhino Resource Center a mine of data. I also thank Paolo Bertagnolio for help with outlining the paper and two anonymous reviewers of the final version for precious comments.

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Chemical horn infusions: a poaching deterrent or an unnecessary deception?

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Abstract

Poaching for horn remains a significant threat to rhinos. Conservationists use various approaches to deal with the threat. One method advocated is infusing rhino horns with chemicals and dye. Promoters of this method claim the procedure renders the horn useless and that ingesting poisoned horn carries potential risk to the end-user. We visually examined white rhino horn that had been treated; we examined available literature; and we obtained expert opinion to assess several assumptions and risks associated with the approach. We found the information on which the assumptions are based to be weak, and refute claims that discolouring horns is a viable method. Our assessment contests the efficacy of this technique on conceptual and logistical grounds, especially when dealing with relatively large populations. We argue that conservationists should not use this technique to deal with the rhino poaching threat.

Résumé

Le braconnage pour la corne reste une menace importante pour les rhinocéros. Les écologistes utilisent différentes approches pour faire face à la menace. Une des méthodes préconisées est l'infusion des cornes de rhinocéros avec des produits chimiques et des colorants. Les partisans de cette méthode affirment que cette procédure rend la corne inutile. Cependant, elle comporte également un risque potentiel à l'utilisateur final quand il ingère la corne empoisonnée. Nous avons examiné visuellement la corne de rhinocéros blanc qui avait été traitée, et nous avons examiné la documentation disponible et obtenu l'avis des experts pour évaluer plusieurs hypothèses et les risques associés à la démarche. Nous avons trouvé que l'information sur laquelle les hypothèses sont fondées n'était pas correcte, et nous réfutons les allégations selon lesquelles la décoloration des cornes est une méthode viable. Notre évaluation conteste l'efficacité de cette technique pour des raisons conceptuelles et logistiques, surtout lorsqu'il s'agit de populations relativement importantes. Nous soutenons que les écologistes ne doivent pas utiliser cette technique lorsqu'ils sont confrontés à la menace du braconnage de rhinocéros.

Introduction

Poaching continues to threaten rhinos despite intensified anti-poaching campaigns (Ferreira et al. 2012). Evaluation of multi-pronged approaches that include reducing demand, providing horn and eliminating poaching through intensified anti-poaching campaigns (Ferreira and Okita-Ouma 2012) illustrates that integrating approaches carries the largest benefits for a suite of conservation outcomes (Ferreira et al. 2014). Some options, such as providing horn through legalized trade, are, however, not available at present (Child 2012; Biggs et al. 2013).

The international call for intensified protection of rhinos through traditional anti-poaching measures may fail to curb illegal killing because the incentives of financial benefits outweigh the disincentives (see Ferreira et al. 2014). Rangers' efforts require matching initiatives directed at disrupting transnational crime networks, at a scale conservationists have never before faced (Dalberg 2012). Authorities may also reduce supply through approaches such as treating live rhino horn chemically to make it unfit for human consumption (Rhino Rescue Project 2013). Typically, horn treatment is infusing a compound or a combination of compounds into the horn of a live rhino. The most

common infusion comprises an indelible dye and a deposit of ectoparasiticides (Rhino Rescue Project 2013). The effectiveness of horn treatment as an added disincentive for rhino poaching is unknown.

Here we consider the strategic context and conceptual basis for reducing poaching through direct deterrence by the chemical itself, or indirect deterrence of making poachers believe that the horn has no value, through publicizing horn infusions. Second, we highlight legal and ethical challenges. Third, we focus on the scientific basis of the potential of chemical deterrence, and the efficiency and maintenance of its application. We also consider the logistical requirements of infusing a large number of rhinos in a population. Reduction in poaching rates, however, is the ultimate measure of success. We check whether this occurs.

Conceptual challenges

The concept of infusing chemical substances into rhino horns in an attempt to reduce poaching is based on a number of assumptions. It presupposes that the infused chemicals provide discomfort to an end-user consuming the treated horn (Rhino Rescue Project 2013). Where infusions comprise indelible dye as well, proponents predict the horn will be considered as worthless for ornamental use. The belief behind such chemical treatments is that it devalues the horn and thus makes it unmarketable. A key element as part of such an initiative is the assumption that wide-scale publicity of chemical treatment of horn will deter poachers.

Prices paid to poachers for horn provide significant financial incentive (Ferreira et al. 2014), which relates to the demand and supply that sets commodity prices at a particular time. Anti-poaching programmes, dehorning (Lindsey and Taylor 2011) or chemical treatments (Rhino Rescue Project 2013) aim to provide equal or higher disincentives. Infusionists assume that poachers will not be able to sell the treated horns to end-users as they would be considered unsuitable, thus reducing the demand for them and thus reducing their financial value. Removing the financial incentive would result in disincentives outweighing incentives and poaching rates would therefore decline (Ferreira et al. 2014).

A key challenge arises, however, because infusing would create two rhino horn commodities—treated and untreated horn. Increasing the supply of treated horn (or horn perceived to be treated), assumed to have no value and thus no demand for them, reduces the supply of untreated horn (whether real or perceived), causing a

growth in demand (Milliken and Shaw 2012). Reducing the supply of untreated horn will escalate prices and simultaneously increase poaching incentives. It implies a threshold requirement of a proportion of treated horn in a population large enough to make it not viable for poachers to seek untreated horn. Such a threshold should eliminate the supply of untreated horn, real or perceived. If there is no supply of untreated horn even though demand remains, economic dynamics predict no price. Completely removing the supply of untreated horn is highly unlikely because lingering demand will likely generate illegal suppliers to design innovative ways of providing horn (e.g. high-pressure chemical washing of horns). The pet trade experienced this innovation dynamic with cybercrime becoming a key element of wildlife trafficking in response to enforcement of CITES resolutions (e.g. Izzo 2010). The example illustrates the potential of illegal supply innovation to derail the market disruption strategy. Demand and supply interactions predict rapidly escalating prices for untreated horn and consequently, increased poaching incentives (Jain 2006).

It is likely that there will be no effect on poaching rates because poachers ignore, or are not aware of, the difference between treated and untreated rhino horn, and additionally because poachers are not the end-users. Therefore, there is no reason for treated horn not to be sold, especially if the chemicals are not visible. In addition, corrupt sellers abound in the horn trade—many fake horns are in circulation and knowingly sold at high prices (Milliken and Shaw 2012). Typically, suppliers seek to sell their product at the highest price and the illegal market does not follow processes based on honest and true facts (Natarajan and Hough 2000). This situation, however, has no effect on supply-and-demand dynamics (Jain 2006) and hence no effect on price incentives for poaching.

Supply-and-demand dynamics (Jain 2006) predict a similar outcome as above if poachers are unaware of chemically treated horn. Publicity that convinces poachers that a whole population comprises only treated rhinos can potentially counteract this outcome. Such an approach is likely to achieve some degree of success on small reserves, but less so in large areas. Even if poachers are aware of infusions, they may not be able to recognize chemically treated horn. For instance, blood, skin, mud and normal wear of the horn may make it difficult for a poacher to recognize a compromised product.

Some of these consequences are easy to mitigate when focusing on one small reserve, in isolation from

the broader context of the complete rhino population. Demand–supply models (Jain 2006) predict that a new supplier or an existing supplier replaces the product missing after an established supplier is removed, if demand is high enough. This dynamic may explain why daily poaching rates in South Africa increased after pseudo-hunting (non-bona fide hunters hunting rhinos as sport hunters, South African Department of Environmental Affairs, unpublished data) was abolished. Outcomes for small reserves disregarding wider implications may thus actually stimulate poaching in other areas.

These varied consequences challenge the assumption that horn treatments reduce demand because it disrupts the supply. Reduction in demand for unspoiled products does not result because of spoiled end-user products (Jain 2006). None of the demand-reduction theories proposed was tested before being implemented, including the effect of infused horn on humans. This effect will be difficult to ascertain; because the use of rhino horn is not legal in end-user countries (Milliken and Shaw 2012), it would be difficult to obtain reliable information on the health outcomes of horn use. The underlying assumptions and subsequent consequences of horn infusions thus introduce complexity that carries uncertainty for curbing rhino poaching. Horn infusions only rearrange the supply axes, but the demand remains.

Legal and ethical challenges

A key legal risk is whether third parties suffer harm, loss or injury resulting from using treated horn. However, the single known existing legal opinion in this regard (available from the Rhino Rescue Project 2013) indicates no criminal or civil implications. The opinion makes use of rules of exception to the *par delictum* rule (the plaintiff cannot be successful in a claim when the plaintiff's own actions were unlawful) and argues that the action to treat the rhino horn is not unlawful because it is primarily aimed at the health and wellbeing of the animal. We could find no published scientific support for this statement. In addition, poaching and most trading in rhino horn are illegal in most countries (CITES 2010, 2011), but whether it is illegal to consume it is uncertain. If authorities allowed legal poisoning of illegal substances, widespread application to reduce worldwide illegal drug trades should result—an outcome never realized. The end consumers would most likely become the plaintiffs,

some of whom received horns as gifts or bought them legally as traditional Eastern medicine (Milliken and Shaw 2012). This introduces uncertainty that could remove the *par delictum* rule exceptions and introduce criminal or civil liability.

Cultural rights dilemmas may also be associated with horn infusions. Key stakeholders within the countries with the highest number of consumers have expectations that the global community respects specific cultural traditions. Treating horn chemically may act as customary rights discrimination (e.g. Fougere 2006), a risk that directly contrasts with several CITES resolutions at recent Conferences of Parties (Cooney and Abensperg-Traun 2013). In contrast, stakeholders living in rhino range States expect that authorities will protect rhinos and effectively fight crime. Infusing horns as a poaching deterrent may thus contribute to expectations of having a society with limited crime (Knight 2011), even if it only translates into illustrating a response. In such a case, the value would be temporary because range State stakeholders would also expect poaching rates to be reduced.

Animal welfare is also an important consideration (e.g. Bonier et al. 2004). Horn infusions use high-pressure systems (9-bar) to permeate the chemicals into the horn (Andrew Parker, pers. comm.¹). Welfare consequences are notoriously difficult to evaluate and typically rely on behavioural indicators such as displacement activities and repetitive behaviours (e.g. Carlstead et al. 1993). We could find no formal evidence of behavioural assessment of either pretreatment vs. post-treatment, or control vs. experimental comparisons.

An immediate health risk to the rhino is associated with immobilizing the animals, with anaesthesia procedures resulting in at least one white rhino dying during the horn infusion process (Beeld 2013). Experience of immobilizing rhinos to notch ears, translocate or treat injuries suggests that the typical 30 minutes to complete the process (Rhino Rescue Project 2013) would be considered long (personal observation). In addition, it does not include effects of chasing rhinos during the actual darting. At least one study illustrated that immobilizing rhinos for translocation introduced elevated levels of stress (Linklater et al. 2010). In rhino-holding facilities, 5–10% of rhinos fail to adapt to boma conditions

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following capture (South African National Parks [SANParks], unpublished data²). Multiple captures of rhinos, particularly young rhinos, may carry chronic stress consequences given requirements of retreatment every 3–4 years (Rhino Rescue Project 2013). Horn infusionists anecdotally reported no detrimental effects on rhino health following capture for treatment (Rhino Rescue Project 2013), but no formal evidence is available.

A key concern is contamination of growth tissue at the base of the horn. The procedure uses a high-pressure system to force chemicals into hard horn; infusing the soft tissue would be simpler but may result in damage to the growing tissue. We could find no literature as to the effect on it. Neither could we find literature that described health benefits from infusing as an ectoparasiticide treatment, although topical application of medication has been used for wound treatments on hooves. Effectiveness of such treatment is still debated in the veterinary field (Johan Marais, pers. comm.³). Given that the infusion with ectoparasiticides focuses on the internal horn tissue, it is unlikely that there will be any noticeable health benefits to the rhino. Even so, conservationists need several clinical trials to evaluate its effectiveness on rhino health. Such an evaluation should include the consequences of disrupting parasite–host interactions. We could find no evidence of such evaluation before or after the commercial launching of the infusion product.

Science challenges

Conservationists strive to adhere to a philosophy of strategic adaptive management (Roux and Foxcroft 2011) and place great value on robust science-based decisions (Roux et al. 2012). Some of the scientific assumptions that infusionists make warrant evaluation.

Chemical deterrence potential

Hazard identification of the composition of the most common treatment (i.e. combination of ectoparasiticides and indelible dye) highlighted that the dye may cause eye, skin and respiratory tract irritation and could be harmful if swallowed, inhaled or absorbed through the skin (document provided by

Peace Parks Foundation⁴). It is unclear what quantities end-users need to consume before the effects become acute. We could find no evaluation associated with the depository of ectoparasiticides. These comprise freely available over-the-counter antiparasitic drugs used to treat ectoparasitic infestations where parasitic organisms primarily live on the surface of the host (defined by Rhino Rescue Project 2013). The exact ectoparasiticide combinations are unknown, with no human health risks defined. Most commercially available ectoparasiticide products are relatively safe to humans and unlikely to have any serious health consequences for end-users in the quantities ingested from known rhino horn products (Johan Marais⁵ and Gerhard Steenkamp⁶, pers. comm.).

Although the chemical combination may carry discomfort, we could not find literature that indicates some part of an animal infused by similar compounds (usually used for treating horse hooves, Johan Marais, pers. comm.⁶) is toxic to humans. Drugs used to treat animals followed by subsequent consumption of meat with residual hormonal and medical drug residues resulted in affecting a small percentage of persons (US Board of Agriculture 1999). It is unlikely that end-users will notice an acute effect, because rhino horn for medicinal purposes comprises only small doses mixed with other substances.

In addition, it is assumed that people will not refrain from consuming something if they perceive it to have medicinal or delicatessen value, even if it is potentially highly toxic. Fugu, or the puffer fish, are highly poisonous and contain tetrodotoxin, a potent neurotoxin (Tsang and Tang 2007). Yet it is a highly valued delicacy in China and Japan, even though a number of people eating it die every year (Bingbin 2012).

Application efficiency

Rhino horn is essentially papillary cornified epidermis (Hieronymus et al. 2006); it comprises a composite material with tubules of keratinocytes forming fibres embedded in a resin-like matrix of varying composition. Calcium phosphate salts, most likely hydroxyapatite or octocalcium phosphate, and melanin

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characterize matrix composition (Hieronymus et al. 2006). Rhino horn has a density of 1.26 g/cm^{-3} (Pienaar and Hall-Martin 1993) with the horn tip slightly denser than the base. When sliced, a polished rhino horn resembles perspex, or poly-methyl-methacrylate, which has a density of 1.18 g/cm^{-3} (makeitfrom.com 2009). More heavily melanin-pigmented cornified epidermal tissue occurs in the central longitudinal core of the horn (Figure 1). Most importantly, the variations in melanin content and calcification result in differential wear, the key mechanism for horn shape (Hieronymus et al. 2006).

Infusing rhino horn is not complex. Veterinarians immobilize a rhino using standard veterinary techniques (Standard operating procedures for capture, handling and transport of wild animals, SANParks⁷). After the rhino is successfully immobilized, holes (~10 mm in diameter) are drilled into the centre of the horn and an applicator is inserted. A compressor fitted to the applicator infuses the chemical combination under 9-bar pressure for 20 minutes (Andrew Parker, pers. comm.⁸). After the procedure, the applicator is removed, the hole plugged with a resin, and veterinarians administer an antidote to the rhino to recover from an anaesthetic drug.

We could find no literature assessing the efficiency of this procedure in distributing chemical compounds evenly through the cornified epidermal tissue of horn. Horn structure suggests differential resistance to wear (Hieronymus et al. 2006), which predicts differential distribution of the chemical compounds following infusion. Neither could we find literature on high infusion pressure that could damage keratinocyte tubules with consequences for the future strength of the horn. Even so, higher core melanin concentration (Hieronymus et al. 2006) predicts weaker treatment penetration in the longitudinal centre of the horn. There is thus some chance that suitable core areas remain and are still available for human consumption. When queried on this issue, the Rhino Rescue Project indicated that they had not cut through a treated horn to ascertain if the coloured dye actually infused through the horn as they claimed.

Samples from five sets of white rhino horns retrieved after horn infusion with indelible dye combined with ectoparasiticides (SANParks: 1 anterior and 1 posterior

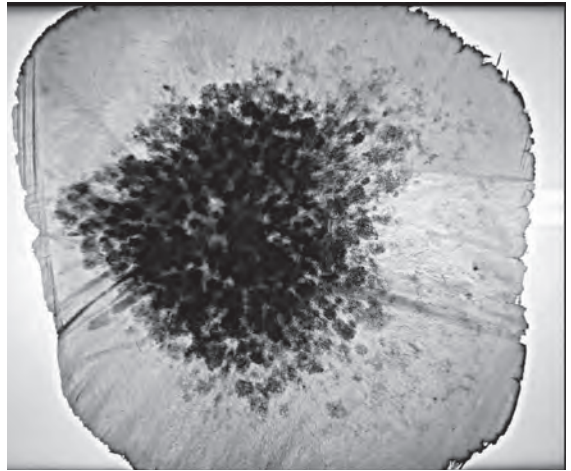


Figure 1. Polished back-lit cross slice through an anterior horn of a white rhino showing the more heavily melanin-pigmented cornified epidermal tissue in the core of the horn.

transverse cut; Sabi Sand Game Reserve: 1 anterior and 1 posterior transverse cut; Ezemvelo KZN: 3 anterior and 3 posterior drilled samples 1 month after infusion⁹) noted no visible discoloration through the papillary cornified epidermis of the horn (Figure 2). Even if there is not a formal test for ectoparasiticides or their metabolic derivatives in the papillary cornified epidermis, they are unlikely to be present given the chemical mixture of ectoparasiticides with indelible dye as part of the application procedure, and the fact that the indelible dye did not penetrate into the horns. All evidence indicates wide-scale failure of the application.

Maintaining deterrence effectiveness

Even if one disregards application efficiency, maintaining deterrence effectiveness may be challenging. Rhino horn continually grows (Pienaar et al. 1991; Rachlow and Berger 1997; Hieronymus and Witmer 2004) at a near-constant rate throughout the areal extent (Hieronymus et al. 2006). This means that new cornified epidermis is laid down continuously at the base of the horn. Anterior (nasal) horns grow at 5–6 cm per year (Pienaar et al. 1991; Rachlow and Berger 1997) while posterior horns (i.e. the small horn behind the nasal horn) grow at 2 cm per year (Rachlow and Berger 1997).

Infusionists advocate treatment effectiveness for

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9 Data provided by Dave Cooper, Ezemvelo KZN, dcooper@kznwildlife.com

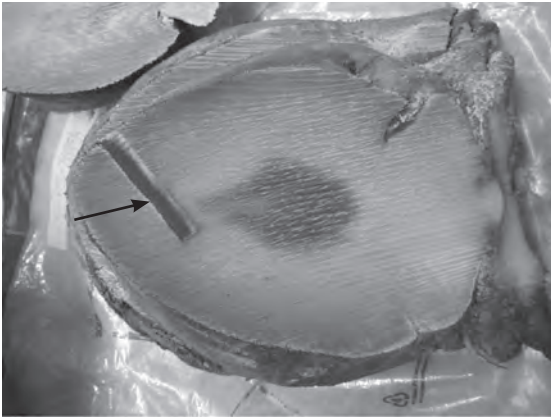


Figure 2. Transverse cut through a recovered posterior horn after infusion with a mixture of indelible dye (shown with arrow) and ectoparasiticides illustrating failure of the procedure to distribute the dye evenly throughout the papillary cornified epidermis of a white rhino horn. This result is characteristic of all horns sampled after the infusion treatment.

3–4 years (Rhino Rescue Project 2013). Horn growth adds new horn each year (Pienaar et al. 1991; Rachlow and Berger 1997; Hieronymus and Witmer 2004). Horn structure with hardness provided by calcification in melanized cornified epidermis (Hieronymus et al. 2006) suggests that the new cornified epidermis is unlikely to be affected by passive diffusion of the chemical compounds. In addition, horn wear determines horn shape and size (Boas 1931) with the higher concentration of melanin and calcium salts in the centre of horn determining the overall conical shape of rhino horn (Hieronymus et al. 2006). A full horn growth cycle is thus likely to be variable and impose uncertainty in the planning and requirements of repeat treatments to sustain apparent efficiency. Furthermore, the interactions between new cornified epidermis being continuously added and wearing rates being higher for treated parts of the horn suggest that untreated cornified epidermis will comprise larger and larger fractions of the horn. This means that over time, attractiveness of the horn will increase, which could influence incentives for poachers.

Logistical challenges

Considering how incentives and disincentives influence a person's decision to poach suggests a critical mass of horn must be treated in a population to deter poachers. Theoretically, fractions larger than 50% introduce probabilities that a poacher more often

than not will encounter rhinos with treated horns, disregarding publicity effects. A poacher will not be able to tell a treated horn from an untreated one on sight and will at best discover the status while removing the horn. Treated horns recovered from poachers showed that it is unlikely that a poacher will notice the pink drilling hole given that poached horns are often covered in mud and blood, and that poaching often happens in low light conditions to make escape easier. Poaching may continue until poachers find suitable horn. Ultimately though, more often than not, the chance of getting treated horn may be a large enough disincentive to overcome price incentives.

The number of rhinos living on an individual private property is usually small, making complete treatment of the population possible. Approximately 150 white rhinos on private property have been treated (Rhino Rescue Project 2013). Logistical requirements increase when the size of areas and populations increase. Recently, Sabi Sand Game Reserve treated about 15% of the white rhinos present, while Ezemvelo KZN treated approximately 65% of the rhinos in Ndumu Game Reserve and Tembe Elephant Park along the Mozambique border. Costs amount to USD 1,000 per rhino, inclusive of helicopter time and vehicles but excluding costs of drugs and veterinary expertise (Andrew Parker, pers. comm.¹⁰). The infusion procedure takes at least 30 minutes per rhino (Rhino Rescue Project 2013). Together with searching, immobilizing, treating, reversing, and preparing drugs and equipment, a team can expect 90 minutes to complete treatment of one rhino, allowing a maximum of four rhinos a day if the area is large and finding rhinos is difficult. In addition to such logistical requirements, a key challenge will be to identify and separate treated rhinos from untreated ones, extending the periods of operations in large areas and populations. Permanent marking of treated rhinos will be necessary. This poses additional challenges in that no permanent visible external markers are available. Most commonly used permanent markers are gum tattoos or microchip insertions, neither of which are visible in free-range wild animals. Invasive techniques like ear notching or tagging are the only alternative; they are effective in small populations but become difficult to impose on larger populations. Given these logistical challenges, the dye approach is feasible only in small and isolated populations.

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Reduction of poaching

The conceptual challenges of chemically treating rhino horn, as highlighted earlier, predict variable effects on poaching rates. By 25 April 2013, infusionists have treated 230 rhinos with 4 of these subsequently poached (Rhino Rescue Project 2013). The poaching rate of treated rhinos of 1.74% (95% CI: 0.03–3.45%) is lower than the 2013 national poaching rate of 4.79% (95% CI: 0.23–9.37%), but confidence intervals overlap. In Sabi Sand Nature Reserve, we know of 3 rhinos with infused horns being killed since the inception of infusion during March 2013 and December 2013. During that period, we also know of 37 other rhinos killed in the same area (SANParks, unpublished data¹¹), clearly challenging the deterrence value of horn treatment to poachers.

