



Perspective

The shared nature of Africa's elephants

Keith Lindsay^{a,*}, Mike Chase^b, Kelly Landen^b, Katarzyna Nowak^{c,**}^a *Amboseli Trust for Elephants, P.O. Box 15135, Langata, Nairobi 00509, Kenya*^b *Elephants Without Borders, P.O. Box 682, Kasane, Botswana*^c *Zoology and Entomology, University of the Free State, Qwaqwa Campus, Phuthaditjhaba 9866, South Africa*

ARTICLE INFO

Keywords:

Loxodonta africana

Transboundary conservation

CITES

Megaherbivore

Adaptive management

Climate change

ABSTRACT

The world's biodiversity is shared by countries that are increasingly recognizing the need for effective responses to human influence and climate change impacts through coordinated management and protection of nature beyond national borders. The case of elephants, a highly mobile and widely distributed mammal that plays crucial ecological and economic roles in savanna and forest landscapes, exemplifies the need for approaches to conservation that transcend geopolitical frontiers. Transboundary cooperation can bring substantial conservation and economic benefits but also presents challenges for policy, governance, and diplomacy. While some multilateral environmental agreements have explicitly incorporated transboundary commitments into their frameworks, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) continues to focus on the sovereignty of individual nations in regulating trade of wildlife. This inward-looking approach is embodied by the continued “split-listing” by range States of African elephants between countries affording two levels of protection—Appendix I (no international commercial trade) and Appendix II (regulated trade). Using data from the African Elephant Status Report 2016, where savanna elephant data are based mostly on the recently completed Great Elephant Census, we show that 76% of elephants are found in populations spread across one or more national borders. This blurring of strictly national populations makes a split-listing of elephants between two CITES appendices—and varying levels of protection—inconsistent with ecological reality and conservation best practice. At the 17th CITES Conference of Parties (CoP17), in September–October 2016, influential parties prevented acceptance of a proposal, supported by the majority of elephant range states, that would have unified all African elephants under Appendix I. The real reasons for perpetuating the split-listing at CoP17 were ideological and political, and threaten to undermine the convention as an evidence-based and coordinated mechanism for conserving threatened species. Isolationist policies and politically motivated compromises will help neither elephants nor people in an interdependent world facing common environmental challenges needful of harmonized agendas and scaled-up cooperation.

1. Introduction

Transfrontier management of wildlife populations has been recognized as best practice in conservation for some three decades (Vasilijević et al., 2015) with the realities of animals' dispersal movements and “zones of influence” preferred over human-centric “zones of management” approaches (Linnell and Boitani, 2012; Delsink et al., 2013; Selier et al., 2016a, 2016b). Motivating factors in transboundary thinking include enhanced protection of viable wildlife populations as well as wildlife-based revenue generation through tourism circuits that link sites in neighboring countries (Vasilijević et al., 2015). African elephants, while not unique in their mobile nature, are compelled by their extreme size to range over significantly larger areas of land than

most other species. A key threat to their survival in the longer term is habitat fragmentation and blockage of dispersal routes by human activities, and solutions lie in maintaining and protecting connections between populations within and, inevitably, between countries through coordinated trans-national approaches to their conservation.

The crisis currently of highest concern to elephant survival is international wildlife crime, notably elephant poaching to supply the international ivory trade, facilitated by nations' globalized