Before horns were infused, poachers killed nine rhinos in Ndumo Game Reserve and Tembe Elephant Park combined. Here, incursion rates also decreased dramatically, with 29 illegal entries by poachers recorded for the 3 months before the infusions, and 5 for the 3 months after treatment. Just before the infusions, however, law enforcers confronted and fatally shot an armed poacher and subsequently recovered a number of illegal weapons from the surrounding area. Sustained poaching pressure over the preceding months had also substantially reduced the number of rhinos present in both reserves and subsequently poaching pressure seemed to shift to other rhino populations farther south of the Mozambique border (personal observations). It is thus difficult to conclude that a chemical deterrent caused the reduction in poaching.

Conclusion

Our assessment highlights key flaws in the assumptions that treating rhino horn will lead to decline in poaching incidents. We propose that human ethical and legal risks arise from assumptions for which we could not find any evidence. Consequences on animal welfare and health also carry large uncertainties.

Many of the above concerns emanate from the information base being primarily speculative. This was most evident when we assessed requirements associated with the procedure itself. Evidence indicates that at least one of the compounds in the most commonly used treatment is harmful to humans. Also, the structure

and growth dynamics of rhino horn suggest that the efficiency of applying and maintaining the treatment may vary considerably. Claims by infusionists that the dye permeates the whole horn and is visible at the base of the horn when poachers remove it simply were not true.

To be successful, a critical number of rhinos need to be treated, with more demanding logistical requirements when areas and population sizes increase. This situation imposes several logistical challenges with potentially high costs to authorities.

These concerns highlight that authorities may carry substantial risks and have high uncertainty if they attempt to reduce poaching rates by infusing horns with chemicals as deterrents for end-users. This activity will detract authorities from achieving other conservation mandates. Relying on publicity to deter poachers also relies on managers being convinced that publicity on the chemical treatment of horns through infusion will secure rhinos. Poachers will benefit and managers will lose when the bluff of horn treatment fails. Chemical horn infusion is thus not a poaching deterrent but an ineffective deception.

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The complex policy issue of elephant ivory stockpile management

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Abstract

Recent elephant poaching levels are a serious concern for conservationists. Opinions differ over how to deal with the upsurge and associated illegal ivory trade. Following the CITES-imposed international trade ban voted in 1989, limited legal trade has been permitted in two one-off sales. Opinions are divided on what effect this has had on poaching. Opinions are now also divided over whether trade in ivory products should be outlawed worldwide, both between and within countries. In the midst of this debate is the question of what government agencies should do with existing stockpiles of collected legal and confiscated illegal ivory. Governments of some countries have destroyed their stockpiles with the claimed intent of reducing poaching, and there are calls for others to follow suit. We review the academic literature and available relevant data and find that under current circumstances, stockpile destruction violates the precautionary principle because the outcome is unknown; it is therefore not recommended. Credible evidence suggests that speculation may drive the current high poaching rates more than consumer demand for carvings. Legal stockpiles provide an option to curtail speculative behaviour of criminals. We recommend that governments move closer towards consensus on a long-term vision for elephant and ivory management before undertaking measures such as large-scale stockpile destruction. In the meantime they should continue to retain existing ivory stockpiles securely to reduce incentives for criminal speculation with illegally accumulated stockpiles. We recommend that research be carried out to understand better the dynamics of the current legal and illegal ivory trade systems in order to formulate evidence-based policy.

Additional keywords: poaching, seizure, speculation

Résumé

Les niveaux récents de braconnage des éléphants sont une préoccupation sérieuse pour les écologistes. Les opinions divergent sur la façon de faire face à la recrudescence du braconnage et le commerce illégal de l'ivoire y associé. Suite à l'interdiction du commerce international imposé par la CITES et voté en 1989, le commerce légal limité a été autorisé lors de deux ventes exceptionnelles. Les opinions sont divisées sur l'effet que cela a eu sur le braconnage. Les opinions sont actuellement divisées aussi quant à savoir si le commerce des produits en ivoire devrait être interdit dans le monde entier, entre et à l'intérieur des pays. Dans ce débat se trouve la question de savoir ce que les organismes gouvernementaux devraient faire avec les stocks existants d'ivoire légal collecté et d'ivoire illégal confisqué. Les gouvernements de certains pays ont détruit leurs stocks avec l'intention déclarée de réduire le braconnage, et il y a des appels pour que les autres suivent cet exemple. Nous passons en revue la littérature académique et les données disponibles pertinentes et nous trouvons que sous les circonstances actuelles, la destruction des stocks viole le principe de précaution puisque le résultat est inconnu; donc elle n'est pas recommandée. Des preuves crédibles suggèrent que la spéculation peut être la cause des taux actuels élevés de braconnage plus que la demande des consommateurs pour les sculptures. Les stocks légaux fournissent une possibilité de réduire le comportement spéculatif des criminels. Nous recommandons que les gouvernements se rapprochent d'un consensus sur une vision à long

terme pour la gestion de l'éléphant et de l'ivoire avant d'entreprendre des mesures telles que la destruction à grande échelle des stocks. En attendant, ils doivent continuer à conserver les stocks d'ivoire existants en toute sécurité pour réduire les incitations à la spéculation criminelle occasionnée par les stocks accumulés illégalement. Nous recommandons qu'une recherche soit effectuée pour mieux comprendre la dynamique des systèmes actuels du commerce légal et illégal de l'ivoire, afin de formuler des politiques basées sur des preuves.

Mots clés supplémentaires: braconnage, saisie, spéculation

Introduction

In November 2013, the US Fish and Wildlife Service destroyed approximately 5.4 tonnes of confiscated ivory. In January 2014, China also destroyed some 6.1 tonnes; in February France followed suit with 3 tonnes and Chad with 1.1 tonnes; and in April Belgium destroyed 1.5 tonnes (CITES 2013a; Chan 2014; *Guardian* 2014a; Cronin 2014; Russo 2014). Hong Kong started destruction of almost 30 tonnes of its stockpile in May with the incineration of about 1 tonne of ivory (*Guardian* 2014b) and in late June the Thai government said it would decide by 8 July whether to destroy its more than 5 tonnes of illegal ivory (Thai PBS 2014). The decision has not been announced.

The material destroyed includes raw and carved whole tusks, smaller carvings, and other elephant ivory items amassed by government authorities as a result of enforcement efforts. The stated purpose of these events was to send a clear message to criminals that poaching and ivory trafficking will not be tolerated (USFWS 2013; Lau 2014). The US government has called on all countries to destroy stocks of illegal, confiscated ivory (IFAW 2013).

Previous stockpile destruction through burning or crushing took place in Kenya in 1989, in Zambia, Taiwan, Japan, the UAE and China in the 1990s, Kenya again in 2011, Gabon in 2012 and the Philippines in 2013 (Stiles 2013; Orenstein 2013). The total quantity of ivory destroyed so far is estimated to be over 65 tonnes. All of this stockpile destruction aims to deter consumer demand and illegal ivory trade and, by extension, elephant poaching.

As a result of an upsurge in elephant poaching beginning in the mid-2000s (UNEP et al. 2013; CITES 2014; Wittmeyer et al. 2014), calls have been increasing to destroy all ivory stockpiles and ban all trade in ivory worldwide, both between and within countries (Wasser et al. 2010; Burntheivory 2013; EIA 2013; Douglas-Hamilton 2013; Christy 2013; Bennett 2014). These actions would, in the

opinion of its proponents, save the elephant by making ivory valueless. There continues to be disagreement about this approach succeeding in reducing elephant poaching for ivory (Stiles 2009a, 2011a, 2013, 2014; Walker and Stiles 2010; Conrad 2012; Bandow 2013, 2014; MacMillan 2013; Challender and MacMillan 2014; Moyle and Stiles 2014).

The issue of ivory stockpiles was discussed at the 65th CITES Standing Committee meeting in July 2014. CITES Resolution Conf. 10.10 (Rev. CoP16) urges Parties involved with elephant ivory to 'maintain an inventory of government-held stockpiles of ivory and, where possible, of significant privately held stockpiles of ivory within their territory'. The resolution also directs the CITES Secretariat to 'support, where requested, the security and registration of government-held ivory stockpiles'. CITES does not recommend stockpile destruction.

However, Chad and the Philippines submitted SC65 Doc. 42.7 at the 65th Standing Committee meeting, which sought to have CITES endorse destroying ivory stockpiles and for it to encourage and assist Parties with such events. The proposal gained limited support, but some countries stated they opposed destroying legal ivory. The Standing Committee did not endorse the proposal, but the issue will be discussed further at CoP17 in South Africa in 2016 (IISD 2014).

We review the potential consequences on elephant poaching levels from policies to either maintain or destroy ivory stockpiles. This debate is not new. It was raised during the run-up to the first CITES-permitted experimental one-off sale of ivory from three southern African countries to Japan, which was held in 1999 (t Sas-Rolfes 1997). At that point the author concluded in part that 'the ivory trade ban is likely to prove unsustainable and even counterproductive in the longer term' and that 'it is important to deal with existing official ivory stockpiles in an appropriate way: destroying them probably makes little conservation sense'.

In the light of 17 years of experience since then and two CITES-approved experimental ivory sales from southern Africa, what, if anything, has been learned that would assist CITES and national governments in taking action on ivory stockpiles that will further elephant conservation?

Trends in elephant numbers, poaching rates and ivory trafficking

Estimating elephant numbers is problematic. The IUCN/SSC African Elephant Specialist Group, which maintains the African Elephant Database, advises that comparisons of database figures should be made with great caution because of data deficiencies (CITES 2014). Given that caveat, Table 1 shows the estimates by African subregions since 1989, the year the ivory trade moratorium was voted.

The minimum number is made up of the *Definite* and *Probable* classes and the maximum is with the addition of the *Possible* and *Speculative* classes.

Notwithstanding the database figures, recent trends in poaching rates, as reported by the CITES programme of Monitoring the Illegal Killing of Elephants (MIKE), are disturbing. MIKE evaluates relative poaching levels based on the Proportion of Illegally Killed Elephants (PIKE), which is calculated as the number of illegally killed elephants found divided by the total number of elephant carcasses encountered by patrols or other means, aggregated by year for each of 60 monitoring sites in Africa. Coupled with estimates of population size and natural mortality rates, PIKE can be used to estimate numbers of elephants killed and absolute poaching rates (CITES et al. 2013). Figure 1 shows PIKE levels from 2002 through 2013. Figures 1 and 2 show that poaching rates accelerated after 2009, peaking in 2011. From 2010 to the present, 50% or more of elephant carcasses found are thought to have been illegally killed.

The Elephant Trade Information System (ETIS) implemented by TRAFFIC is the CITES programme for monitoring ivory trafficking that is the counterpart to MIKE. Figure 3 shows the estimate of the mean weight of illegal ivory trade combining all weight classes by ivory types, per year from 1996

through 2012. Figure 3 depicts relative (not absolute) values for the quantity of ivory being traded illegally, based on reported confiscations of smuggled ivory. Here, the pattern rather than the comparative weights is what is significant. There is relative stability in the quantity of ivory in illegal trade through 2007,

Table 1. African elephant population estimates, rounded to the nearest 10, 1989–2013

Year	Minimum	Maximum
1989	608,030	608,030
1995	387,520	581,180
2002	461,090	660,210
2007	554,970	689,670
2013	515,860	675,000

Source: Cobb (1989) and <http://www.elephantdatabase.org>

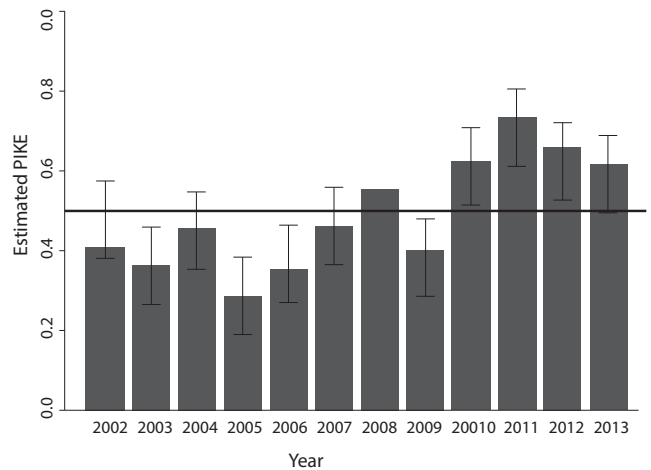


Figure 1. The estimated Proportion of Illegally Killed Elephants (PIKE) for all subregions of Africa combined. Source: CITES 2014.

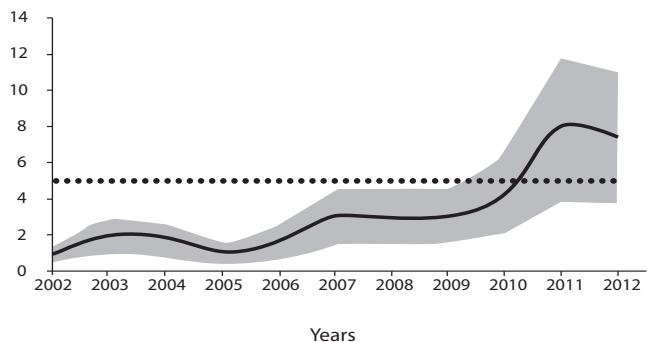


Figure 2. Estimated poaching rates. (The dotted line represents the normal average elephant population growth rate (5%).) Source: UNEP (2013).

but thereafter a fairly sharp upward climb is seen, despite a drop indicated in 2012. This pattern is similar to the MIKE poaching trend. The 100+ kg raw ivory class contributes the most to the weight index. This signifies that large-scale ivory seizures are driving the upward trend in the ivory trade. TRAFFIC interprets the trend for larger-scale ivory shipments as indicative of the presence of organized crime in the illicit ivory trade (CITES et al. 2013).

Larger shipments could also be evidence of increased demand for the purpose of speculative stockpiling. There is evidence that the larger shipments were not due to a requirement for larger raw ivory supply to meet increased production needs. One source of evidence is the legal market. It is reasonable to assume that the demand for legal carvings would follow similar (but not identical) trends as the illegal. Rising incomes in China should lead to demand in both markets increasing. This statement does not mean they will rise at the same rate or to the same levels. There are points of difference. The legal market appears to specialize in larger pieces while the illegal market handles smaller pieces (Moyle and Conrad 2014). This specialization, however, is not perfect. For instance, legal carving factories do make small carvings. About 80% of the carvings in 2013 weighed less than 100 g, but these carvings made up only 5% of the total by weight (Moyle and Conrad 2014).

Nonetheless, legal demand since 2009 appears relatively flat. First, only 13.78 tonnes of the 18 tonnes allocated by 2013 had been used by legal carvers (Yu 2013; Moyle 2014). This is supported by analysis of nearly 1,300 tusks that have gone through the legal factory system since the first allocation in 2009 (Figure 4). This suggests that retail consumer demand in general has been largely flat over this period. It also corroborates that the throughput of ivory is less than the government allocations in the legal ivory market sector.

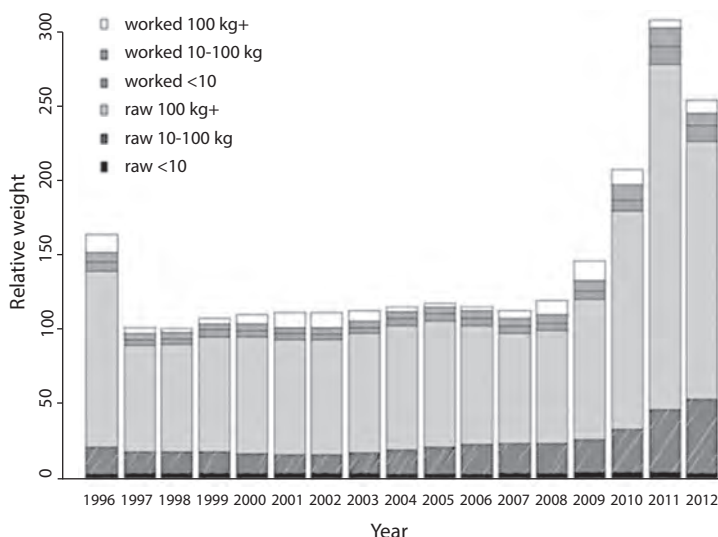


Figure 3. Estimate of the mean weight of illegal ivory trade combining all weight classes by raw or worked ivory, 1996–2012. Source: UNEP et al. 2013..

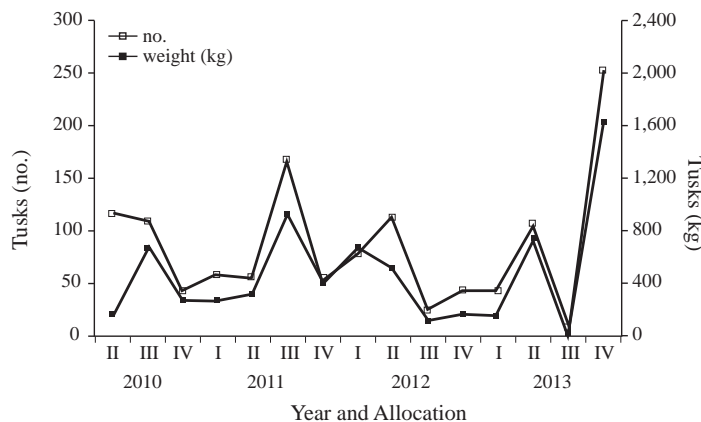


Figure 4. Throughput of tusks in Chinese factories, 2009–2013.

Production and consumption quantities of illegal ivory are unknown, but if the consumer demand pattern observed with legal ivory is similar, it would seem there has not been an increase large enough to account for the huge alleged increase in illegal raw ivory imports over the past five years or so.

Speculative stockpiling would be carried out by ivory dealers that supply ivory factories, some of whom probably have interests in ivory factories themselves. An example of this occurring is Hong Kong, where ivory dealers still have over 100 tonnes of ivory in stock 24 years after the CITES ivory trade ban (Hong Kong Government 2014). As long as ivory

rises in value sufficiently year-on-year, it remains profitable to stockpile and sell only small quantities, at great profit, as needed.

Clearly, something occurred in the 2008–2009 period that triggered the increased elephant killing and ivory seizure pattern seen since 2009. A widely held view is that the cause was the 2008 CITES-approved auctions of ivory stockpiles in four southern African countries to China and Japan (EIA 2012; Rice 2012; IFAW 2012). According to this line of thought, ‘the sale approved by CITES in 2008 spurred production and trade of ivory products in China and stimulated the demand for ivory from a growing class of wealthy consumers’ (IFAW 2012). This rise in demand, ‘combined with an uncontrollable legal ivory market which provides cover for illegal trade, makes a lethal combination that is decimating wild elephant populations.’ The claims by IFAW and EIA have been repeated by countless other NGOs, media outlets and prominent individuals. The same arguments were made regarding the first CITES-approved ivory sales to Japan held in 1999 (EIA 2002).

Stiles (2012) disagrees with the view that legal raw ivory sales in Africa stimulated consumer demand for worked ivory in China, even if the imported legal ivory did result in the availability of more worked ivory. First, the average consumer in China was totally unaware of the CITES one-off sales, so how could they have influenced consumer decisions to buy ivory? Second, to the extent that consumer demand for ivory increased after 2008, this coincided with a general and well-documented rise in Chinese consumer demand for all luxury products. Ivory, along with jade, works of art, gold, etc., became investment vehicles and prestige items of social display (Fischer 2011; IFAW 2012; Gao and Clark in review). Ivory consumption most likely rode the same wave. Third, consumer demand for ivory was stimulated by a Chinese government campaign to promote cultural heritage. Several government declarations and China’s adherence to UNESCO’s Convention for the Safeguarding of Intangible Cultural Heritage in 2005 publicized Chinese cultural arts. The ivory industry took advantage of the campaign to promote ivory carving in exhibitions, the media and on the internet. In May 2006, Beijing and Guangzhou ivory carving was included in the first National List of Intangible Cultural Heritages (Gao and Clark in review). This piqued interest in ivory as an aesthetic and culturally desirable commodity to acquire.

The MIKE and ETIS programmes were established

under CITES as a result of CITES Resolution Conf. 10.10, which included a call to assess to what extent observed trends of illegal elephant killing or ivory trading are a result of decisions taken by the Conference of the Parties to CITES, in particular CITES-approved sales of legal ivory.

ETIS (TRAFFIC International 2013) found that, after analysing ivory seizure data, ‘Over the 16-year period examined, an uninterrupted progression of Chinese involvement in illegal ivory trade is demonstrated. ... China’s involvement in illicit ivory trade transactions is 46 times greater in 2011 than it was in 1996. The increasing pattern of growth in illicit trade in ivory for China was well established long before the one-off sale under CITES commenced and certainly, for the period 1996–2008, was clearly driven by other factors ... independently of the CITES ivory sale event.’

MIKE (CITES 2013b) concluded after analysing the PIKE and associated data, ‘The MIKE analysis has therefore not found any evidence to suggest that illegal killing of elephants increased or decreased as a direct result of the CoP decisions. If the decisions had any effect on poaching levels, that effect was not discernible from the available data.’

Earlier analyses of available data, using different methods, could also find no causal relationship between the 1999 CITES one-off sales and ivory market activity or elephant mortality (Stiles 2004; Bulte et al. 2007).

Pro-ban supporters use the 1999 and 2008 sales to underpin the claim that a legal, regulated trade would stimulate ivory demand and drive elephant poaching to catastrophic proportions. The call for ivory stockpile destruction derives from this claim, based on the assumption that if there is no ivory to sell or otherwise leak onto the market, there would be no trade to stimulate elephant poaching. This simplistic argument has a superficial logic and emotional appeal, but it does not fit the empirical evidence or stand up to economic analysis, as we aim to demonstrate.

Raw ivory price trends

Data on raw ivory prices in various parts of the world are confusing and conflicting. For a review of methodological issues affecting the collection of raw ivory prices and a sample of prices see Stiles et al. (2011). Raw ivory prices are rarely collected and reported accurately by researchers and the media. In spite of deficient data, it is safe to say that raw illegal

ivory prices have been rising between about 2000 to 2014 in Africa and eastern Asia. It is unclear since 2012 what direction prices have taken in China, the most significant market for ivory. Table 2 presents prices from 1999 to 2014 in selected countries.

Table 2 shows that the prices for smaller, 1–5 kg tusks in urban areas in Cameroon (Douala and Yaounde) and the Democratic Republic of Congo (DRC—Kinshasa and Kisangani) have not risen in real USD terms between 1999 and 2010. The prices for >5 kg tusks have risen, however, from an average of USD 56/kg in Cameroon in 1999 to USD 91/kg and in DRC from a minimum of USD 70/kg to an average of USD 112/kg. Martin and Vigne (2013) report raw ivory prices in smaller urban areas of Nigeria in 2012 for 1–5 kg tusks, obtained from a secondary source, of USD 110/kg and Vigne and Martin (in press) report the average price for tusks of 1–3 kg in Luanda, Angola, in 2014 as USD 150–250/kg, most of them originating in the DRC. This would imply the price in the DRC in 2014 would be less than USD 150–250/kg, because transport and markup costs would have been added to those in Luanda.

The available raw ivory African prices appear consistent and show a clear pattern of a steady rise in prices from 1999 to the present for the larger tusk weights, but not for smaller tusks.

Japan shows a modest rise in inflation-adjusted prices for >5 kg tusks for the period 2002–2009 while Thailand experienced a much larger price rise between 2002 and 2008 of average prices of less than USD 200/kg to USD 387/kg—approximately double (Martin and Stiles 2002, 2003; Vigne and Martin 2009; Stiles

2009b). TRAFFIC recently carried out an ivory survey in Bangkok but unfortunately did not collect price data (Doak 2014).

Prices in China are less well understood. There appear to be two different ivory markets and sets of prices: the legal market and the illegal (black) market. In 2002, the black market inflation-adjusted prices for >5 kg tusks in China ranged from USD 155 to 220/kg. There were no legal raw ivory prices in 2002 because legal ivory was not being traded due to scarcity (Martin and Stiles 2003). By early 2011, the inflation-adjusted price for 1–5 kg illegal tusks in Fuzhou had risen to USD 777/kg, 350–500% more expensive than larger tusks in 2002. The government, legal inflation-adjusted price for 1–5 kg tusks was an average of only USD 471/kg in 2011, 40% less than the black market price (Martin and Vigne 2011). Larger >5 kg illegal tusk prices had risen in southern China to an inflation-adjusted USD 930/kg (Martin and Vigne 2011), four to six times more expensive than in 2002 for that size.

The black market price appears to have skyrocketed in 2014 to an average of USD 2,100/kg for small <5 kg tusks in Beijing (AFP 2014a; E Martin, pers. comm. to D Stiles 2014), implying that larger tusks would be even more expensive. However, prices for black market carvings (necklaces and bracelets) do not show the same trend. Moyle and Conrad (2014) report that these black market pieces are systematically lower in Beijing and Fuzhou than the legal prices.

Legal government-owned raw ivory prices had risen much less from the 2011 USD 471/kg average, ranging USD 483–613/kg for >5 kg tusks in Fuzhou

Table 2. Middleman raw ivory prices^a in USD, 1999–2014

Country	Year	Weight (kg)	Price/kg (USD)	Year	Weight (kg)	Price/kg (USD)
Cameroon	1999 ^b	1–5	38–53	2010 ^e	1–5	43
Cameroon	1999 ^b	>5	42–70	2010 ^e	>5	53–128
DRC	1999 ^b	1–5	42–70	2010 ^d	1–5	32–53
DRC	1999 ^b	>5	>70	2010 ^d	>5	64–160
China	2002 ^e	1–5	155–220	2014 ^f	1–4	2,100
China	2011 ^g	1–5	471–777	2014 ^h	>5	660–1100
China	2011 ^g	>5	930	2014 ⁱ	>5	484–613
Japan	2002 ^j	>5	181–311	2009 ^j	>5	302–362
Thailand	2002 ^k	1–5	30–236	2008 ^l	1–5	387

^a Pre-2014 prices have been converted to 2013 USD prices to take into account inflation using the 'real price' conversion for a commodity available from <http://www.measuringworth.com/>; ^b Martin and Stiles (2000); ^c Randolph and Stiles (2011); ^d Stiles (2011b); ^e Martin and Stiles (2003); ^f AFP (2014a) and Esmond Martin, pers. comm. 2014; ^g Martin and Vigne (2011); ^h T Esmail, *in litt.* to D Stiles 2014; ⁱ B Moyle and K Conrad, field research 2014; ^j Vigne and Martin (2009); ^k Martin and Stiles (2002); ^l Stiles (2009b).

and Beijing (B Moyle, field research). In 2014, DaXin Ivory Carving Factory in Guangzhou offered USD 660/kg for three pairs of tusks weighing an average of 36 kg each (Figure 5). These were accompanied by CITES permits that would allow legal export from Canada and import to China. In response to a reference by the seller to a USD 1,300/pound (USD 2,860/kg) price purportedly paid in China in 2013 (Levin 2013), DaXin replied it was untrue. A private dealer in China offered USD 1,100/kg for the tusks (T Esmail *in litt.* to D Stiles).

It is difficult to explain the large difference between legal and illegal raw ivory prices. Chinese government prices for >5 kg tusks are in the USD 480–660/kg range. These prices are supported by a legal raw ivory auction in France in July 2014, in which 50 tusks of 20 kg average weight were sold for about USD 630/kg to Chinese buyers (AFP 2014b). Much smaller illegal tusks are reportedly selling for an average of USD 2,100/kg (AFP 2014a). The high illegal price receives support from Gao and Clark (in review), who report prices in 2014 for illegal ivory sold online between private parties ranging from USD 1,700/kg to USD 2,890/kg. These pieces were quite small (0.5–1.9 kg) tusk tips and cut tusk sections.

Further research is called for to understand the ivory market dynamics that explain these price indicators. However, it is simple to understand the incentives for elephant poaching when tusks can be purchased in Africa for less than USD 150/kg and sold in China for well over 10 times that amount.

Theories of elephant conservation, ivory trade and stockpile management

Contemporary threats to wild elephant populations are essentially economic by nature; they include habitat loss, conflict with humans and poaching. The two essential drivers for these are competition with other forms of land use by humans (and their constituent species) and the demand for elephant products, principally ivory. Elephant poaching is undertaken because it is a profitable economic activity. Some of these economic aspects have been outlined in the economic literature from Barbier et al. (1990) through to Mason et al. (2012).

Major challenges to understanding the economics of the black market in ivory are two. The first is that the participants do not willingly reveal their business plans



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Figure 5. Legal tusks ranging in weight from 5.5 to 55 kg (average 36 kg). Prices offered in China to purchase them in March 2014 were USD 660–1,100/kg.

and activity to authorities or researchers; the trade is mostly unobservable. For example, smugglers do not fill out compulsory statistical returns on trade and so the prices and quantities of ivory sold are unclear. Incomplete or inaccurate information is a hindrance to understanding the scale and organization of illegal activity.

The second challenge is that many factors influence black market activity. For instance, the steady growth in affluence in China has created an upward impetus in demand (Underwood et al. 2013; Gao and Clark in review). A milieu of interacting factors have short- or long-term effects on the market. For example, in a 2013 visit by Conrad and Moyle (2013) to factory owners in Guangzhou, they stated that the 1997 Asian financial crisis caused demand for carvings from Taiwan to drop coincident with a new system of ivory management in Taiwan that had prohibited ivory manufacture there (Phipps and Chen 1997). If demand for worked ivory destined for Taiwan from Guangzhou factories dropped at the same time that Taiwan stopped producing its own ivory carvings, the drop in consumer demand in 1997 must have been substantial.

Vigne and Martin (2011) reported that demand for worked ivory in South China was variable in 2010. It had risen in Guangzhou, where economic prosperity had grown, but remained low in Fuzhou, where economic growth was much less. It is difficult to identify all of the factors that drive this global black market. It is a dynamic system, changing over time, and it is a complex system, with many interactions not fully understood.

It is outside the scope of this paper to describe the global black market in ivory. The challenges stated

above mean that our understanding must adapt as new information is acquired, and that while general tendencies can be described, they should not be treated as emphatic predictions. In complex systems, confounding shocks generated by other variables are likely.

The focus of this paper is poaching and its interaction with stockpiles. In discussing stockpiles, we can distinguish between different categories. The most important distinction is between those held illegally and those held legally. Illegal stockpiles are privately held and clandestine—their location and extent is not known, but we assume that they consist mostly of raw ivory. This assumption is based on the dominance by weight observed of raw ivory being smuggled to Asia in seizures. Legally held stockpiles consist of both raw and worked ivory (carvings) and are mostly owned by governments, having been sourced from natural mortality and culls in range States or from confiscations of illegal ivory in range, transit or consumer countries.

The illegal trade in ivory has three important economic features. First, the major consumer markets in Asia and sources of ivory in Africa are separate. This makes it a trade mediated by many parties between poachers and consumers (Underwood et al. 2013; Bennett 2014). This also means that many strategic interactions occur along the supply chain. Participants in the illegal trade are not passive. They anticipate enforcement effort (by, for example, concealment strategies or bribing officials). Second, raw ivory is used mostly as input to produce carvings. It is usually not consumed in retail sales in its raw form. Third, ivory is durable and can be stored (Figure 6). This gives criminals the option of storing ivory for many years to be used later. Is it possible to identify the factors causing stockpiling to occur or not?

The following economic theory identifies two important motivations for acquiring raw ivory. The first is that ivory is poached and smuggled for immediate use as an input for carvings. The second motivation is speculation, i.e. stockpiling for anticipated future demand, either by carvers or by intermediaries (Kremer and Morcom 2000; Mason et al. 2012). The drivers for these two differ. When discussing the issue of stockpiles, therefore, it is important to be clear whether they relate to the immediate market for carvings or the future market as speculators perceive them. The economic theory also affirms that stockpiles are essentially a supply-side issue, and its effects on



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Figure 6. Tusks from an ivory factory in China. Ivory has little ongoing storage costs.

buyer's demand are uncertain.

Price elasticity for carvings will also influence the effectiveness of trade restrictions. If buyers are relatively insensitive to higher prices and tend to sustain their consumption, demand is price inelastic and trade bans face significant hurdles. Even a small reduction in supply will lead to correspondingly larger increases in price. Such market circumstances nurture the development of criminal cartels and present significant challenges for enforcement (Becker et al. 2006). Conversely, if demand is highly elastic, increasing legal supply may have little effect on prices or levels of illegal exploitation. The price elasticity of demand for carvings needs to be understood and not conflated with income increases that also affect demand.

We discuss several papers relevant to these issues. They are not intended to be full descriptions of the illegal market and all the factors at play but simply highlight the relationship between poachers and stockpiles. Their point is that they are abstractions of the real market. They are specific to wildlife with storable parts—in most cases, elephants.

Bergstrom (1990) specifically addresses the issue of ivory stockpiled from confiscations. These confiscations or seizures can have two negative effects on poaching levels. The first is that poachers kill additional animals to replace tusks lost in seizures to authorities or otherwise. The CITES Secretariat (2010, n24) observes that seizures are a plausible motivation for some of the recent poaching, as criminals attempt to recoup their losses to authorities. The second effect is that removing this ivory from the market can reduce the supply of ivory as an input. This in turn may cause higher prices for raw ivory that factories have to pay and, as a knock-on effect, higher prices in the consumer

market (all else being equal). These higher prices may offer a greater incentive for poaching effort.

Bergstrom (1990) affirms that changes to supply through confiscating and destroying ivory will affect the illegal market. This does not necessarily affect ivory demand, but it does reduce the potential supply and potentially generates a new condition with a combination of higher prices and lower quantity demanded in the market for carvings. Bergstrom thus concludes that destroying legally held stockpiles exacerbates rather than reduces poaching levels, all else being equal. The act of confiscating the ivory reduces the supply—destroying it then ‘seals the deal’.

In terms of poaching levels it makes no difference if the government sells ivory from the legally held stockpile or if criminals steal ivory from the stockpile to sell. This only affects who gets the revenue from the sales. While we prefer that criminals do not benefit from the sales, the conservation benefits are similar. Adding to raw ivory supply from whatever source should reduce incentive to poach, as long as demand levels remain constant.

Kremer and Morcom (2000) revisit the stockpile issue a decade after the CITES ban. A key element of this paper is that governments and criminals both have stockpiles. Criminal sellers accumulate their stockpiles both by poaching elephants and by theft or leakage from legal stockpiles. Their motive for doing so is their expectation of higher returns on ivory in the future. This point deserves emphasis. It is not the current market for carvings that is driving criminals to stockpile their own ivory. It is what they expect is going to happen in the future—up to many years hence.

Traders are willing to hold large stocks of ivory if storage costs are low and they expect the price of ivory to increase. Examples are ivory traders and owners in Hong Kong, Japan, the USA and France who have held on to raw tusks for many years, even decades, and have sold or plan to sell at great profit. As stated by Bergstrom (1990), legal stockpiles affect the ivory market by changing the behaviour of sellers. The effect now however is felt not only through the market for carvings. It is a longer-term interaction based on the value attributed by criminals to their illegal stockpiles. Kremer and Morcom (2000) thus argue that governments should ideally retain legally held stockpiles for the purpose of threatening to dump them on the market as a deterrent for illegal speculation.

Mason et al. (2012) revisit the issue of speculative

stockpiling as ‘banking on extinction’. They examine hypothetical instances of speculators with market power whose strategy is to drive certain species to extinction. Extinction would concentrate further market power in their hands as they hold most of the stock, enabling them to inflate prices and earn supernormal profits. Elephants are currently a poor fit to this model with a multitude of competing conspiracies, making it unlikely that a dominant seller will emerge.

Given that the wild population would likely still take decades to reach extinction (CITES et al. 2013; Wittmeyer et al. 2014), ‘banking on extinction’ does not yet appear to be an economic option. Nonetheless, Mason et al. (2012) again highlight that stockpile accumulation is a forward-looking strategic issue subject to manipulation by speculators. Furthermore, even competing illegal stockpilers will profit from reduced elephant numbers and ivory stocks as the relative scarcity and value of their own stock increases. They will therefore all benefit from maximum levels of poaching and work together in an inadvertent conspiracy to deplete elephant populations. The clear policy implication here is that it is risky to enable the concentration of market power in the illegal market.

The above analysis suggests that legally held stockpiles have two significant effects on poaching. The first is to influence the supply of ivory available as an input for carvings. The second is to influence sellers’ expectations of the future. Stockpile-holding policy can cause illegal agents to change poaching rates to manipulate criminal stocks of ivory. The demand curve of buyers is effectively stationary and buyers respond to changes in the supply curve.

The effect of legal stockpiles is predicated on legal sales potentially or actually occurring (although thefts are an unofficial transmission mechanism from such stockpiles to the black market). This introduces the issue of trade policy. The current regime consists of an international trade ban in ivory. Exceptions have been granted to a small number of parties as one-off sales. A literature survey shows that the ban is an ambiguous policy. It resolves some extinction risks but also creates other risks. Direct economic analysis of the first one-off sale (Bulte et al. 2007) indicates that it produced mixed results and does not resolve the issue of whether the ban is optimal.

The common risk associated with legal trade is laundering (Khanna and Harford 1996; Bulte and Van Kooten 1999). Illegal ivory has a long history of being laundered as legal and concealed within the legal trade.

Another conjecture is that legal trade results in lowered enforcement effort or makes enforcement less efficient (Bulte and van Kooten 1999). Proponents of a blanket ban advance this argument on all domestic ivory trade. Following this principle, the US president's Advisory Council on Wildlife Trafficking recommended a total domestic ban on ivory. The US White House has subsequently announced a trade ban on almost all types of elephant ivory (US White House 2014).

Fischer (2004) is the first to discuss the demand side effects of trade and notes a potential 'stigma effect'. She posits a consumer-type termed 'law-abiding' who drops out of the market if the product is illegal (or swamped by illegal products). This is because the commodity is stigmatized for that consumer. Other consumers stay in the market. If a ban (or other factors) stigmatizes ivory, demand falls. This effect has to be shown to be present in some markets, and if it dominates the adverse supply-related effects of the ban, it is an appropriate regime. However, it is also possible that an opposite effect exists in some Asian markets: if, for example, some consumers seek possession and consumption of illicit products as a means to acquire and demonstrate social status by being beyond the reach of the law.

Kremer and Morcom (2000) identify a number of variables that should affect stockpiling. One is interest rates. Stockpiling ought to increase with low interest rates, all else being equal, because of the higher potential for relative return on investment. For instance, if criminal speculators expect the price of ivory to increase 10% per year and interest rates decrease from 6% to 3%, then they would prefer to hold more ivory and less of the financial assets. Note that speculators typically hold assets with low returns when these assets also have lower risk. Figure 7 shows that global interest rates have collapsed since the global financial crisis. This is consistent with speculators wanting more raw ivory for stockpiling. The correlation statistic with raw ivory seizures is -0.455 , which means when interest rates drop, seizures increase and vice-versa. We are assuming seizure levels are an indicator of illegal ivory trading scale.

A second factor is costs. Freight costs (air and shipping) matter for ivory, given

its weight and distance between range States and consumer countries. Note that this does not mean that these are the only relevant costs, rather that the preference for shipping containers is consistent with this. Figure 8 shows that shipping costs have also recently collapsed. Changes in freight costs and interest rates are consistent with the economic theory and of a magnitude that matches the surge in poaching (assuming that the hypothesis of ivory being mostly stockpiled by criminal speculators holds).

Rising Chinese consumer affluence appears to be driving increased demand for ivory carvings (IFAW 2012; Underwood et al. 2013). However, this demand has not kept up with the sudden changes seen in poaching rates, interest rates or transport costs. To illustrate, suppose there is a 20% seizure rate and 30–40 tonnes of raw ivory are being seized. This would mean an extra 150 to 200 tonnes of raw ivory being fed into the carving market every year. To see

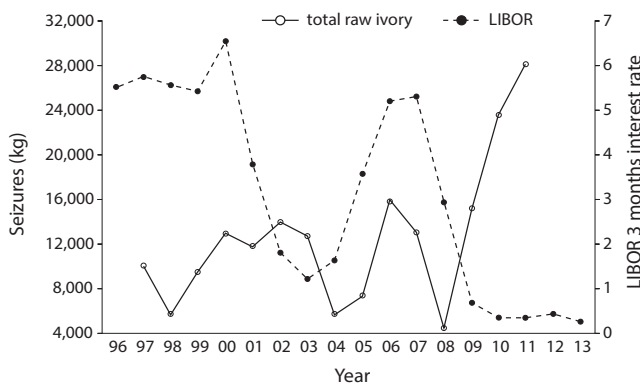


Figure 7. Interest rates versus raw ivory seizures. Sources: ETIS (TRAFFIC International 2013) for ivory seizures, Bloomberg (2013a) for interest rates.

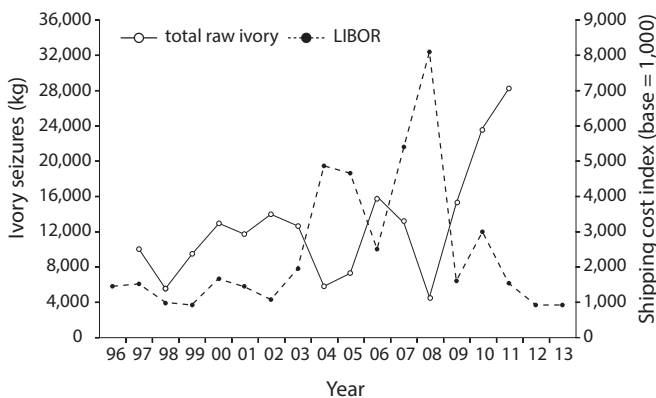


Figure 8. Freight costs versus raw ivory seizures.

price increases in ivory as seen in China and Thailand (Table 2) with the high volumes being smuggled in, at such low global transport costs, requires a massive offsetting increase in demand. However, there is little evidence to support this. The CITES Secretariat (2010) has highlighted that reported demand in Asia is not commensurate with the influx of ivory, verified by Wang Shan, secretary general of the China Arts and Crafts Association (Ma 2013) and supported by legal turnover of tusks shown in Figure 4. There appears to be a gap between estimated illegal raw ivory imports and worked ivory output. This gap is also supported by recent reports of a drop in demand in China for luxury goods (Baldwin 2014; Wendlandt 2014).

Converting the dramatic increase of poached raw ivory into carvings for rapid sale implies great flexibility in adjusting manufacturing volume. This would be evidenced by excess productive capacity and, in this industry, a very large number of under-employed or unemployed carvers to take up the extra carving requirements instigated by this ivory influx. This can be partly ameliorated by making smaller pieces, which require less time and skill. The trade-off is that the pieces are smaller, which puts downward pressure on throughput. To illustrate, the approximately 15,000 carvings of less than 100 g made in the legal factories in 2013 represented about 80% of the number of pieces made, but only about 5% of the weight of ivory used (Moyle and Conrad 2014).

The number of ivory carvers is also limited (Moyle and Conrad 2014), and to make carvings is time-consuming because production is largely artisanal (Stiles 2004). Indeed, Vigne and Martin (2011) report factories in South China closing because of lack of carvers. Many carvers left ivory to go into wood carving, which they found more profitable. Production evidence implies that illegal factories face a significant obstacle in trying to absorb the volumes of smuggled ivory. It does not appear that this obstacle has been overcome.

The evidence for black market stockpiling is still circumstantial. Nonetheless it aligns with many of the observations about the market while the explanation of increased worked ivory sales does not. Interest rates are low. Sales do not appear to have risen by a magnitude to absorb the influx of illegal raw ivory. Carving capacity is hindered by a lack of artisans. None of these explanations

explicitly rule out a large increase in illegal sales, but in combination they make the stockpiling explanation credible.

It is important to identify the destination of the smuggled ivory because this implies stockpile destruction will have an effect in different ways. If the ivory being smuggled into Asia is largely being stockpiled for speculation, destruction will have little immediate effect on the market for carvings. Any changes to the market observed in the wake of the announced intent to destroy ivory and its follow through will likely be the result of other factors. Measures of consumer demand in China have been softening through 2013 into 2014. One such measure is Chinese consumer confidence. This metric is apt as it homes in on Chinese households. This makes it a better measure than say, GDP, which includes non-household expenditures, such as those coming from industrial growth or exports. This measure has softened again. For instance, through 2013 Chinese consumer confidence has declined (Figure 9). A softening in demand for carvings thus appears plausible irrespective of the stockpile destruction.

Discussion

The economic literature describes a complex system of interactions between stockpiles, poaching, prices and expectations. Poaching levels have multiple potential trajectories and can switch among them (Kremer and Morcom 2000). An important feature of ivory is that it can be stored for years. Illegal stockpiles accumulate (via increased poaching or leakage) to buffer black

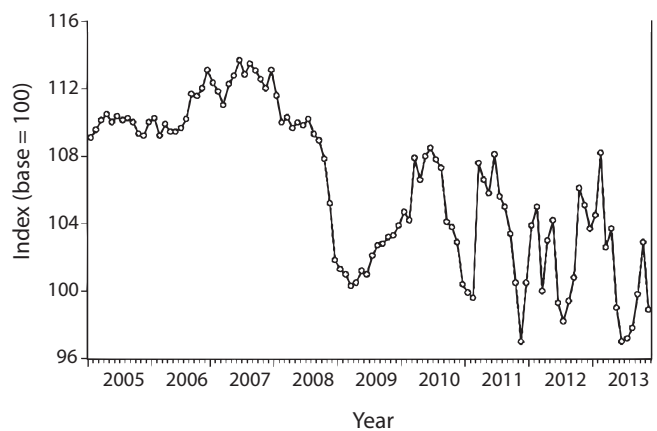


Figure 9. Chinese consumer confidence. Index from Bloomberg (2013b).

market sellers against volatile ivory supply, in expectation of future price increases and possibly to manipulate prices.

Poaching levels thus respond partly in anticipation of future market conditions. They are not merely a product of current conditions. The fact that CITES seems unlikely to approve further legal sales for the foreseeable future may create incentives for criminal speculators to accumulate stockpiles. Legal stockpiles act as a counterweight to these illegal stockpiles, and a threat of future legal sales (or even leakage by theft) may deter some poaching. There is no theoretical rationale for destroying legal stockpiles for conservation purposes. Indeed, destroying them concentrates market power with speculators holding illegal stocks and, if demand for ivory persists, makes extinction trajectories more likely (Bulte et al. 2003; Mason et al. 2012).

The future demand for ivory is a crucial issue that lacks proper analysis. With the exception of Fischer (2004), the literature assumes that demand for ivory will be maintained, if not accelerated. Trade bans and stockpile destructions are primarily supply oriented. Their demand effects are unclear.

There is also an important conflict in perceptions between speculators amassing ivory illegally and organizations supporting stockpile destruction. Such speculators must be confident that demand will persist and prices will keep rising (Kremer and Morcom 2000). They do not consider efforts to reduce ivory demand to be credible. By contrast, advocates of stockpile destruction are assuming that such actions will cause demand to decline. If the speculators are correct, demand for ivory will resist these measures.

Cultures with a long history of ivory use have a record of maintaining demand despite external pressure (Walker 2009). The conflict in perceptions extends to the diverse values elephants have for various peoples. Numerous cultures throughout Africa, the Middle East, Europe, North America and Asia have long-standing traditions of ivory use (Walker 2009). Some of these same cultures now have groups strongly opposed to any use of ivory. This conflict in values has wider dimensions. It motivates some parties favouring narrow conservation to adhere to a strict preservationist approach. A narrow policy can also generate a social justice dimension where some cultures' values are discounted completely or external economic costs are imposed upon them (Harris 2013).

The current dilemma is the conflict between demand and supply measures to reduce poaching. Existing attempts to change consumer behaviour (and therefore reduce ivory prices) employ both coercion (trade bans) and moral suasion (demand reduction campaigns). However, reducing supply via bans and stockpile destruction may exert upward pressure on prices, thereby offsetting gains from demand reduction. Attempting to reduce supply and demand at the same time is akin to simultaneously turning up the heating and turning on air-conditioning; it does not make good sense. Demand reduction alone may make short-term sense, but it ought to precede supply reduction to pre-empt the conflict.

Decisions to destroy confiscated and other legally held ivory stockpiles do not conform to policy aimed to deter illegal raw ivory hoarding. Instead, the economic literature supports the holding of legal stockpiles as an insurance policy that will lessen the benefits to hoarders of concentrating ivory stocks that gain in value from the decline in elephants. The claimed effect that stockpile destruction has on demand is based on rhetoric and assertions about ivory demand that lack coherence or empirical evidence.

The rapid increase in poaching and the scale of it in recent years defies a simple explanation and a simple solution. We postulate that criminal organizations and other speculators may have determined that stockpiling ivory is a viable investment. This is where research needs to be focused. It is also a warning that these speculators do not perceive ivory destruction to be a threat. It would be frightening to discover that concentrating market power in the hands of criminals through policies like ivory destruction is actually encouraging them further.

Conclusions

The recent stockpile destructions in the USA, China, France and Hong Kong amounted to relatively small proportions of the known legally held stockpiles. Nonetheless, there are reports by ivory vendors in Beijing and Hong Kong, and by a non-government organization in Hong Kong, that the price of worked ivory did in fact increase after the China crush (Moore 2014; ITV 2014; NPR 2014). Table 2 and the section on price above demonstrate that illegal raw ivory prices have shot up since 2011, when the current round of stockpile destruction began with Kenya. The planned further destructions in Hong Kong and

possibly Tanzania and Thailand amount to a much higher proportion of legal stocks and consequently a greater potential risk of driving up the price of illegal ivory even more.

The decision to destroy legal stockpiles of ivory should be driven by sound policymaking, backed up by a robust economic rationale supported by compelling evidence. This evidence should include data on demand elasticities. Any stockpile destruction should be a credible signal to black market participants that ivory will become less valuable. Any rationale for destruction must address concerns that the signal will perversely increase the perceived value of illegal stockpiles. There should also be a monitoring system in place beforehand to assess whether these destructions are meeting their aims. Current moves to destroy stockpiles do not satisfy these conditions.

The economic literature on ivory trade, stockpile management and related issues provides no theoretical support for a policy of stockpile destruction. Trade legalization may have undesirable consequences, but the extent to which stigma is generated by bans is an unsettled empirical issue. The persistence of ivory demand in markets with long cultural traditions of use does suggest this type of market is not always readily or entirely amenable to stigmatization. It has not yet been convincingly demonstrated to what extent underlying demand is sensitive to stigma in the important markets of China and Thailand.

The argument that existing legally held ivory stockpiles pose a threat to elephants is supported neither by economic theory nor by empirical evidence. The only circumstance under which existing, securely held stockpiles would pose a threat is if they are primarily held by illegal speculators. Such agents benefit from large declines or extinction threats of elephants because they would drive up the rarity value of their stock. This is a further argument in support of governments retaining legal stockpiles, as a potential competitive buffer to such an outcome.

Ivory stockpiles are not a threat to wild elephant populations, but destroying them may be, as it reduces potential future supply; it may increase perception of scarcity value and thus drive up black market prices for ivory and therefore future levels of poaching. Ivory stockpile destruction does not meet the precautionary principle criteria, because the outcome is unknown. Having policy options in an uncertain environment is precautionary. Eliminating them is irresponsible.

Acknowledgements

The authors would like to thank Kirsten Conrad for sharing data and commenting on the draft manuscript, and we are very grateful to Yufang Gao and Susan Clark for giving permission to use information from their article, unpublished at the time of submitting this article. We are also grateful to the two reviewers of the manuscript, who offered very valuable comments that resulted in useful revisions.

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Rehabilitation of greater one-horned rhinoceros calves in Manas National Park, a World Heritage Site in India

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Abstract

For the first time in the history of rhino conservation in India, three rescued orphan greater one-horned rhinoceros calves have been rehabilitated in an area that in the recent past was a good habitat for rhinos. The calves were rescued in Kaziranga National Park (NP) when they were about one to five months old when they were swept away by flood waters. The calves were hand reared and nursed at the Centre for Wildlife Rehabilitation and Conservation (CWRC) with the aim of releasing them into their natural habitat. They were fed human milk formula until they reached two years of age, and then with concentrates and greens in paddocks in CWRC. At the age of about three years the calves were translocated to Manas NP, about 500 km away from Kaziranga, and placed in a pre-release area measuring 600 acres. This pre-release area is enclosed with an electric fence and the calves were free to roam and forage within it. After spending about two years in this area the calves were released into Manas NP. The calves were radio monitored for two years; they all survived and created their own home ranges.

Résumé

Pour la première fois dans l'histoire de la conservation des rhinocéros en Inde, trois orphelins du grand rhinocéros unicolore sauvés ont été réhabilités dans un autre habitat qui avait été une zone abritant les rhinocéros dans un passé récent. Les bébés rhinocéros ont été sauvés dans le parc national de Kaziranga (PN), quand ils étaient âgés d'entre un et cinq mois quand ils avaient été emportés par les inondations. Les bébés étaient nourris au biberon et soignés au Centre de Récupération et de Conservation des Animaux Sauvages (CRCAS) dans le but de les réhabiliter dans leur habitat naturel. Les bébés ont été nourris à la formule du lait humain jusqu'à ce qu'ils atteignent deux ans, puis avec des concentrés et de l'herbe dans les paddocks au CRCAS. A l'âge d'environ trois ans, ils ont été transférés au PN de Manas, à environ 500 km de Kaziranga, et placés dans une zone de pré-relâchement mesurant 600 hectares. Cette zone de pré-relâchement est entourée d'une clôture électrique et les jeunes rhinocéros sont libres de se déplacer et de fourrager. Après avoir passé environ deux ans dans cette zone de pré-relâchement, ils ont été libérés dans le PN de Manas. Ils ont été suivis par radio pendant deux ans ; ils ont tous survécu et on a constaté qu'ils créaient leurs propres habitats vitaux.

Introduction

Rehabilitated animals are now seen as useful scientific resources not limited to the classical theories of individual animal welfare or endangered species conservation (Robinson 2005). When a population

is threatened, either globally or locally, released rehabilitated individuals can have a positive effect on the population. Until the early nineties, *Rhinoceros unicornis* had a healthy population in Manas National Park (NP) (26°30'N–27°00'N to 90°50'E–92°00'E), a World Heritage Site in India (Figure 1). Assam

Forest Department (2001) revealed in their internal documents that this population was, however, wiped out due to civil unrest during the late nineties. The civil unrest ended in 2004 following political agreements that led to the formation of the Bodoland Territorial Council (BTC). Thanks to the efforts of BTC and the local autonomous civil administration authority and support from communities around Manas, this important global biodiversity hot spot has regained its protection status. BTC proposed adding an area measuring 950 km² to the eastern boundary of Manas NP. The legislative council has endorsed the proposal and this much larger landscape is to be called the Greater Manas; it awaits final endorsement by the State Board of Wildlife, Assam, a statutory body of the government of Assam. This new conservation initiative in Manas is banking on community conservation efforts, a new approach in India. With civil societies collaborating to protect these rhinos, conservation communities asked for them to be urgently reintroduced in Manas NP.

Kaziranga NP (26°33'N–26°45'N and 93°9'E–93°36'E), another World Heritage Site in the northeast Indian state of Assam, has a population of

about 2,000 wild greater one-horned rhinos: more than two-thirds of their global population (Figure 1). As Kaziranga NP is situated on the bank of River Brahmaputra, flooding is a natural phenomenon and almost every year about 90% of the park is under flood (Vasu 2003). During each flood, a number of wild animals are dispersed, separated from their mother populations and their land in civil areas. These animals are injured or killed in different circumstances such as in road accidents, by humans or by poachers. To minimize mortality and to have a proper scientific rescue and rehabilitation programme, the Assam Forest Department in collaboration with the Wildlife Trust of India (WTI) and the International Fund for Animal Welfare (IFAW) established the Centre for Wildlife Rehabilitation and Conservation (CWRC) in 2002 at Kaziranga. With 2 biologists, 2 veterinarians and 12 animal keepers, CWRC has been providing all rescue and rehabilitation needs of wild animals in distress in Kaziranga for the last 12 years. In the last 10 years, CWRC has handled more than 3,500 animal rescue cases; more than 50% of these animals were successfully released into the wild. CWRC is a major facility for hand-raising orphaned large

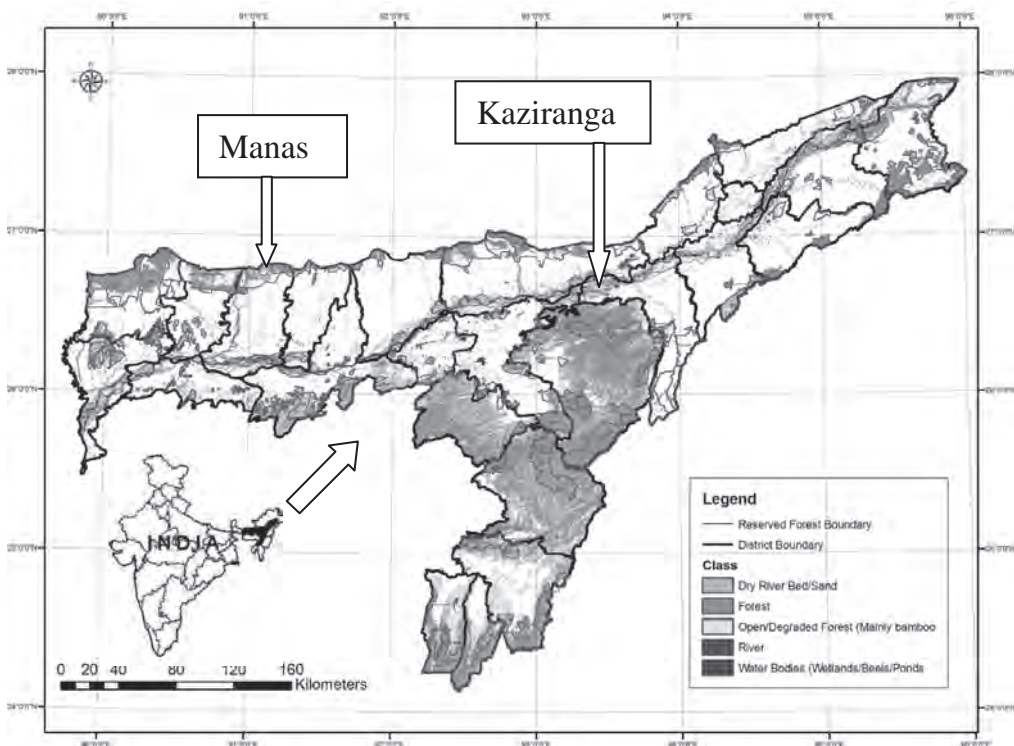


Figure 1. State of Assam showing Manas and Kaziranga NPs.

wild mammals, especially rhino, elephant and wild buffalo calves in northeast India. At this centre, orphan animals spend their time in different housing facilities from nursery to big paddocks, depending on their age at rescue. They are bottle-fed human baby milk formula until they are weaned at different ages, depending on the species. In 2002 and 2004 three rhino calves aged less than five months were rescued in Kaziranga NP after they were separated from their mothers by high flood waters. They were shifted to CWRC for further care and treatment. These animals were later released into Manas NP. This is the first time in the history of rhino conservation in India that rescued rhino calves have been rehabilitated and reintroduced into a natural habitat. Before that, all rescued calves were placed in a zoo and many died while being hand-raised in captivity (pers. comm., Office of the Park Director, Kaziranga NP).

The process

Wildlife rehabilitation is still in its infancy (Holcomb 1995) and a professional and scientific wildlife rescue and rehabilitation programme is lacking in India (Ashraf and Menon 2005). The best way to reintroduce a hand-raised rhino to the wild is still debated and doing so needs consultation and inputs from various experts. A wildlife rehabilitation consultative workshop was organized at CWRC in 2005 to get expert suggestions and inputs, to share Africa's experiences, and to formulate a protocol for reintroducing these rescued rhino calves (Figure 2). This forum discussed a protocol drafted by a

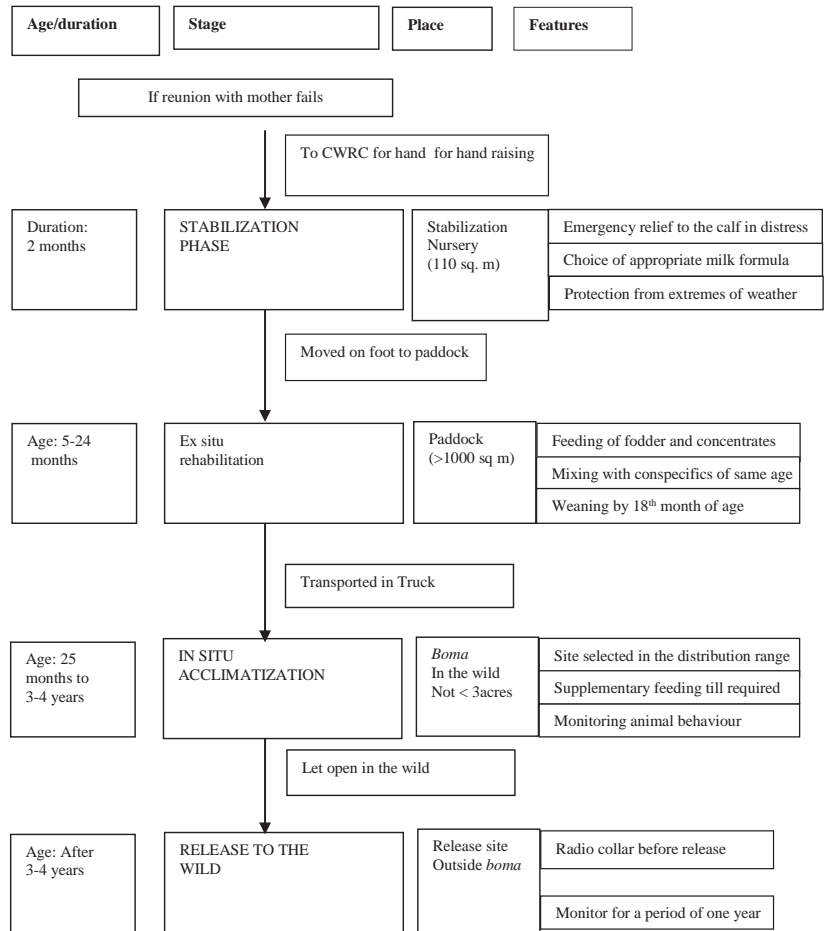


Figure 2. Rhino rehabilitation protocol flow chart.

WTI-IFAW team and incorporated expert inputs. This protocol to rehabilitate large mammals in Assam (Ashraf et al. 2005) was later adopted by the Assam Forest Department-WTI-IFAW-run CWRC. It was tested with the rhino calves rescued and admitted at CWRC that were later released in Manas NP.

Rhino calves admitted to CWRC

The first rhino calf was rescued in July 2002 after it was separated from its mother during the floods. It was weak and less than a month old. Two calves estimated to be less than six months old were rescued in July 2004 in similar conditions. CWRC rescued 21 other rhino calves under various circumstances. Flooding is the major cause of displacement of rhino calves in Kaziranga NP. In a few cases, calves were found alone in the forest for unknown reasons; a few were orphans

after poachers killed their mothers, others were failed predation attempts. CWRC took in all these rhinos for treatment and care. While 5 of the 24 rhinos brought to the CWRC were injured, due largely to predation, 4 cases could be attributed solely to floods. Interestingly, almost all the rhino calves with serious injuries were encountered outside the peak monsoon season (July–September). In spite of medical care, all calves that survived predation died from the serious injuries. Critics consider ‘rescuing’ such calves as disrupting normal ecological processes. Field staff in the park realized that these cases were predation attempts only after taking the animals captive. Park authorities have been advised to adopt a wait-and-watch policy when they encounter rhino calves as they could be cases of predation attempts. Of the 10 calves that died, 6 died within 48 hours of admission, 3 within two weeks and 1 inside the boma at Manas. CWRC veterinarians have found it much easier to hand-raise rhino calves than elephant calves; however, their condition on arrival determines whether they will survive. A healthy rhino calf, even when very young, has greater survival chances than an elephant calf of the same age group. Besides the four rhinos that were relocated to Manas in 2006, 2007 and 2008, CWRC at present has five rhino calves, all males (Table 1).

At CWRC, the calves were placed in a nursery enclosure (~5 m x 5 m), observed for injuries and stabilized. Generally, calves are accompanied round the clock by an animal keeper. Calves were fed diluted human baby milk formula that was available in the market (brand name: Nestogen, make: Nestlé) with a special 2-litre bottle with a long rubber nipple. For the first three to four days, they were given milk at one-hour intervals, although this frequency was reduced during the night. Once they were accustomed to drinking this milk, were less stressed and had stabilized, they were allowed to use a paddock (~10 m x 10 m) next to the nursery. After three to four months, varying with the individual, the calves were fed concentrates with mineral supplements and vitamins. From the age of 6 months, they were introduced to fresh greens, mainly grass, and continued with concentrates and milk. They were weaned at two years and fed a diet of greens from then on. Veterinary doctors treated the calves and prescribed appropriate medicines for injuries. At any time, there were two vets at CWRC, ready to handle any emergency with medical interventions.

While the calves were being hand raised at CWRC, procedures had started to select sites where they could

be rehabilitated. Though Kukrakata near Kaziranga NP was identified as a possible site for release, the CWRC governing council recommended moving them to Manas NP for rehabilitation and release. Rehabilitation is isolated from the holistic conservation effort when it is not linked to an active conservation programme. Here was an opportunity to link rehabilitation efforts with an active conservation programme. Using rehabilitated animals in reintroduction programmes for establishing new free-ranging populations has greater conservation value than releasing them in areas like Kaziranga where there is already a healthy rhino population.

Two important issues were considered while selecting Manas as the release site. The IUCN *Guidelines on re-introduction* (1998) stipulate that the re-introduction area should have assured long-term protection, and the causes of the species’ decline should be identified and eliminated or reduced to a significant level. Cessation of political unrest in the region, formation of the autonomous BTC and resumption of park protection and management activities assured that the project had political support and that poaching in the park has been reduced to insignificant levels.

Following the governing council’s recommendation, a site selection committee visited Kokilabari and Bansbari areas in 2005 to assess the area. This committee consisted of the chief wildlife warden of Assam, the directors of Manas and Kaziranga NPs, all range officers of Manas NP and representatives from WTI. Site selection criteria were developed based on the IUCN (1998) guidelines on re-introduction that had the following set of suitability criteria: the site falling within the rhino distribution range; availability of adequate cover, food and water; minimal presence of human settlements in the area; reports of minimal livestock grazing and human trespassing; habitat suitability in terms of vegetation composition; accessibility of the site for monitoring; reports of livestock diseases reported from the area; how prone the site is to flooding during the monsoon; and availability of reports of hunting, poaching and insurgency in the area. Three sites within Manas were selected: Kuribeel, Uchila and Kokilabari. The committee considered the advantages and disadvantages of each site, and the Kuribeel area of Bansbari Range in Manas NP was chosen as the site in which to establish the rehabilitation station. Kokilabari has less grassland area, few perennial water bodies and high human intervention; Uchia is located deep in the

Table 1. List of rhino calves admitted at CWRC for various reasons since 2002

Sl no.	Date of admission	Place of rescue	Stage/sex	Cause of displacement	Outcome	Date of outcome
1	21/01/2013	Kaziranga	Infant female	unknown (found alone)	died in captivity	31/01/2013
2	23/09/2012	Haldibari	Neonate female	flood/river induced	died in captivity	19/11/2012
3	01/07/2012	Baghmari	Infant male	unknown (found alone)	alive	N/A
4	27/10/2011	Burapahar	Infant female	unknown (found alone)	died in captivity	27/10/2012
5	10/03/2011	Hathikhuli	Neonate male	injury (unknown)	died in captivity	22/03/2011
6	15/02/2011	Karetapu	Infant female	unknown (found alone)	died in captivity	04/03/2011
7	19/12/2010	Agoratuli	Neonate male	orphan (parent killed)	alive	N/A
8	08/03/2010	Kathpora, Kohora	Infant female	stuck in mud	died in captivity	15/03/2010
9	10/09/2009	Baghmari, Baguri	Infant male	unknown (found alone)	alive	N/A
10	21/08/2009	Haldibari	Neonate male	unknown (found alone)	alive	N/A
11	13/03/2009	Baruntika Camp, Baguri	Infant male	unknown (found alone)	alive	N/A
12	09/02/2009	Bokhpura	Infant male	orphan (parent killed)	alive	N/A
13	31/01/2008	Gerakati, Baguri	Infant male	unknown (found alone)	alive	N/A
14	22/09/2007	Hatikuli, Kohara	Neonate female	orphan (parent killed)	died in captivity	06/10/2008
15	11/09/2007	Deopani, Baguri	Infant male	injury (unknown)	died in captivity	12/09/2007
16	16/10/2006	Japoripothar	Neonate male	injury (predation)	died in captivity	16/10/2006
17	20/06/2005	Baguri	Neonate female	injury (unknown)	died in captivity	20/06/2005
18	09/01/2005	Ajagar camp	Infant female	unknown (found alone)	died in captivity	27/01/2005
19	09/12/2004	Dumjan	Infant male	injury (predation)	died in captivity	28/12/2004
20	22/07/2004	Harmoti, Baguri	Infant female	flood/river induced	released	27/11/2008
21	14/07/2004	Baghmari,	Infant female	flood/river induced	released	27/11/2008
22	06/03/2003	Kaziranga	Infant male	injury (predation)	died in captivity	06/03/2003
23	06/08/2002	Kaziranga	Infant female	flood/river induced	died in captivity	07/08/2002
24	28/07/2002	Kaziranga	Infant female	flood/river induced	released	27/11/2008

park and it was likely there would be problems with regular monitoring of the area. The presence of a few watchtowers around Kuribeel area ensured 24-hour rhino security. As the plan was to move the rhinos in trucks, it was also important to have the pre-release area located along an existing forest camp road.

The boma: pre-release area

The pre-release area in Kuribeel—called a ‘boma’, as this is what a similar enclosure is called in Africa—was surrounded by a solar-powered electric fence. It had three compartments: compartment A was ready when the first rhino was moved, and as soon as compartment B was completed, the rhino was allowed to use both areas (Figure 3). The boma also included part of a perennial stream because rhinos need water bodies to wallow in during the hot hours of the day. Hume pipes (large cemented pipes) were placed below the fence to facilitate the free flow of stream water through the boma. The nine-strand power fence had a twin role: to keep the rhinos confined in a large area for at least two years and at the same time keep away wild elephants and large carnivores like tigers. A corridor measuring 20 m x 70 m was created between sections A and B in case the rhinos needed to be confined for medical intervention. Two more rhinos were relocated to the boma in 2006 and another rhino calf was rescued in September 2007. The boma was expanded to double

its existing size. Accordingly, 19 acres were added as compartment C in January 2008, just before the fourth rhino was relocated. All three compartments together measure 33.35 ha and were sufficient to accommodate the four rhinos until they were released.

Relocating rhinos to Manas NP

Early in 2006 WTI partnered with BTC to reintroduce rhinos into Manas NP from Kaziranga. IUCN guidelines (Emslie et al. 2009; Suwal and Shakya 2002) were used to plan and translocate the hand-raised rhinos. The first rhino, a three and a half-year-old female christened Maino by BTC, was moved to the boma on 21 February 2006. Maino thus got the distinction of being the first rhino to reach Manas after the resident population of rhinos had been wiped out during the decade of political instability in the region. On 28 January 2007, two more female rhinos, Rose and Manasi, were relocated from CWRC to the same boma. After a month of habituation at CWRC the rhinos were each lured into a crate, and a long-acting tranquilizer, Azaperon (Stressnil), was administered intramuscularly to reduce aggression and minimize damage to the crate. With the use of a crane the crates were loaded onto individual trucks that travelled by road overnight for about 400 km.

On 23 February 2008 a female rhino calf about two years old was translocated from CWRC to Manas NP,

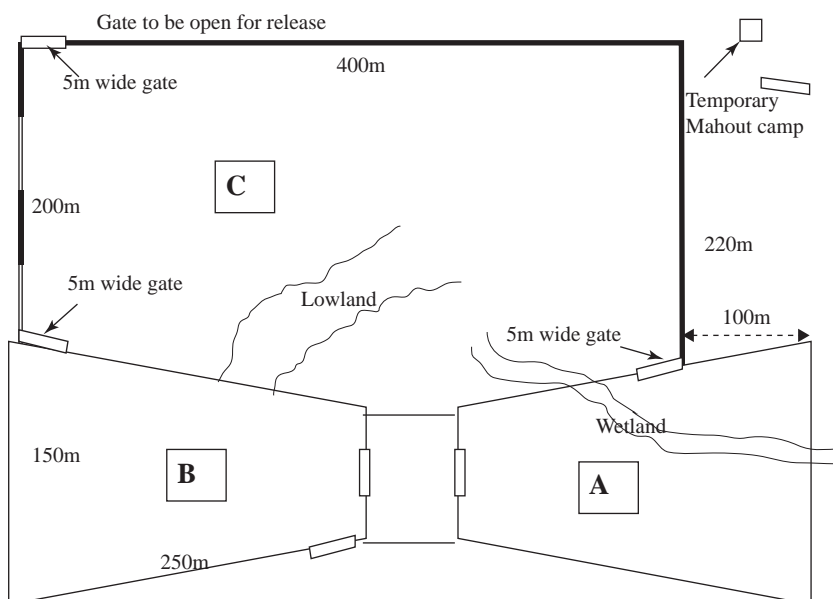


Figure 3. Schematic diagram of the boma used for rhino rehabilitation.

raising to four the number of rhinos inside the boma. This rhino had been rescued from Hatikhuli Tea Estate near Kohora after poachers killed its mother. While the rhinos that had been moved to Manas earlier were all hand raised, this calf was already two years old and was therefore considered to have been already weaned off milk. Consequently, luring this calf into the transportation crate was not considered an appropriate option for trapping it. We used a combination of Medetomidine and Ketamine hydrochlorides to restrain it before placing



A calf under rehabilitation at CWRC is bottle-fed milk.

it on the sledge and dragging it into the crate. To give the rhinos a sense of familiarity to the new area, bags of their fresh and old dung had been taken to Manas from CWRC the previous day and scattered on the ground. The next morning after the trucks reached Manas, the young rhinos were let out of their crates into the boma. All four rhinos have been radio-collared to enable post-release monitoring. Within two months of relocating the fourth rhino to Manas, two male rhinos from Pabitora Wildlife Sanctuary (WLS) were hard-released (caught in the wild and directly released in Manas without using a pre-release boma) in Manas as part of the Indian Rhino Vision 2020 (IRV 2020) rhino translocation programme of the government of Assam. The female rhinos translocated from CWRC to Manas have a chance to choose mates while they are rehabilitating in Manas NP.

Rhinos at the boma

The rhino calves admitted to CWRC were hand-raised for about 18 months. Unlike elephant calves, they were held in large stockades at the centre until they were considered fit enough to be relocated to the boma at the release site. Since rhino calves begin nibbling grass blades by the age of 2–3 months, grass and browse were made available to them by the time they were four months old.

A ‘soft-release’ strategy was adopted after holding the rhinos in captivity at the release site for two to four years, depending on the age of the rhino at the time of its relocation. All rhinos were given supplementary feeding, a concentrate mix, for a week following their relocation. Supplementary feeding stopped as soon

as they became accustomed to the grazing area inside the boma.

The fourth rhino was much younger and she was held initially in a small paddock specially created within compartment A, before she was allowed free access to the entire compartment. The plan was to restrict the calf to this compartment until the other three adult or subadult rhinos occupying compartments B and C were released. However, one of the male IRV 2020 rhinos strayed more than 100 km from Manas, creating panic among people, and had to be captured and released into the boma. The second male rhino, possibly lured by the three females inside, had already forced his way into the boma by disrupting the power fence on 10 June 2008. Fortunately, this happened on the side harbouring compartments B and C where the adult rhinos were held and not in compartment A. However, releasing the straying rhino into the boma through compartment A had serious consequences. The standard operating procedures were overlooked and the calf was left among adult and subadult rhinos with all compartments interconnected. On 14 September 2008 the young female calf was found dead. The carcass was discovered only after a couple of days by which time putrefaction had started and scavengers had devoured the carcass considerably. Mandibular fracture and other circumstantial evidence pointed to death due to traumatic injury caused by the adult rhinos. Though fingers were pointed at the wild captured rhinos, there was no clear evidence to support this.

Data were collected on rhinos’ use of habitat within the boma, and rhino behaviour towards caretakers, strangers, conspecifics and other wildlife was recorded anecdotally. Initially, the animals were seen following the caretaker whenever he inspected the fence for repairs. A month later the monsoon set in and tall grass grew inside the boma that soon cut down the visibility of the rhinos from outside. Three months after they were released, the rhinos showed little concern for people patrolling around the fence, though they were at times heard vocalizing on noticing human presence.

The tall grass was cut to encourage the growth of fresh blades of grass. The rhinos were moved from one compartment to another and the grass was trimmed close to the ground. Burning the grass would have been a better option but was not done as the fire might have gone out of control and spread into the other compartments holding the rhinos.

Release and post-release monitoring

On 27 November 2008, the park authority and WTI representatives visited the pre-release site at Bansbari to assess whether it was feasible to release three female rhinos from the boma. The Rhino Task Force meeting of the government of Assam held in September 2008 had proposed that these rhinos be released. The team found all conditions favourable and released the rhinos from the pre-release site. On 27 November 2008, the gate of the boma at the northern-most boundary was opened and two female rhinos came out immediately. The third female rhino only ventured out the next day. At the time of release, one of the females was over six years old and the other two nearly five years. Meanwhile, the two male rhinos continued being held in the boma till 3 May 2009 when the younger forced his way out, once again by breaking through the power fence. The reason was said to be persecution by the other male inside. Once part of the southern boundary of the park was power fenced, the other male rhino was also let out, on 25 November 2009. This was exactly one year after the three rehabilitated rhinos had been released from the boma. Soon, the male and female rhinos were seen grazing together, often occupying the same habitat.

The rehabilitation protocol emphasized that the rhinos be monitored intensively for one year post-release (Ashraf et al. 2005; Emslie et al. 2009). But the rhinos were monitored for more than this designated period. In spite of collaring them as early as 2006 and 2007 respectively, the collars continued to give signals till the end of 2009 and beginning of 2010. Collars therefore provided range-use data for more than the stipulated period of one year post-release. Manasi's collar fell in October 2009, and Maino's in February 2010. Rose's collar is on the verge of falling due to normal wear and



Female (rehabilitated) and male (hard release) rhinos graze in Manas National Park.

tear. The collar stopped functioning, but not before providing the tracking team with information on her movement patterns for more than a year. All rhinos were intensively monitored till 31 March 2010.

Radio-tracking was done largely using a vehicle, but sometimes on foot and rarely on elephant back. Temporary watchtowers were erected at strategic locations, especially near the southern park boundary towards the village site, to facilitate easy tracking. Having been held in captivity in the boma for more than two years, the rhinos had developed site fidelity and as a result did not wander long distances after their release, unlike the hard-released males. Tracking these animals was therefore much easier as they rarely went

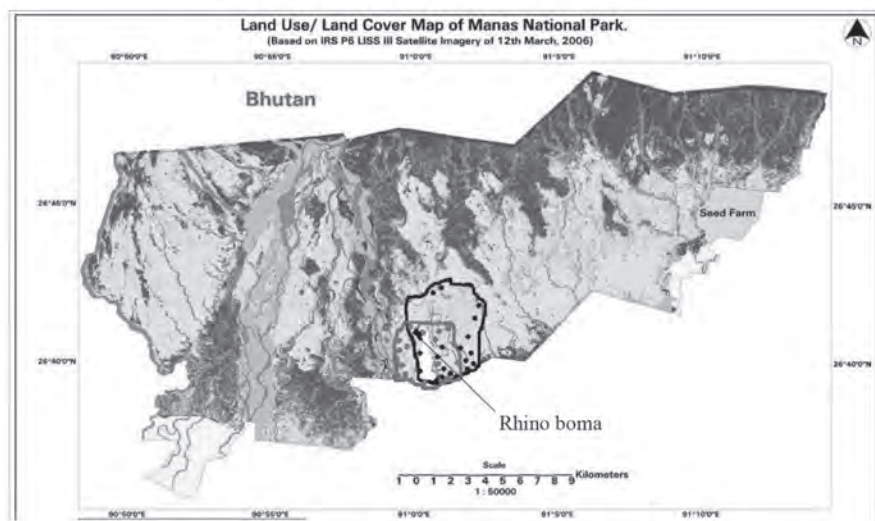


Figure 4. Home range of rehabilitated rhinos in Manas National Park. Key: solid line = Maino; broken line = Manasi and Rose

beyond the coverage area of the radio-transmitter. As they were also habituated to the caretakers, watching them from close quarters did not hamper their normal behaviour. However, they were never seen to approach humans as was the case during the first six months of being released into the boma in 2006 and 2007 respectively.

Range extension and habitat use: first six months post-release

The rhinos did not have a chance to re-enter the boma as the gates had to be closed for the two male rhinos to be held captive till the southern boundary of the park was power-fenced. However, true to the nature of soft-released animals, the initial range utilization of all the three rhinos had a close association with the boma. The two younger females (Rose and Manasi) were confined to the perimeter of the power fence for the first two months after their release. Within six months, Maino had established a home range of about 15 km² and Rose and Manasi a considerably small home range of 7–8 km² (Figure 4). Maino extended her range towards the south and southeast of the boma up to the fringe areas of the southern boundary. The farthest distance she travelled from the park boundary was 1.5 km up to Barengabari village. From the boma the northern limit was 2.5 km and movement towards east during the first six months of release varied from 2 to 5 km. It was apparent that the movement to the south and southeast of the boma was for the aquatic vegetation on the Giati River and short grassland in the fringe areas where livestock grazing and other biotic pressure is high. In May 2009, her movement pattern almost coincided with that of the male rhino that had escaped from the boma on 3 May 2009. By September 2009, all three rhinos not only showed a general increase in their range use, but also a shift in habitat use pattern, which was possibly determined by the physiognomic changes in ground vegetation. Because of her frequent association with the male

rhinos, Maino's range use often coincided with the movement pattern of the males. As a result, she also strayed out of the park repeatedly during the day and up to four or five times during May 2009. By placing an animal tracker solely for guarding against this at the Palsiguri beat of the southern boundary of the park, the situation could be brought under control. However, after the power fence was erected on the Bansbari side of the southern boundary, incidents of straying have not been reported.

Maino avoided the tall grasslands being routinely burned in January 2010 and instead used swampy grasslands more. As soon as new blades of grass emerged in the burnt areas, the rhino began frequenting these patches. In January, Maino was associated with one of the IRV 2020 male rhinos and both disappeared from the scene for nearly a week. With no signal being received from Maino for five days, intensive search led to her being spotted in the Tower camp, northeast of the boma.

Range extension and habitat use: the last six months (October 2009–March 2010)

By March 2010, Maino had extended her range further to the northeast of the boma (Figure 5). The animal was no longer sighted frequently in and around anti-poaching camps. This could be because short grasses and aquatic vegetation were abundant everywhere. The rhinos in Manas most frequented areas with short grass and aquatic vegetation. Unlike Rose and Manasi, Maino explored newer areas that are also used by the

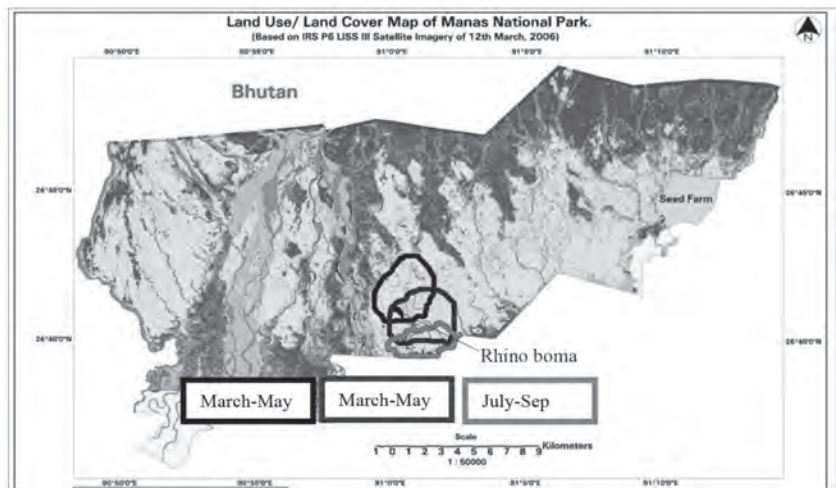


Figure 5. Shift of home ranges in different seasons.



Releasing a rhino from CRWC into Manas National Park.

adult male rhinos. For instance in March, she was sighted with a male rhino in Bangale Hatdhua area, long after her collar had dropped.

While Maino had her own range-use pattern, often associating with the males, Rose and Manasi were always found moving together. In March 2010, both rhinos were seen using the elephant training camp, boma and Bathan areas. However, it was not uncommon to see all three in one location for a brief period.

The one year of radiotracking rehabilitated rhinos ended, and intensive tracking formally came to an end on 31 March 2010. The rhinos are still physically tracked and their GPS locations, habitat use, association with conspecifics and activity recorded anecdotally. By April 2010, the home ranges of Maino and the other two females were almost equal, each occupying 15–20 km². It will be interesting to compare the home ranges of these rhinos with those of the wild-caught males hard-released in Manas.

Lessons for the future

Transportation age: All three rhinos (except the fourth, which died in the boma) were relocated to Manas when they were about three and a half to four years of age. It would be better to move them much earlier, say by two years, as this would shorten the time caretakers would be needed at CSRC. It is also much easier to move younger rhinos.

Protecting offspring: Experience in Dudhwa NP has shown that reintroduced rhinos have little chance of protecting their calves from tiger attacks. In Kaziranga NP, rhinos lose a considerable number

of their calves to tigers. The 2,000 odd rhinos in Kaziranga can withstand this occasional removal of individuals from the population, but this may not be the case in Manas. The rhinos with newly born calves may have to be confined to the boma to protect their calves till they are about two years old.

Relocating the boma: In a soft-release programme, animals tend to establish their home range close to the area of their acclimatization. To spread out the distribution of the rhinos in the park and to reduce pressure on the southern boundary, future releases might have to be deep inside the park in areas like Uchila and beyond. The boma might have to be relocated to ensure that this happens next time when orphan rhinos are moved to Manas.

Time of collaring rhinos: Since a considerable amount of battery life is lost by collaring the rhinos before their relocation, in future the animals should be collared only when they are about to be released from the boma. Experience has shown that the rehabilitated rhinos do not break the fence and venture outside. They can always be captured and returned to the boma should an emergency of this sort happen.

From rescue to release: the success of rehabilitation

The successful rehabilitation of rhinos in Manas NP can be recapitulated in the following stages:

1. Rescuing the calf from distress: When attempts to reunite calf with mother fail, the calf is taken to CWRC for hand-raising. In the last 10 years of experience at Kaziranga NP, not a single rhino calf has been reunited with the mother. This is in contrast to elephants wherein at least seven calves have been successfully reunited.

2. Hand-raising: All calves are stabilized upon arrival in captivity. Depending upon their hydration levels, fluid therapy is given where necessary. A standard milk formula is employed. The calves are weaned by 18 months of age and unlike elephant calves, rhino calves begin nibbling blades of grass even before they turn two months of age.

3. Translocating: Weaned calves spend another one year held in a 2–3-acre bamboo paddock reinforced with live wire at CWRC. Husbandry practices include providing adequate fodder (largely grass) and a suitable concentrate mix of gram, cereal, vitamins and mineral supplements. At the time of translocating them, they are either habituated to a crate or chemically restrained

and dragged into it, and moved to the release site in a truck after their radio collars have been placed.

4. Acclimatizing to the release site: Following translocation, the rhinos are held in the boma for a minimum of two years to acclimatize to the local conditions. Apart from managing the habitat within the enclosure, no other husbandry practice is followed here. Such a soft-release programme also helps the animals become loyal to the site.

5. Release and monitoring: The boma gates are opened and the rhinos released into the wild after the period of acclimatization is over. They are then radio-tracked for one year post-release and valuable data on their habitat use, range extension, social interactions with conspecifics is collected. The collars either drop on their own or are made to drop using a pre-programmed device.

Conclusions

The project has demonstrated that hand-raised rhinos can successfully contribute to the reintroduction of rhinos to Manas NP. With five more orphaned rhino calves waiting to be moved to Manas in the next two years and more wild rhinos being planned for addition to Manas as part of the IRV 2020 programme, the conservation scenario looks bright as far as the return of rhinos to the park is concerned.

All IUCN guidelines have been adhered to, not only in formulating the rhino rehabilitation protocol (Ashraf et al. 2005; Emslie et al. 2009), but also during the implementation of the project. All the required permissions from the chief wildlife warden of the state, from the Ministry of Environment and Forests and from the Central Zoo Authority were obtained in advance. All rhinos were also screened for infectious diseases before they were moved to Manas NP following the appropriate protocol (Woodford 2001). The rehabilitated rhinos have contributed to the return of this species to the once-renowned Manas National Park.

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FIELD NOTES

Decay rate of elephant dung in Conkouati-Douli National Park, Republic of Congo

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Introduction

Dung surveys are commonly used to monitor elephant (*Loxodonta africana cyclotis*, Blumenbach, 1797) populations in forest environments. To estimate elephant density from dung density two parameters are required: 1) the dung deposition rate, and 2) the rate of dung decay (Barnes and Jensen 1987; Barnes 1996; Theuerkauf and Gula 2010; Vanleeuwe 2010). The rate at which elephant dung decays is non-linear and is affected by numerous variables including environmental factors such as rainfall, exposure to sunlight, and temperature, and biological factors such as elephant diet and the action of decomposers, particularly fungi and insects but also small mammals foraging for seeds. These complex interactions result in seasonal, inter-site and intra-site variation in decay rates (White 1995; Barnes 1996; Barnes et al. 1997; Breuer and Hockemba 2007; Theuerkauf et al. 2009). For this reason it is recommended that researchers conduct their own studies of dung decay rates to ensure accurate population estimates (Hedges and Lawson 2006).

Study site

Conkouati-Douli National Park is located on the southern coast of the Republic of Congo, along the border with Gabon. The park covers an area of 5,050 km²; approximately 76% (3,850 km²) of it is terrestrial and the remaining 24% (1,200 km²) forms the Republic of Congo's only marine protected area.

Conkouati-Douli is the most biodiverse protected area in Congo, encompassing a wide variety of habitats and species. The park is classified as a RAMSAR site for its important wetlands birdlife; it is a listed candidate to become a UNESCO World Heritage Site and is a high priority site for great apes in the IUCN Great Ape Conservation Action Plan due to its large number of Central African chimpanzees (Vanleeuwe and Morgan 2012).

Methods

Seasonal movement patterns result in a large variation in elephant numbers. To control for this variation, dung counts are ideally conducted at the end of a season, ensuring that dung piles recorded during the count were deposited in the elapsed season. Dung decay studies are therefore best conducted during the same season that dung counts are conducted. In Conkouati-Douli, onset of the rains renders the terrain difficult to access and dung counts are therefore conducted at the end of the dry season, before onset of the rains.

The elephant dung decay study therefore took place during the dry season to make the results pertinent for elephant monitoring in Conkouati-Douli. A large herd of elephants was spotted around the park headquarters at the onset of the dry season, allowing us to tag 57 dung piles that were all less than 24 hours old at the start of the study.

Dung piles were marked and the habitat, canopy cover and slope were recorded for each pile. Canopy cover was classified into four categories as 0) no

Table 1. Stages of decay as per Barnes and Jensen, 1987

Stage	Condition of dung pile
A	pile intact, very fresh, moist, with odour
B	pile intact, fresh but dry, no odour
C1	more than 50% of the pile is distinguishable, some has disintegrated
C2	less than 50% of the pile is distinguishable, the rest has disintegrated
D	pile completely disintegrated, forms a flat mass
E	decayed to the stage where it would be impossible to detect at 2-m range in the undergrowth, and it would not be seen unless directly underfoot

canopy, 1) 0–25% cover, 2) 25–50% cover, and 3) 50%+ cover. Slope was classified as: 0) no slope, 1) 0–25% incline, 2) 25–50% incline, and 3) 50%+ incline.

Dung piles were monitored weekly and their stages of decay classified according to Barnes and Jensen (1987). Dung piles were considered fully decayed when they reached stage E (Table 1).

As the exact number of days between the final observation of dung as stage D and its transition to stage E was unknown, a random number between one and seven was added to calculate survival time and decay rate (Barnes et al. 1997; Breuer and Hockemba 2007).

Results

A total of 57 dung piles were monitored from March to September 2005. The majority (75.4%, $n = 43$) were found in forest habitat with 12% ($n = 7$) in scrub, 10% ($n = 6$) in savanna grasslands and 1.8% ($n = 1$) in farmland. Mean survival time of dung piles was 158.3 days (SD \pm 12.6, 95% CI 155.1–61); the mean rate of decay was 0.00637 per day (SD \pm 0.0007, 95% CI 0.0618–0.0656). Dung survival ranged from 89 days to 174 days; however, all but one of the dung piles survived for a minimum of 147 days. There was no significant difference in the survival time of dung piles by habitat type (Kruskal-Wallis, $X^2 = 1.616$, $df = 3$, $p = 0.656$), canopy cover (Kruskal-Wallis, $X^2 = 5.839$, $df = 2$, $p = 0.054$) or slope (Kruskal-Wallis, $X^2 = 2.212$, $df = 2$, $p = 0.331$).

Conclusions

Investigating dung decay rates across a large landscape can be a laborious undertaking involving significant commitment to time and resources (Kuehl et al. 2007). By opportunistically targeting a large herd near the

research station, we ensured that all dung was less than 24 hours old at the start of the study, which minimized the effort needed to monitor the dung piles. The study was carried out entirely during the dry season to ensure dung decay rates were relevant to elephant monitoring in Conkouati-Douli, which takes place at the end of the dry season.

The survival time of dung piles in Conkouati-Douli is one of the longest reported in the literature. Variation in survival time was also low relative to similar studies. These differences may be partly due to many studies reporting combined figures for wet and dry seasons (e.g. Breuer and Hockemba 2007; Olivier et al. 2009). While we did not detect any effect of habitat type, canopy cover or slope on dung pile survival time it is likely that this was due to the small sample size and low variability in survival time.

Further study is needed to fully understand the factors affecting the decay rate of elephant dung piles in Conkouati-Douli. Nevertheless, this study provides a site-specific decay rate for Conkouati-Douli, which has been used to calculate the elephant population in 2005, 2008, 2010 and 2013.

Acknowledgments

We thank the Ministère du Développement, de l'Économie Forestière et de l'Environnement of the Republic of the Congo for their collaboration and support in all studies conducted by the Wildlife Conservation Society in Conkouati-Douli National Park. We also thank Abdou Bitsindou, Richard Mboumba and Justin Thonio, the research assistants who contributed in collecting the decay data.

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Cyanide poisoning and African elephant mortality in Hwange National Park, Zimbabwe: a preliminary assessment

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Introduction

Hwange National Park (NP) is the largest national park in Zimbabwe. Covering 14,651 km², it is located between 18°30'–19°50'S and 25°45'–27°30'E. Hwange NP is characterized by semi-arid conditions with an annual mean rainfall of about 634 mm (Hubbard and Haynes 2012). It has more than 100 mammal species, 19 of which are large herbivores and 8, large carnivores, and more than 400 bird species (ZPWMA 2012). Hwange NP is largely dominated and characterized by deep Kalahari sands (Rogers 1993) and has no perennial river system. Water-dependent animals rely on pumped water boreholes; the first boreholes were drilled in the 1930s (Mukwashi et al. 2012) and now over 80 boreholes are known to exist in the park.

During 2013, media reports of elephant (*Loxodonta africana*) deaths in Hwange NP due to chemical poisoning sent shock waves across the conservation field. Media framing of the incident portrayed different figures of elephant deaths and manner of poisoning. For example, the headline of *The Telegraph* of 20 October 2013 read 'Poachers kill 300 Zimbabwe elephants with cyanide', the *International Business Times* of 21 October 2013 also reported more than 300 elephant deaths, while the *Zimbabwe Standard* of 20 October 2013 reported over 500 elephant deaths. Still others reported different figures.

This article reports the first attempt at a rigorous and systematic study of chemical poisoning of wildlife in Hwange NP prompted by the 2013 cyanide poisoning of elephant and other animal species. The objectives of the study were to: 1) identify the species and quantify the animals affected by cyanide poisoning in Hwange NP and its environs, and 2) assess the opinions of

people directly affected by this incident, both socially and ecologically. The assessment conducted in October 2013 included two field visits to the main sites of elephant poisoning, personal interviews with five Parks officials based at Hwange NP and three Forest Commission representatives based at Ngamo Forest Field Station, and a review of aerial survey reports.

Effects of cyanide poisoning on elephants and other animal species

Extensive aerial survey reports and personal observation put the total elephant deaths through poisoning at 105 inside the park and 30 outside. However, our figures are inconsistent with those from Zimbabwe Parks and Wildlife Management Authority (ZPWMA), which stand at 115. This difference may be explained by a disparity in identifying the cause of death of some carcasses found. A total of 40 cyanide-contaminated sites were recorded (E Makuwe, pers. comm., 11 October 2013); their distribution is shown in Figure 1.

Elephant carcasses were discovered either at or close to saltpans. In Josivanini we observed that some elephant carcasses were located between a minimum distance of less than 5 m and a mean maximum distance of 1 km from a licked poisoned saltpan, suggesting that some of the affected elephants quickly succumbed to poisoning.

Other species were also affected (Table 1). The number of predators affected is low, but the actual extent of the impact to other wildlife was not ascertained. Ivory was removed from many of the adult elephant carcasses seen, indicating a sign of organized poaching. For example, of the reported 87 elephant carcasses identified as at 26 September 2013,

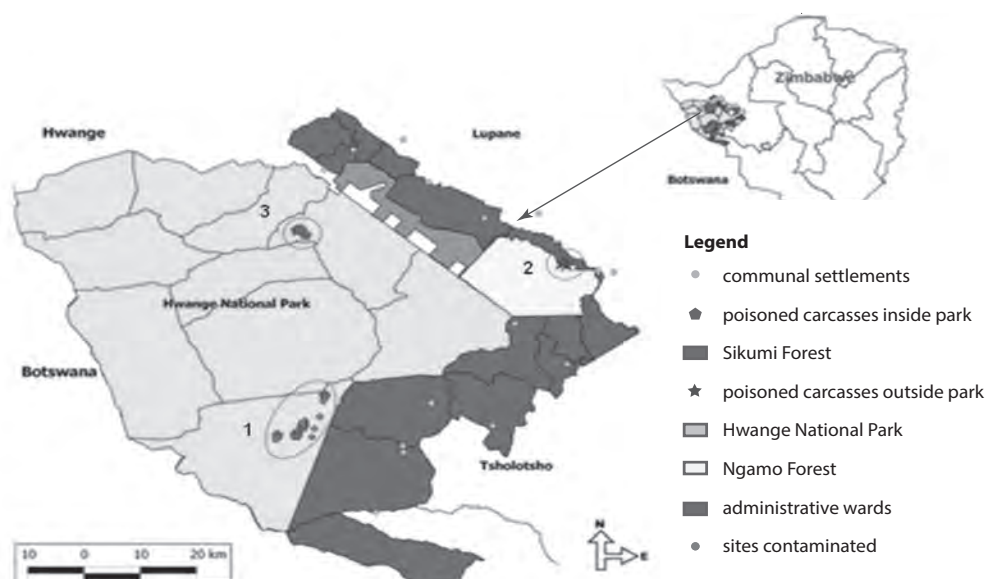


Figure 1. Distribution of cyanide poisoning sites in and outside Hwange NP. (Three different localities were poisoned—two inside and one outside the part, i.e. Josivanini [1] and Ngamo Forest area [2]) and Guvalala pan [3].)

authorities recovered only 51 tusks leaving 123 tusks in the hands of poachers (ZPWMA 2013). The reasons for mass poaching of elephants using cyanide were varied and included issues of poverty, disgruntlement over skewed distribution of Communal Area Management Programme for Indigenous Resources (CAMPFIRE) proceeds, land contests, external influence, particularly from markets, retaliation for crop raiding and outright subversion of the law. Similar issues have been linked to poaching incidents in other areas (Gandiwa et al.

2013; Muboko and Murindagomo 2014). Despite this unfortunate incident, the impact on elephant population is non-significant considering that Hwange NP already has an elephant problem: an elephant population of over 45,000 (Foggin 2003; Mukwashi et al. 2012) has exceeded the threshold of potential concern, as illustrated by unsustainable vegetation damage.

Interviewed officials had mixed perceptions on the effects of cyanide on natural ecological systems. Concerns focused on the persistence of cyanide in the

Table 1. Number and distribution of animal species killed by cyanide poisoning in three sites

Species	Josivanini	Ngamo Forest	Guvalala	Total
African elephant (<i>Loxodonta africana</i>)	94	30	11	135
African buffalo (<i>Syncerus caffer</i>)	2	–	–	2
Giraffe (<i>Giraffa camelopardalis</i>)	1	–	–	1
Lion (<i>Panthera leo</i>)	1	–	–	1
Spotted hyena (<i>Crocuta crocuta</i>)	1	–	–	1
African wild dog (<i>Lycaon pictus</i>)	2	–	–	2
Greater kudu (<i>Tragelaphus strepsiceros</i>)	1	–	–	1
White-backed vulture (<i>Gyps africanus</i>)*	–	–	3	3
Hooded vulture (<i>Necrosyrtes monachus</i>)	–	–	3	3
Lappet-faced vulture (<i>Torgos tracheliotos</i>)*	–	–	–	–

Source: Interviews and field observations (2013)

– numbers could not be ascertained due to the state of carcass decomposition

* no carcasses observed

environment, its reaction after exposure to open, hot and dry conditions, and its effect on water systems either through surface contamination or underground seepage.

Recommendations

It is important to re-enforce law-enforcement efforts, review workforce levels and conduct further detailed studies on the impact of chemical use on wildlife ecology. While long-term socio-ecological studies are critical, policymakers and researchers can also focus on the following research themes to underpin future research: mammal studies (especially on distribution, movement patterns), water supply, saltpans and ornithological studies, parks–community relations, human–wildlife conflict and effectiveness of community-based conservation initiatives.

Acknowledgements

We thank the executive and staff of Chinhoyi University of Technology for supporting this preliminary assessment. We also thank the management at ZPWMA Head Office, Hwange NP and Ngamo Forest for not only giving us permission to conduct the study, but also for providing support in the form of accommodation and staff assistance during field visits.

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Three rhinos on maps of India drawn in Faizabad in the 18th century

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In an *Atlas of India* produced in 1770 at the court of Oudh, there are three illustrations of a rhinoceros inserted on the maps. These were the work of Indian artists, and do not appear to rely on earlier representations of the animals. The Atlas was based on the investigations of Colonel Jean-Baptiste-Joseph Gentil (1726–1799), a French military officer who lived and worked in India for 25 years in the second half of the 18th century, from 1752 to 1777. He spent the last 10 years as the official French agent at the Court of Oudh (Awadh), which at the time of the ruler Shuja-ud-daula (1732–1775) was located at Faizabad, Uttar Pradesh, India, on the banks of River Ghaghra. While Gentil was at the court, he had time and leisure to collect data on the history and geography of India, which he compiled in a number of manuscripts which largely remained unpublished during his lifetime.

By studying the *Ain-i-Akbari* written in the 16th century for the Mughal emperor Akbar, Gentil was able to develop new maps of the different parts of India. He employed a number of Indian artists, whose identity has been lost in time, but may have included Nevasi Lal and Mohan Singh. All maps were embellished with little drawings of scenery, people, plants and several animals, both within the cartographic part and around the borders.

The three images of a rhinoceros are found on the maps of ‘Bengale’ (Bengal; Figure 1), ‘Bear’ (Bihar; Figure 2) and ‘Avadh’ (Oudh, Uttar Pradesh; Figure 3). It might be argued that the little figures on the maps were entirely decorative. At the same time it is remarkable that the animals appear only on maps of regions where at one time the rhinoceros would have occurred, maybe even were still present when Gentil was in the country (Rookmaaker 1984). In the map of Bengal the rhinoceros is seen just outside the north-eastern border of the state, in Bihar near the Himalayan foothills, and in Oudh in the northern parts



Figure 1. Rhinoceros and elephant on the map of ‘Bengale’ in the Atlas produced for Jean-Baptiste-Joseph Gentil in Faizabad in 1770. British Library, London.



Figure 2. Rhinoceros on the map of ‘Bear’ (Bihar, India) in Gentil’s Atlas. British Library, London.

which would now be in the area between Balrampur and Gorakhpur.

The figures show that all rhinos were single-horned, but at the same time they differ in small details. I don’t believe that this in any way signifies that the artists had any intention to indicate the presence of different types of rhinos, it is more likely that these were merely different ways to depict the animal. Although the drawings do not lend themselves to strict naturalistic determination, they all must show the Indian (greater one-horned) *Rhinoceros unicornis*.

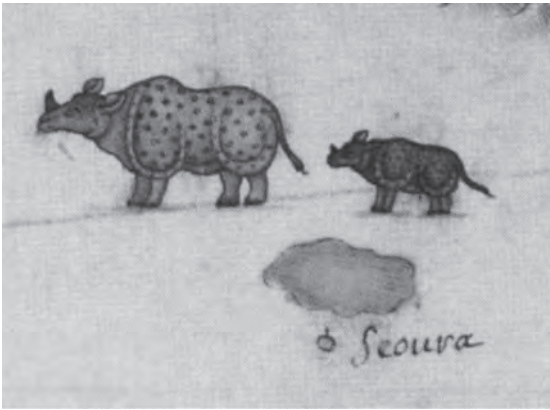


Figure 3. Rhinoceroses (mother and young?) on the map of 'Avadh' (Oudh) in the Atlas produced by Jean-Baptiste-Joseph Gentil and dated 1770. British Library, London.

The drawings are remarkable for the early age and for the fact that they were made by Indian artists, as very few similar representations are known. There is no information where the artists might have seen the animals, or earlier drawings of them. However, the court of Oudh had a special passion to keep and exhibit rhinos, certainly in later years, but maybe even in the 1770s although details are absent (Rookmaaker 1998: 90).

Gentil had two copies of his Atlas, but only the principal one includes the animal drawings. This document is now in the India Office Library of the British Library, London. The Atlas was introduced, annotated and reproduced by Gole (1988), but has not been noticed in the zoological literature.

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Social media and the ivory ban: Myanmar and China cross-border trade

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From 31 December 2013 to 2 January 2014, we conducted a survey of the ivory trade in the town of Mong

La, Myanmar, on the border with China. We counted 3,300 pieces of carved ivory and 49 whole tusks. Mong La is situated in the autonomously controlled Special Region 4, which has a strong cross-border trade. While Mong La is situated in Myanmar its population is largely Chinese, so is its currency, the Chinese yuan, its mobile phone and electricity network, and it operates at Beijing time (1.5 hours ahead of the rest of Myanmar).

We wrote a short report on our findings that was uploaded on 13 January 2014 on the TRAFFIC webpage and sent out to media contacts. The story was covered well by the media, and sparked several original reports in various outlets. An error was introduced by the Associated Press on 14 January, reporting that 30 instead of 49 tusks were observed, and this was taken over by other media sources.

On 16 January 2014 a petition was uploaded on the Care2 petition website demanding that Myanmar and China instigate a crackdown on the sale of ivory to save the elephants. The author of the petition was Sue Lee, someone we do not know and have not been in contact with. The text of the petition is shown on page 98.

Note that more errors were introduced, including that Mong La and the eastern Shan State are now situated in China. Myanmar does indeed hold the second largest population of *Asian* elephants but not of all elephants, and some sweeping statements '... no form of government control to stop the sale of ivory throughout China and other Asian countries', could do with a bit more nuance, but overall the statement described correctly the current situation concerning ivory trade in the Myanmar–China border area.

On 4 February 2014, we extracted the names of the first 50,000 signatories of this petition. Care2 allows the author of a petition to determine the end point of the petition and the option to download details of the petition including a list of all the signatories. We did not have this option available to us. However, Care2 allows any reader to scroll down to see the signatures.

This allowed us to copy them and, in batches of ~500, to paste them into a database. The name, country, date, time (Pacific Standard Time – this is followed here) and number are transferred as one string and the comments, if any, in another. When signing the petition one can choose to not disclose their name, but the other details (country, date, etc.) remain visible. One must include a prefix (Mr, Mrs, Ms, Dr). Searches were done using wildcards where appropriate (China would be searched using Chin* — this retrieves China but also Chinese) or alternative names (Myanmar vs Burma) and checked manually (thus excluding Mrs. Roshchina from Russia when searching for China).

The first signatory signed on 16 January at 14:25 hours and that same day another 139 people signed, at a rate of ~15 persons/hour. This increased slightly to ~20 persons/hour the following day, and then gradually started decreasing to 5 and 1 person/hour the next two days. From 21 to 24 January inclusive, less than 10 people signed the petition per day, and this continued to 25 January when only 2 people signed the petition in the early hours of the day. By that time 1,019 people had signed the petition. Then at 21:04 hours the petition went viral through postings on Twitter and Facebook (all with links to the petition site) and within 10 minutes over 200 additional people had signed. The following days between 5 and 15 people signed the petition every minute, lowering to 1 signing every three minutes until on 4 February signature there were 50,000 signatures.

For 1,865 (3.7% of total) signatories the names were not disclosed. Some 1,472 (2.9% of total) had a doctorate; of the 93.3% petitioners that disclosed their sex 34,341 (73.6%) were female. It was not possible to quantify the countries from where the signatories originated as they were part of a string, but by manually scrolling through it we tallied more than 130 countries (34 on the first day alone). All but one (Bhutan) of the Asian elephant range States were included on the list as well as 19/37 African range countries (the absentees

Demand that Myanmar and China crackdown on the sale of Ivory and save the Elephants!!

author: [SUE LEE](#)

target: Asian Governments Throughout and near China

signatures: 49,975



we've got 49,975 signatures, help us get to 50,000



overview | petition

Please sign and share this petition worldwide in an effort to stop the untimely death of elephants being murdered for their ivory.

In China, it's illegal to kill elephants for their ivory and sell their tusks. But somehow, 30 tusks and thousands of pieces of ivory were recently discovered for sale at a market in Mong La. Investigations into wildlife monitoring and trafficking noted that this market could be one of the biggest unregulated ivory markets in Asia. How could this be if laws exist? Ivory is openly displayed at this market in the Eastern Shan State of China to cater to the many tourists that visit. There is obviously no form of government control to stop the sale of ivory throughout China and other Asian countries.

The problem has also reached epidemic levels in Myanmar, considered as the second largest elephant population area worldwide, just after India. It is believed that about 6,000 elephants in the wild still roam the lands of Myanmar. It has laws forbidding trade in endangered species, but violations are rampant, especially in remote border regions. The laws need to be more strictly enforced!

Please sign and share this petition worldwide in an effort to stop the untimely death of elephants just so their ivory can be sold worldwide. We need China and Myanmar to crackdown on the illegal sale of ivory in our efforts to protect the elephant.

you have the power to **create change.**

START SHARING AND WATCH YOUR IMPACT GROW



were mostly francophone elephant range countries). It is worth noting that 51 signatories were from China, 73 from Hong Kong, 8 from Macao and 47 from Taiwan (combined this represents 0.4% of the total); 4 were from Myanmar.

Some 2,852 (5.7%) signatories added a comment, ranging from a series of exclamation marks to 500-word essays. Twice as many commenters referred to China than they did to Myanmar or Burma (405 vs 172). In terms of species, 25 comments refer specifically to African elephants (or elephants in Kenya, Tanzania) whereas only 10 refer specifically to Asian (or Indian) elephants; many more simply mentioned elephants. Thirty-seven commenters linked the ivory trade to the trade in rhino horn.

With reference to what needs to be done or solutions to curb the trade, 3.9% noted a need for better regulation of banning the trade altogether: 81 people recommended a (global) ban on wildlife trade, with an additional 12 referring to CITES and 14 to policing or increased regulation. Furthermore, 24 recommend the destruction (or crushing or burning) of stockpiles and 13 commenters refer to virtues of tourism as an alternative source of income.

No fewer than 229 (0.5%) mention the need for better law enforcement or increased legislation, pointing out that the act of selling ivory is criminal and therefore effective prosecution is needed. A minority pointed to the need to boycott products from countries trading in ivory, 16 times in specific reference to China or Chinese products and 5 times in reference to Myanmar.

Tackling the illegal trade in ivory in Asia, Africa and, indeed, elsewhere is a complicated issue and one that is unlikely to be addressed by simply signing an online petition, but observing the large number of people that feel compelled to do something and reading through the comments, we found it evident that this is an issue that goes to the heart of biodiversity conservation and people's idea of what is just in an increasingly globalized world. We for one were surprised to see this emerging response to one of our ivory surveys and hope that the combined efforts of many will lead to positive results.

MIKE-ETIS UPDATES

CITES-MIKE update

Mise à jour de la CITES-MIKE

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Update on the MIKES project

As reported in *Pachyderm* 54, the European Commission announced in December 2013 the award of a €12 million grant to the CITES Secretariat to implement a new project entitled Minimizing the Illegal Killing of Elephants and other Endangered Species (MIKES). I am pleased to report that the European Commission signed the MIKES Contribution Agreement in June, paving the way for the project to start.

In anticipation of this exciting new project, an internal meeting was held at the CITES Secretariat in January to discuss the project in detail and to determine next steps and necessary preparations. In addition to all the activities normally undertaken by the MIKE programme, several of which will be strengthened and streamlined, the MIKES project includes a host of new activities, as described in *Pachyderm* 54. Some of the activities to be undertaken before the project can run at full steam include developing benchmarks to assess law-enforcement capacity at participating sites and countries; developing criteria and mechanisms for identifying focal sites, countries and partners for enhanced law-enforcement support; and developing partner agreements. These matters were consulted with the MIKE and ETIS (Elephant Trade Information System) Technical Advisory Group (TAG) at its 12th meeting, which was held in Nairobi in April (and more on which below), and proposed approaches to handle these matters were submitted to the MIKE ETIS

Mise à jour sur le projet de MIKES

Comme indiqué dans le numéro 54 de *Pachyderme*, la Commission européenne a annoncé en décembre 2013 l'attribution d'une subvention de 12 millions d'€ au Secrétariat de la CITES pour mettre en œuvre un nouveau projet intitulé « Réduire le braconnage des éléphants et d'autres espèces menacées d'extinction (MIKES) ». Je suis heureux d'annoncer que la Commission européenne a signé l'accord de contribution à MIKES en juin, ouvrant la voie au lancement du projet.

En prévision de ce nouveau projet passionnant, une réunion interne a eu lieu au Secrétariat de la CITES en janvier pour discuter en détail du projet et déterminer les prochaines étapes et les préparatifs nécessaires. En plus de toutes les activités normalement menées par le programme MIKE, dont plusieurs seront renforcées et rationalisées, le projet MIKES comprend une série de nouvelles activités, comme décrit dans le numéro 54 de *Pachyderme*. Certaines activités à entreprendre avant que le projet puisse fonctionner d'aplomb comprennent le développement des «repères» pour évaluer la capacité d'application de la loi sur les sites et dans les pays participants; l'élaboration de critères et des mécanismes permettant d'identifier les sites focaux, les pays et les partenaires pour un soutien accru de l'application de la loi; et l'élaboration des accords de partenariat. Ces questions ont été discutées avec le Groupe Consultatif Technique (GCT) de MIKE et ETIS (Système d'information sur le commerce des éléphants) à sa 2ème réunion, qui s'est tenue à Nairobi en avril (des détails supplémentaires ci-dessous), et les approches proposées pour traiter ces questions ont été soumises au sous-groupe de MIKE-ETIS

subgroup for approval at the 65th meeting of the CITES Standing Committee (Geneva, July 2014). Furthermore, these and other issues relating to MIKES, such as the roles of MIKE subregional support officers, national officers and site officers, will be the subject of additional consultations to be held with African elephant range States during meetings to launch MIKES scheduled for September and October this year.

MIKE analysis for SC65

Elephants were prominent on the agenda for the 65th meeting of the CITES Standing Committee (Geneva, July 2014). In preparation for that meeting, and as was done for the SC61 and SC62, the MIKE programme prepared an updated analysis of MIKE data for incorporation into a report jointly authored by the CITES Secretariat (through its MIKE programme), the IUCN/SSC African and Asian Elephant Specialist Groups, TRAFFIC, the UNEP World Conservation Monitoring Centre and the African Elephant Fund Steering Committee. The MIKE analysis, which was reviewed by the TAG before it was submitted, was based on 12,073 records of elephant carcasses found between 2002 and the end of 2013 at 53 MIKE sites in 29 range States in Africa, representing a total of 446 site years. It is worth noting that 51 sites submitted data in 2013—the greatest-ever level of participation recorded in the history of the MIKE programme.

As in previous MIKE reports, the analysis shows steady increase in levels of illegal killing of elephants starting in 2006, with 2011 displaying the highest levels of poaching since MIKE records began in 2002. The latest analysis shows that poaching levels began to level off or even decline thereafter, reaching in 2013 similar levels to those recorded in 2010. In addition, the decline in PIKE (Proportion of Illegally Killed Elephants) between 2011 and 2013 is statistically significant, with the odds of 108 to 1 in favour of a real decline. However, this is merely an overall decline across the 39 MIKE sites reporting in both 2011 and 2013. Reported PIKE actually increased in 13, or 33%, of those sites, declined in 18 sites (46%) and did not change in the remaining 8 (21%).

Despite the decline since 2011, poaching levels overall remain alarmingly high, with

pour approbation lors de la 65^{ème} réunion du Comité permanent de la CITES à Genève en juillet 2014. En outre, ces approches et d'autres questions relatives à MIKES, telles que les rôles des agents de soutien sous-régionaux de MIKE, les responsables nationaux et les dirigeants du site, feront l'objet de consultations supplémentaires qui se tiendront avec les Etats de l'aire de répartition de l'éléphant d'Afrique au cours des réunions pour le lancement de MIKES prévu pour septembre et octobre cette année.

Analyse MIKE pour la SC65

Les éléphants occupaient une place importante sur l'ordre du jour de la 65^{ème} réunion du Comité permanent de la CITES à Genève en juillet 2014. En préparation à cette réunion, et comme cela a été fait pour la SC61 et la SC62, le programme MIKE a préparé une analyse actualisée des données de MIKE pour l'incorporer dans un rapport rédigé conjointement par le Secrétariat de la CITES (à travers son programme MIKE), les Groupes de Spécialistes de l'Eléphant d'Afrique et d'Asie de la CSE de l'IUCN, TRAFFIC, le Centre Mondial du Suivi de la Conservation et le Comité directeur du Fonds pour l'éléphant d'Afrique. L'analyse de MIKE, qui a été examinée par le GCT avant la soumission, était basée sur 12.073 dossiers sur les carcasses des éléphants trouvées entre 2002 et la fin de 2013 dans 53 sites de MIKE dans 29 Etats de l'aire de répartition en Afrique, ce qui représente un total de 446 sites en années. Il est à noter que 51 sites ont soumis les données en 2013, le plus haut niveau de participation jamais enregistré dans l'histoire du programme MIKE.

Comme dans les rapports précédents de MIKE, l'analyse montre une augmentation régulière des niveaux d'abattage illégal des éléphants à partir de 2006, avec 2011 affichant les plus hauts niveaux de braconnage depuis que les enregistrements de MIKE ont commencé en 2002. La dernière analyse montre que les niveaux de braconnage ont commencé à se stabiliser, voire diminuer par la suite, pour atteindre en 2013 des niveaux similaires à ceux enregistrés en 2010. En outre, la baisse de PIKE (Proportion d'Eléphants abattus illégalement) entre 2011 et 2013 est statistiquement significative, avec une chance de 108 sur 1 en faveur d'un réel déclin. Cependant, ce n'est qu'une baisse globale dans 39 sites MIKE ayant soumis des rapports en 2011 et 2013. Le niveau PIKE rapporté a augmenté dans 13 de ces sites ou 33%, a diminué dans 18 sites (46%) et n'a pas changé dans les 8 autres (21%).

nearly two-thirds of dead elephants found in 2013 deemed to have been illegally killed. Overall, the elephant population at MIKE sites is likely to have continued to decline in 2013, as poaching rates exceed likely intrinsic population growth rates. In some areas, a decline in PIKE may be the result of a substantial decline in the elephant population, making it more difficult for poachers to find suitable targets in such areas. However, without recent and reliable elephant population estimates from such areas, it is difficult to verify the impact of poaching on such populations.

The SC65 report also includes an analysis of factors associated with levels of elephant poaching at MIKE sites. As in previous occasions, poverty and enforcement capacity at the site, governance at the national level and global demand were found to be the strongest predictors of poaching trends. Interestingly, we found that declared import prices of mammoth ivory in China and Hong Kong (which together import most of the nearly 100 tonnes being exported by Russia in recent years) are a better predictor of PIKE than the Chinese household consumption variable used in previous analyses. More details can be found in CITES document SC65 Doc. 42.1 report, which is available from cites.org/sites/default/files/eng/com/sc/65/E-SC65-42-01_2.pdf, while the carcass data used in the analysis can be found in Table C1 of document SC65 Inf. 1 (cites.org/sites/default/files/eng/com/sc/65/Inf/E-SC65-Inf-01.pdf)

TAG 12

The 12th meeting of the MIKE and ETIS TAG was held 7–8 April in Nairobi. In addition to considering a number of administrative matters, reviewing the MIKE analysis for SC65 and providing guidance on the development of the MIKES benchmarks, the TAG considered issues relating to the validation of PIKE-based inference. In particular, the TAG discussed the problems associated with differential detection probabilities between naturally dead and illegally killed elephants, especially in forest sites, as well as with estimating natural mortality rates, which are needed for converting PIKE into estimated poaching rates and numbers of elephants killed. To address these issues, an intersessional working

Malgré la baisse depuis 2011, les niveaux de braconnage restent globalement alarmants, avec près de deux tiers des éléphants trouvés morts en 2013 comme ayant été tués illégalement. Dans l'ensemble, la population des éléphants sur les sites MIKE est susceptible d'avoir continué à baisser en 2013, car les taux de braconnage dépassent les taux probables de croissance intrinsèque de la population. Dans certaines régions, la baisse de PIKE peut être le résultat d'une baisse importante de la population d'éléphants, ce qui fait que c'est plus difficile pour les braconniers de trouver des cibles appropriées dans ces zones. Cependant, sans estimations récentes et fiables des populations d'éléphants issues de ces zones, il est difficile de vérifier l'impact du braconnage sur ces populations.

Le rapport de la SC65 comprend également une analyse des facteurs associés à des niveaux de braconnage d'éléphants sur les sites MIKE. Comme précédemment, on a jugé que la pauvreté et la capacité d'appliquer la loi sur le site, la gouvernance au niveau national et la demande mondiale sont les meilleurs prédicteurs de l'évolution du braconnage. Fait intéressant, nous avons constaté que les prix des importations déclarées de l'ivoire de mammoth en Chine et à Hong Kong (qui importent ensemble la plupart des quelques 100 tonnes exportées par la Russie au cours des dernières années) est un meilleur prédicteur de PIKE que la consommation variable des ménages chinois utilisée dans les analyses précédentes. On peut trouver plus de détails dans le document de la CITES du rapport de la SC65 Doc. 42.1, qui est disponible à partir du site cites.org/sites/default/files/eng/com/sc/65/E-SC65-42-01_2.pdf, alors qu'on peut trouver les données sur les carcasses utilisées dans l'analyse dans le tableau C1 du document de la SC65 Inf. 1 (cites.org/sites/default/files/eng/com/sc/65/Inf/E-SC65-Inf-01.pdf)

GCT 12

La 12^{ème} réunion du GCT de MIKE et ETIS a eu lieu le 7 et le 8 avril à Nairobi. En plus de l'examen d'un certain nombre de questions administratives, la revue de l'analyse MIKE pour la SC65 et la provision des conseils sur l'élaboration des repères MIKES, le GCT a examiné les questions relatives à la validation de l'inférence basée sur PIKE. En particulier, le GCT a examiné les problèmes liés à la probabilité de détection différentielle entre les éléphants morts naturellement et ceux abattus illégalement, en particulier dans les sites forestiers, ainsi que l'estimation du taux de mortalité naturelle, qui sont nécessaires pour convertir PIKE en un taux de braconnage

group chaired by Simon Hedges was created with the tasks of compiling a list of all PIKE validation issues so far identified, and to assess the practicality of solving each of the issues identified, suggesting possible analyses and pitfalls. It is anticipated that some of these issues will be more thoroughly researched as part of the MIKES project.

Subregional update

The introduction of SMART (Spatial Monitoring, Analysis and Reporting Technology) at MIKE sites by the MIKE subregional support units is progressing well. The system has been introduced by MIKE staff to Chewore (Zimbabwe), Nyaminyami (Zimbabwe), South Luangwa (Zambia), Waza (Cameroon), WAPO (Benin, Burkina Faso and Niger), Nazinga (Burkina Faso), Mole and Kakum (Ghana), Gourma (Mali) as well as to two non-MIKE sites—Bouba Ndjidah in Cameroon and Sena Oura in Chad.

To complement the site-level training efforts as well as to promote the uptake and institutionalization of the SMART approach, the SMART partnership convened, with funding from the MIKE 3.0 project, a training course specifically geared to African wildlife training institutions. The training was held 16–19 June at the Southern Africa Wildlife College (SAWC) in Hoedspruit, South Africa; participating were directors of studies and lecturers from SAWC, Mweka and Garoua, as well as of several national wildlife training colleges from southern and eastern Africa.

The training session provided an overview of the adaptive management approach as well as an introduction to the SMART approach with the intention of eventually integrating these approaches into programme curricula at these centres. The workshop was led by trainers with extensive experience with SMART, wildlife conservation, law-enforcement monitoring and protected-area management. The training was well received by participants, and we look forward to continuing to engage with these training colleges to make the deployment of sound monitoring routines more sustainable in the long run.

estimé et un nombre d'éléphants tués. Pour répondre à ces questions, un groupe de travail d'intersessions, présidé par Simon Hedges a été créé avec les tâches de dresser une liste de toutes les questions de validation de PIKE identifiées à ce jour, évaluer la faisabilité de la résolution de chacun des problèmes identifiés, et suggérer des analyses et des obstacles possibles. Il est prévu que certaines de ces questions feront l'objet d'une recherche approfondie dans le cadre du projet MIKES.

Mise à jour sous-régionale

L'introduction de SMART (*Technologie de contrôle spatiale, d'analyse et de reportage*) dans les sites MIKE par les unités de soutien sous-régional de MIKE progresse bien. Le système a été mis en place par le personnel de MIKE à Chewore, Nyaminyami, South Luangwa Waza, WAPO, Nazinga, Mole et Kakum (Ghana), Gourma (Mali) ainsi que dans deux sites qui ne sont pas de MIKE – Bouba Ndjidah au Cameroun et Sena Oura au Tchad.

Pour compléter les efforts de formation au niveau du site, ainsi que pour promouvoir l'adoption et l'institutionnalisation de l'approche SMART, le partenariat SMART a convoqué, avec le financement du projet de MIKE 3.0, une formation spécifiquement adaptée aux établissements de formation sur la faune africaine. La formation a eu lieu du 16 au 19 juin à l'École de la Conservation de la Faune et de la Flore d'Afrique australe (SAWC) à Hoedspruit en Afrique du Sud, et comprenait les directeurs d'études et les professeurs de la SAWC, Mweka et Garoua, ainsi que ceux de plusieurs écoles nationales de formation de la faune en Afrique australe et orientale.

La formation a donné un aperçu sur l'approche de gestion adaptative ainsi qu'une introduction à l'approche SMART avec l'intention de finalement intégrer ces approches dans les programmes de formation dans ces centres. L'atelier était animé par des formateurs ayant une vaste expérience avec SMART, la conservation de la faune, la surveillance de l'application des lois et la gestion des aires protégées. La formation a été bien accueillie par les participants, et nous avons l'intention de continuer à collaborer avec ces instituts de formation pour rendre l'utilisation des routines robustes de contrôle plus durable sur le long terme.

Progress in implementing the Elephant Trade Information System (ETIS)

Avancement dans la mise en œuvre du Système d'Information sur le Trafic des Eléphants (ETIS)

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ETIS continues to grow. Currently there are 21,065 ivory seizure records in the database, but major data sets for 2013 have yet to be received from some key countries. TRAFFIC aims to undertake another major analysis later this year to examine the illegal trade trend through 2013. A call to all CITES Parties to submit outstanding ivory seizure data for that year to ETIS will soon be issued through the CITES Secretariat. As reported in the last ETIS update, a record quantity of ivory was seized globally in 2013, in the context of large-scale ivory seizures—important law-enforcement actions that result in 500 kg or more of ivory being seized at a single time. Since then, three more such seizures in 2013 have been reported to ETIS, pushing the total quantity of ivory seized in these transactions to over 49.5 tonnes, the highest quantity in 25 years of data (Table 1). Whether this record high represents a major improvement in law enforcement since the 16th meeting of the CITES Conference of Parties (CoP16) (Bangkok, Thailand, in March 2013) or a further worsening of global trade in elephant ivory should become much clearer following the upcoming trends analysis.

ETIS continue à croître. Actuellement, il y a 21.065 dossiers de saisie d'ivoire dans la base de données, mais certains grands ensembles de données en provenance des pays clés pour 2013 n'ont pas encore été reçus. TRAFFIC a pour but d'entreprendre une nouvelle analyse approfondie plus tard cette année pour étudier l'évolution du commerce illicite en 2013. Un appel à toutes les Parties à la CITES de soumettre des données de saisies exceptionnelles d'ivoire pour cette année à ETIS sera bientôt publié par le Secrétariat de la CITES. Comme indiqué dans la dernière mise à jour d'ETIS, une quantité record d'ivoire a été saisie dans le monde en 2013 dans le cadre des saisies d'ivoire à grande échelle, ces importantes mesures de mise en application de la loi ayant saisi 500 kg d'ivoire ou plus à la fois. Depuis lors, trois autres saisies en 2013 ont été signalées à ETIS, poussant la quantité totale d'ivoire saisi dans ces opérations à plus de 49.5 tonnes, la plus grande quantité en 25 ans de données (Tableau 1). Si ce grand record représente une amélioration de l'application de la loi depuis la 16^{ème} réunion de la Conférence des Parties à la CITES (CdP16) (Bangkok, Thaïlande en mars 2013) ou une aggravation du commerce mondial de l'ivoire d'éléphant devrait être beaucoup plus clair après la prochaine analyse des tendances.

Table 1. Number and weight of large-scale (>500 kg) ivory seizures and mode of transport, 2013 and 2014 (ETIS, 10 July 2014)

Tableau 1. Nombre et poids des saisies d'ivoire à grande échelle (> 500 kg) et mode de transport, 2013 et 2014 (ETIS, le 10 juillet 2014)

Year/ Année	Air		Sea / Mer		Land / Terre		Total	
	No.	Weight / poids (kg)	No.	Weight/ poids (kg)	No.	Weight/ poids (kg)	No.	Weight/poids (kg)
2013	1 (4)	797 (2)	14 (64)	36,831 (74)	7 (32)	11,942 (24)	22 (100)	49,570 (100)
2014	2	2,713	5	8,824	2	2,833	9	14,370

Numbers in brackets are percentages of the total 2013 seizures. Some weights may involve estimates and worked ivory weights are given as raw ivory

Certains poids peuvent nécessiter des estimations et les poids de l'ivoire travaillé sont donnés à titre d'équivalent d'ivoire brut.

Interestingly, for the first time since 2007, African countries made more seizures in terms of number and quantity of ivory apprehended than Asian countries (Table 2). It is also significant to note that 17 of the 22 large-scale ivory seizures in 2013 were made by Kenya, Tanzania, Uganda, Hong Kong SAR, Vietnam and China, all of which are part of the CITES oversight process on illegal trade in ivory agreed at the 64th meeting of the CITES Standing Committee (SC64) in March 2013. As previously reported, these countries and territory, together with Thailand, Philippines and Malaysia, were mandated to develop and implement action plans for addressing illegal ivory trade within or through their jurisdictions, or face potential sanctions under CITES. It is clear that the 'action plan' countries are now in the forefront of those nations making major ivory seizures: some measure of improved law-enforcement engagement appears to be driving a better record of performance. Based on incomplete data, the number and weight of large ivory seizures seem to have dropped appreciably in 2014, but half a year still remains to be assessed, as does the important issue of law-enforcement effort, so optimism concerning real change for the better may yet prove illusive (Table 1).

Regardless, both trade routes and methods of illegal transport used by the criminal traders illegally moving ivory between Africa and Asia may also be adapting in the face of concerted CITES interventions to curtail illicit trade. For example, following a routine inspection in June 2014, Hong Kong SAR Customs arrested 16 passengers in transit from Angola with 790 kg of raw and worked ivory between them in check-in baggage. All the ivory smugglers were Vietnamese citizens who had flown to Hong Kong from Angola via Ethiopia and were poised to travel onward to Cambodia using a circuitous route through South Korea to mask their original departure from Africa. This case, together with other recent examples of raw ivory being moved by air as personal effects, could highlight the emergence of new criminal tactics with a shift to air travel and the use of teams of human 'mules' to move large quantities of ivory concealed in check-in or carry-on baggage. The characteristics of this case are a clear departure from the typical movement of large quantities of

Fait intéressant, pour la première fois depuis 2007, les pays africains ont fait plus de saisies en termes du nombre et de la quantité d'ivoire appréhendé que les pays asiatiques (Tableau 2). Il est également important de noter que 17 des 22 grandes saisies d'ivoire en 2013 ont été faites par le Kenya, la Tanzanie, l'Ouganda, Hong Kong, le Vietnam et la Chine, qui font partie du processus de surveillance du commerce illégal de l'ivoire de la CITES convenu lors de la 64^{ème} réunion du Comité permanent de la CITES (SC64) en mars 2013. Comme indiqué précédemment, ces pays et territoires, avec la Thaïlande, les Philippines et la Malaisie, ont été mandatés de développer et mettre en œuvre des plans d'action pour lutter contre le commerce illégal de l'ivoire à l'intérieur ou à travers leurs juridictions, ou faire face à d'éventuelles sanctions de la CITES. Il est clair que les pays du «plan d'action» sont maintenant au premier plan des nations qui font d'importantes saisies d'ivoire: une certaine mesure d'amélioration de l'application de la loi semble conduire à une meilleure performance. En se basant sur des données incomplètes, le nombre et le poids des grandes saisies d'ivoire semblent avoir sensiblement baissé en 2014, mais une demi-année reste encore à être évaluée, de même que la question importante de l'effort de l'application de la loi, de sorte que l'optimisme concernant un véritable changement pour le mieux peut encore s'avérer illusoire (Tableau 1).

Quoiqu'il en soit, les routes commerciales et les méthodes de transport illégal utilisées par les commerçants criminels pour déplacer illégalement l'ivoire entre l'Afrique et l'Asie peuvent également être en train de s'adapter malgré les interventions concertées de la CITES pour réduire le commerce illicite. Par exemple, suite à une inspection de routine en juin 2014, les douanes de la Région Administrative Spéciale de Hong Kong ont arrêté 16 passagers en transit d'Angola avec 790 kg d'ivoire brut et travaillé dans les bagages en soute. Tous les contrebandiers d'ivoire étaient des citoyens vietnamiens qui avaient pris l'avion pour Hong Kong à partir d'Angola en passant par l'Éthiopie, et qui étaient sur le point de se rendre au Cambodge en utilisant un détour par la Corée du Sud pour masquer leur départ initial d'Afrique. Cette affaire, ainsi que d'autres exemples récents d'ivoire brut étant transporté par voie aérienne comme des effets personnels, pourrait mettre en lumière l'émergence de nouvelles tactiques criminelles et un changement vers le voyage par avion et l'utilisation des équipes de «mules» humaines pour déplacer de grandes quantités d'ivoire dissimulées dans les bagages à soute et les bagages à cabine. Les caractéristiques de cette affaire constituent clairement une

Table 2. Number and weight of large-scale (> 500 kg) ivory seizures by country of seizure, 2013 (ETIS, 10 July 2014)

Tableau 2. Nombre et poids des saisies d'ivoire à grande échelle (> 500 kg) par pays de saisie, 2013 (ETIS, le 10 juillet 2014)

Country of seizure / Pays de saisie	No.	Quantity (kg)
<i>Africa</i>		
Kenya*	5	13,540
Tanzania*	3	5,898
Uganda*	2	4,048
Malawi	1	2,640
Togo	1	700
Subtotal	12	26,826
<i>Asia</i>		
Vietnam*	3	6,975
Hong Kong SAR*	3	5,736
United Arab Emirates	2	3,731
China*	1	4,464
Singapore	1	1,838
Subtotal	10	22,744
Total	22	49,570

* Countries or territories that are part of the CITES ivory trade action plan process

* Pays/territoires qui font partie du processus du plan d'action du commerce de l'ivoire de la CITES

ivory in containerized shipments through seaports and possibly signal a new front in the illicit ivory trade globally.

The worked ivory in the haul comprised carved name seals, bangles and prayer beads. With Luanda, Angola, harbouring one of the world's largest unregulated illegal ivory markets, these products are likely to have been mass-produced there, but the ivory itself probably originated in Central Africa [Editor: see related story in this issue]. Hopefully, questions of origin will be solved through forensic examination for large ivory seizures now mandated by the Convention. The ultimate destination of this contraband remains unclear as the local ivory market in Cambodia appears to be declining (Martin and Martin 2013). In fact, Cambodia could be emerging as a 'backdoor' entry point to important ivory markets in neighbouring Thailand, Lao People's Democratic Republic (Lao PDR) or Vietnam, or even more distant China. Both the trade route and the *modus operandi* in this case represent something not previously captured

rupture avec le mouvement typique de grandes quantités d'ivoire dans les cargaisons de conteneurs par les ports maritimes et signalent peut-être un nouveau front dans le commerce illicite de l'ivoire à l'échelle mondiale.

L'ivoire travaillé dans la saisie était composé de seaux sculptés, des bracelets et des perles de prière. Avec Luanda, en Angola, abritant d'un des plus grands marchés illicites d'ivoire non réglementés dans le monde, ces produits y auraient été probablement produits en masse, mais l'ivoire pourrait venir d'Afrique centrale (éditeur: voir l'article dans ce numéro). Heureusement, les questions d'origine seront résolues par un examen médico-légal maintenant mandaté par la Convention pour les grandes saisies d'ivoire. La destination finale de cette contrebande n'est pas claire car le marché local de l'ivoire au Cambodge semble être en déclin (Martin et Martin 2013). En fait, le Cambodge pourrait être en train de devenir un point d'entrée par la «porte dérobée» sur les marchés d'ivoire importantes en Thaïlande voisin, en République Démocratique Populaire du Laos, au Vietnam, ou même en Chine plus lointaine. La route commerciale et le *modus operandi* dans ce cas représentent quelque chose qui n'a pas été capturé auparavant dans les données de saisie d'ETIS, ce qui indique que la situation du commerce illicite de l'ivoire reste très dynamique et variable.

Mais la CITES s'adapte également et met plus de force derrière les interventions visant à réduire le commerce illégal de l'ivoire. A la SC65 à Genève en Suisse, du 7 au 11 juillet 2014, l'examen de la mise en œuvre du processus du plan d'action de la CITES par le Comité permanent et des décisions sur le commerce de l'ivoire prises à la CdP16 ont conduit à un certain nombre de développements importants. La Thaïlande, en particulier, a été remarquée pour avoir échoué à faire des progrès significatifs sur une gamme de situations qui continuent de permettre un marché illicite de l'ivoire sans entrave à prospérer dans le pays au-delà de la portée de l'application de la loi. Avant la réunion du Comité permanent, le suivi mensuel de TRAFFIC du marché intérieur de l'ivoire de Bangkok a révélé un quasi triplement du nombre de produits en ivoire en vente et une forte augmentation du nombre de points de vente qui vendent l'ivoire depuis que la Thaïlande a accueilli la Conférence des Parties à la CITES 15 mois auparavant. L'étude de TRAFFIC, publiée juste avant la SC65, a documenté le fait que le nombre de produits en ivoire travaillé est passé de 5865 en janvier 2013 à 14.512 en mai 2014, alors qu'entre janvier et décembre 2013, le nombre de points de vente d'ivoire est passé de 61 à 105. Ces conclusions remettent en question l'engagement du gouvernement thaïlandais

in ETIS seizure data, indicating that the illegal ivory trade situation remains highly dynamic and variable.

But CITES is adapting too and putting more force behind interventions to curtail illegal trade in ivory. At SC65 in Geneva, Switzerland, 7–11 July 2014, the Standing Committee's review of implementation of the CITES action plan process and the ivory trade decisions taken at CoP16 led to a number of significant developments. Thailand, in particular, was singled out for failing to make meaningful progress on a range of issues that continue to allow an unfettered illicit ivory market to flourish in the country, beyond the reach of law enforcement. Prior to the Standing Committee meeting, TRAFFIC's monthly monitoring of Bangkok's domestic ivory market revealed a near trebling of the number of ivory products for sale and a steep rise in the number of retail outlets selling ivory since Thailand hosted the CITES Conference of Parties some 15 months earlier. The TRAFFIC study, released just prior to SC65, documented that the number of worked ivory products rose from 5,865 in January 2013 to 14,512 by May 2014, while between January and December 2013, the number of ivory retail outlets increased from 61 to 105. These findings called into question the Thai government's commitment to end domestic ivory trade made by then Prime Minister Yingluck Shinawatra in front of some 170 world governments during the opening ceremony of CITES CoP16. Analysis of ivory market survey data has consistently found that Thailand hosts one of the world's largest unregulated ivory markets and the lack of tangible progress led to increased CITES oversight pressure on the country.

At SC65, Thailand was given until 30 September 2014 to submit a revised national ivory trade action plan, and until 31 March 2015 to implement a number of key issues, including verbatim:

- the enactment of appropriate legislative or regulatory provisions (such as the inclusion of the African elephant as a 'protected species' under the Wildlife Act) that allow for the effective control of domestic trade and possession of elephant ivory and provide for strict penalties in case of illegal possession or illegal domestic trade of ivory;
- the enactment of legislative or regulatory

de mettre fin au commerce intérieur de l'ivoire fait par le Premier ministre Yingluck Shinawatra devant quelques 170 gouvernements du monde lors de la cérémonie d'ouverture de la CdP16 de la CITES. L'analyse des données de l'étude du marché d'ivoire a toujours trouvé que la Thaïlande est le théâtre de l'un des plus grands marchés d'ivoire non réglementés du monde et l'absence de progrès tangible a conduit à une augmentation de la pression de contrôle de la CITES sur le pays.

A la SC65, l'on a accordé à la Thaïlande jusqu'au 30 septembre 2014 pour présenter un plan d'action national révisé sur le commerce de l'ivoire, et jusqu'au 31 mars 2015 pour mettre en œuvre un certain nombre de mesures clés, y compris:

- l'adoption de dispositions législatives ou réglementaires appropriées (telles que l'inclusion de l'éléphant d'Afrique comme une «espèce protégée» en vertu de la Loi sur la faune) qui permettent le contrôle effectif du commerce intérieur et de la possession de l'ivoire d'éléphant prévoyant des sanctions sévères en cas de possession illégale ou de commerce intérieur illégal de l'ivoire;
- l'adoption de contrôles législatifs ou réglementaires créant (i) un système d'enregistrement complet de l'ivoire et (ii) un système efficace d'enregistrement et d'autorisation des commerçants d'ivoire (y compris l'application de la loi et la pénalisation en cas d'infraction); et
- un effort accru sur la surveillance et le contrôle des commerçants d'ivoire et des données d'ivoire, ainsi qu'aux efforts d'application de la loi contre le commerce illégal de l'ivoire, y compris des indicateurs sur la façon dont ces efforts seront mesurés.

Le Comité permanent s'attend à ce que la Thaïlande présente des rapports sur les mesures prises pour mettre en œuvre le plan d'action d'ici le 15 janvier 2015 et le 31 mars 2015 pour permettre l'évaluation des progrès accomplis par le Secrétariat de la CITES. S'il n'est pas satisfait, le Secrétariat est prié de commencer une procédure par correspondance avec les membres du Comité permanent qui pourrait mener à la suspension du commerce des spécimens d'une ou plusieurs espèces inscrites sur la liste de la CITES conformément au paragraphe 30 de la Résolution Conf. 14.3 sur les *procédures de conformité* de la CITES. L'impact de la suspension du commerce sur toutes les espèces inscrites à la liste de la CITES pourrait produire de graves répercussions sur l'économie nationale de la Thaïlande ; par exemple, les exportations lucratives d'orchidées par le secteur de l'horticulture

- controls establishing (i) a comprehensive registration system for domestic ivory and (ii) an effective system for registration and licensing of ivory traders (including enforcement and penalisation in case of offences); and
- increased effort on the monitoring and control of ivory traders and ivory data, as well as for law enforcement efforts against illegal ivory trade, including indicators on how those efforts will be measured.

The Standing Committee expects Thailand to submit reports on any measures taken to implement the action plan by 15 January 2015 and 31 March 2015 to allow assessment of progress by the CITES Secretariat. If not satisfied, the Secretariat is requested to commence a postal procedure with Standing Committee members that could lead to the suspension of trade in specimens of one or more CITES-listed species in accordance with paragraph 30 of Resolution Conf. 14.3 on *CITES compliance procedures*. The effect of a trade suspension on all CITES-listed species could produce a serious impact on Thailand's national economy as, for example, lucrative exports of orchids by the horticultural sector would effectively be disrupted, affecting an export industry that was valued at USD 80 million in 2013. Beyond Thailand, the eight other countries or territories in the ivory action plan process were requested to report on further measures taken to implement their national plans to the Secretariat by 15 May 2015.

In other SC65 developments, the countries that had been identified in the CoP16 ETIS analysis as 'countries of secondary concern' and were addressed in Decision 16.79, Cameroon, Congo, the Democratic Republic of Congo, Egypt, Ethiopia, Gabon, Mozambique and Nigeria, were instructed to develop national ivory trade action plans with clear actions, time frames and milestones by 31 October 2014, and then to press forward with measures to ensure proper implementation prior to SC66. These countries must submit comprehensive reports to the Secretariat by 15 May 2015 so that progress can be evaluated. Similarly, Angola, Cambodia and the Lao PDR, part of the 'countries to watch' identified in the last ETIS analysis and subsequently addressed in Decision 16.80, were

seraient effectivement perturbées, affectant une industrie d'exportation qui représentait une valeur de USD 80 en 2013. A part la Thaïlande, les huit autres pays ou territoires dans le processus du plan d'action de l'ivoire ont été priés de faire rapport sur les nouvelles mesures prises pour mettre en œuvre leurs plans nationaux au Secrétariat avant le 15 mai 2015.

En d'autres développements de la SC65, les pays qui avaient été identifiés dans l'analyse d'ETIS à la CdP16 comme « pays d'intérêt secondaire » et ont été mentionnés dans la Décision 16.79 ; le Cameroun, le Congo, la République démocratique du Congo, l'Egypte, l'Ethiopie, le Gabon, le Mozambique et le Nigeria, ont été chargés d'élaborer des plans d'action nationaux de commerce de l'ivoire, y compris des mesures claires, les délais et les étapes d'ici le 31 octobre 2014, puis procéder avec des mesures afin d'assurer une mise en œuvre correcte avant la SC66. Ces pays doivent soumettre des rapports complets au Secrétariat avant le 15 mai 2015 afin que les progrès puissent être évalués. De même, l'Angola, le Cambodge et la RDP du Laos, quelques uns des « pays à surveiller » identifiés dans la dernière analyse d'ETIS et ensuite mentionnés dans la décision 16.80, ont également été obligés de finaliser l'élaboration des plans d'action nationaux du commerce de l'ivoire avec les mêmes dates limites des rapports. La plupart de ces pays semblent jouer un rôle plus important dans le commerce illégal de l'ivoire, en particulier l'Angola et le Cambodge, comme indiqué dans le cas ci-dessus, ainsi que la République démocratique populaire du Laos, le Mozambique et le Nigeria. Enfin, le Japon, le Qatar et les Emirats arabes unis, également notés comme des « pays à surveiller » dans la Décision 16.80 ont été invités à présenter des rapports au Secrétariat sur la mise en œuvre des dispositions de la CITES relatives au contrôle du commerce de l'ivoire d'éléphant et les marchés d'ivoire avant le 15 mai 2015. Dans l'entretemps, le Secrétariat, par le biais de MIKE et d'ETIS, a été invité à identifier les Parties de « préoccupation principale », de « préoccupation secondaire » ou « importantes à surveiller » pour examen par le Comité permanent à la SC67, en se basant sur une analyse de toutes les données des cinq dernières années disponibles à MIKE et ETIS et en utilisant des méthodes scientifiques et claires.

Il est profondément encourageant de constater que le Comité permanent de la CITES a soutenu l'attitude « ferme » contre le commerce illégal de l'ivoire d'éléphant démontrée pour la première fois par les Parties à la CITES lors de la CdP16. Tenir les Pays responsables et augmenter progressivement la pression sur les pays

also required to finalize the development of national ivory trade action plans with the same reporting time deadlines. Many of these countries appear to be playing more prominent roles in the illegal ivory trade, especially Angola and Cambodia, as indicated in the case above, and Lao PDR, Mozambique and Nigeria. Finally, Japan, Qatar and the United Arab Emirates, also noted as ‘countries to watch’ in Decision 16.80, were asked to submit reports to the Secretariat on their implementation of CITES provisions concerning control of trade in elephant ivory and ivory markets by 15 May 2015. In the meantime, the Secretariat, through MIKE and ETIS, was requested to identify Parties of ‘primary concern’, ‘secondary concern’ or ‘important to watch’ for consideration by the Standing Committee at SC67, based on an analysis of all data in the last five years available to MIKE and ETIS and using scientific and clear methods.

It is deeply encouraging to report that the CITES Standing Committee has sustained the ‘get tough’ attitude against illegal trade in elephant ivory first exhibited by the CITES Parties at CoP16. Holding countries accountable and progressively ratcheting up pressure on those nations that perennially fail to address fundamental issues that give rise to illegal trade and drive high levels of elephant killing is a critical part of the solution. So far, the CITES ivory trade action plan appears to be yielding good results and the Parties are unwavering in their desire to see real progress. Hopefully, this desire is being complemented with on-the-ground actions that enhance effective anti-poaching activities in elephant range States, support collaborative law enforcement along the entire trade chain that disrupts and eliminates key smuggling networks, and promote demand reduction in end-use markets. SC65 ended with an increasing number of countries required to direct their attention to illegal ivory trade matters. Let’s hope these interventions deliver an imminent downturn in elephant poaching and ivory trafficking.

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Martin E, Martin C. 2013. The decline in Cambodia’s ivory trade. *TRAFFIC Bulletin* 25(2):43–45.

qui ne parviennent jamais à résoudre les situations fondamentales qui donnent lieu au commerce illégal et conduisent à des niveaux élevés d’abattage d’éléphant est une partie essentielle de la solution. Jusqu’à présent, le processus du plan d’action du commerce de l’ivoire d’éléphant de la CITES semble produire de bons résultats et les Parties sont inébranlables dans leur désir de voir de réels progrès. Espérons que cela soit complété par des actions sur le terrain qui améliorent la lutte efficace contre le braconnage dans les Etats de l’aire de répartition, appuient l’application collaborative de la loi le long de toute la chaîne du commerce afin de perturber et éliminer les réseaux de la contrebande, et encouragent la réduction de la demande dans les marchés d’utilisation finale. La SC65 s’est terminée par l’obligation faite à un nombre croissant de pays de diriger leur attention sur les questions du commerce illégal de l’ivoire. Espérons que ces interventions produiront un ralentissement imminent du braconnage des éléphants et du trafic de l’ivoire.

TRANSITION

Passing of a conservation icon

Mike Knight

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Dr Anthony Hall-Martin, aged 68, died on 21 May 2014 after a fight with cancer. He leaves a considerable conservation legacy in his wake.

Armed with separate postgraduate degrees in botany, wildlife management and zoology, Anthony was well trained for his life in conservation. His career commenced in the then Department of Forestry and Game in Malawi in 1969, with a particular focus on the vegetation of Nyika National Park. His continued links to Malawi and its conservation efforts remained till the end of his career. Only when he joined South African National Parks did his engagement and interest in pachyderms flourish. He started with important individual recognition studies and vegetation effects of the black rhinos and elephants in the small Addo Elephant National Park—his vegetation plots are being used to this day! With his move to Kruger National Park in the early 1980s, he continued his work on elephants and rhinos, becoming SANParks expert and spokesperson on these two species. He was also one of the early members of the IUCN SSC African Elephant and Rhino Specialist Group, joining it 1976, and a founding member of the African Rhino Specialist Group—so began two decades of involvement with these groups. Anthony contributed significantly in arguing the case for African elephants on the international arena, and greatly contributed to South Africa's request to CITES to sell ivory for conservation purposes. Anthony published extensively, authoring 10 books and numerous scientific papers. Notable titles include *Elephants of Africa* and *Cats of Africa*, co-authored with the artist Paul Bosman.

Anthony climbed rapidly through the ranks in SANParks to become Director of Research and



Dr Anthony Hall-Martin.

Development in 1995. So began another quest—expanding the national parks system. In the period from 1990 till he retired from SANParks in the early 2000s, he was instrumental in adding six new national parks, and in expanding numerous others to the tune of about 400,000 ha. This effort was driven by his desire to include under-represented ecological biomes in the protected areas system, to expand the parks to larger more viable ecological units and to offer ecotourism opportunities to provide the essential revenue to SANParks to fulfil its conservation mandate. Not only did this see more and bigger homes for his beloved black rhinos and elephants, it also introduced new models of private ownership in the expanding SANParks system. Clive Walker, one of Anthony's long-term friends, aptly said that 'the nation's wild

heritage is immeasurably larger, safer, and richer as a result of Anthony's vision'. In recognition of his contribution to conservation he received a number of awards including the British Council for Zoology Award, the Bruno H Schubert Prize in Germany, the Senior Captain Scott Medal from the South African Academy of Science, and the National Geographic Society Award.

After his retirement from SANParks, together with Paul van Vliissingen (1941–2006), he was instrumental in establishing the non-profit organization African Parks. Here he continued the mission of securing the protected areas footprint but now in an Africa-wide landscape. The plan was to secure cash-strapped struggling national parks and game reserves in Africa and develop them into self-sustaining parks with

vibrant ecotourism products. As Conservation and Development Director for African Parks, Anthony championed the organization's successful entry into the conservation environment of Malawi, Rwanda, Ethiopia and Zambia. He worked till his last day.

Anthony stands out in the African conservation field by dedicating his life to his vision of conserving Africa's unique landscapes, along with its magnificent mega fauna. 'Pachyderms everywhere have reason to be grateful for Anthony's outstanding life's work', according to Professor Nigel Leader-Williams. He could not have achieved this success without the support of his wife, Catherina, and their daughters, Vega and Cate.

Bayete Nkhosi, lala khale, siya hlangana ngo lina langa (Peter Hitchins)

BOOK REVIEW

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Polishing off the ivory trade: surveys of Thailand's ivory market

Naomi Doak, 2014

TRAFFIC International, Cambridge, UK

A current survey of Thailand's ivory market is certainly needed, because Thailand has what is probably the second largest illegal ivory market in the world after China, and the country has been under intense scrutiny and criticism by CITES. The 65th CITES Standing Committee meeting held in July 2014 gave Thailand until 30 September 2014 to submit a revised National Ivory Action Plan, the original being deemed deficient, which should include a list of actions to be achieved by 31 March 2015 to regulate domestic ivory trade. It also requested that a progress report on these actions should be submitted by 15 January 2015. Failing this, Thailand could face a CITES trade suspension, which would be catastrophic for the country's economy.

It is surprising, therefore, that TRAFFIC published a report that is so deficient in so many respects. First, the title is misleading. The report only concerns Bangkok. The important ivory manufacturing and worked ivory supply centres in central Thailand were not visited, nor were Chiang Mai and Mae Sai in the north, traditionally important ivory selling centres because of their high tourism profile.

Previous published reports on Thailand's ivory market (Martin and Stiles 2002; Stiles 2004; Stiles 2009) included crucial raw and worked ivory price data, counts and proportions of the different worked ivory types, numbers of ivory workshops and craftsmen, sources of raw ivory, and nationalities of the principal buyers. None of these scale and trend indicator variables were collected, which limits the value of the TRAFFIC report substantially.

TRAFFIC explained to me that this report was not intended to be a comprehensive study covering most aspects of the ivory industry in Thailand, but rather,

'It was our initial intention to assess ivory turnover in key locations in Bangkok, thus the reason for repeated monthly surveys in key markets' (TRAFFIC, in litt., August 2014). In addition, TRAFFIC explained that, '...the Thai government has articulated policy commitments to CITES concerning the future of ivory trade in their country and our report was focused upon examining that commitment since it was made at the last Conference of the Parties in terms of retail availability of ivory in Bangkok, which we feel is representative of general ivory trade and market patterns across the country.' None of the objectives communicated to me by TRAFFIC are contained in the report itself, but with TRAFFIC's clarification my apparently misplaced criticisms above should be disregarded.

The data collected were the number of outlets selling ivory, the number of pieces displayed, and the number of bangles counted in 12 survey periods between January 2013 and May 2014. The report stated that data on all carving types were collected, but they were not presented in the report.

The data analysis concluded that there was a significant overall increase in the number of outlets selling ivory and the number of ivory items for sale over the course of the 17-month survey period.

Table 1, which according to the heading presents the 'Number of surveyed Bangkok retail outlets and surveyed retail outlets selling ivory' is, according to my communications with TRAFFIC, incorrect. The table does not include the hundreds of outlets that actually were visited. There is also an incorrect statement in the Methods section: 'Initial surveys focused on 119 shops from ten general locations around Bangkok identified in previous work...' In fact, in the first survey period (January 2013) only 71 of these 119 shops could be found. The table shows that 61 ivory outlets were found in total, but they were a combination of outlets on record as having ivory from previous surveys

made between 2004 and 2008 (the 71 in black in the table), and new outlets found during the January 2013 survey (i.e., the 61 in red in the table includes both). It cannot be ascertained from the report how many of the 119 were ever found, because new outlets found in previous surveys were added to the 'Outlets with ivory' category in each subsequent survey, if I understood TRAFFIC's explanation correctly.

Table 1 gives the impression, if read and analyzed according to what is stated in the report, that the increase in number of ivory outlets and pieces is largely a function of finding more of the previously known outlets containing ivory. TRAFFIC assures that this is not the case, and that sampling coverage remained consistent over the course of the entire survey period.

The report concludes that the increase in ivory outlets and pieces 'is strongly indicative of a growing market'. It is, in fact, an unprecedented growth never seen before in any repeated ivory survey reports on record. In less than a year and a half, the ivory market grew from over 5,700 pieces to over 13,200 pieces. January 2013 must have represented a serious slump in market activity for some reason, which is not explained in the report. Martin and Stiles (2002) reported 38,510 ivory pieces in Bangkok in 2001 and Stiles (2009) found over 12,500 items in 2006/7. The trend was downwards until January 2013, with less than half the number of ivory pieces and only 40% of the outlets seen six years earlier. Suddenly, in February 2013 the market jumped in scale and continued its upward trend in growth to May 2014.

No explanation is given in the report for this extraordinary growth over a relatively short period. Oddly, the Market Research: Results section concludes, 'Results from the latest surveys were similar to those from earlier work (Martin and Stiles in 2001, and Stiles in 2006–2007 and 2008), with 167 individual locations identified in total but with an increase in the number of locations across the duration of the surveys.' The massive growth rate is not similar to results found by Martin and Stiles.

An important finding was that there are many more ivory outlets in Bangkok than the 39 that are registered with the government, as the law requires. The number of outlets found selling ivory in any one survey varied from 61 to 120, up to three times the legal number.

In the Discussion, there is no clear comparison of the current data with the same variables seen in previous surveys. How does 2013–2014 compare with 2007–2008 (Stiles 2009)? A table would have been useful.

Other deficiencies: a number of source citations are given in the report, but there is no References section. A few acronyms are presented, but there is no acronyms section to decipher them (what is WARPA?). TRAFFIC admitted that these were oversights, a result of efforts to complete the report in time for release at the CITES 65th Standing Committee meeting.

Overall, this is a disappointing report. However, even with the methodological problems, the TRAFFIC survey of Bangkok's ivory market demonstrated that Thailand is not complying with CITES resolutions or living up to commitments it has made to control its domestic ivory market. Thailand still faces a CITES trade sanction if it does not address the unregulated ivory market, and calls for domestic ivory trade in the country to be closed entirely look increasingly justified.

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GUIDELINES FOR CONTRIBUTORS

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Pachyderm publishes papers and notes concerning all aspects of the African elephant, the African rhino and the Asian rhino with a focus on the conservation and management of these species in the wild. At the same time, the journal is a platform for disseminating information concerning the activities of the African Elephant, the African Rhino, and the Asian Rhino Specialist Groups of the IUCN Species Survival Commission.

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References

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In the reference list, punctuation is minimized. Examples are drawn from previous issues of *Pachyderm*:

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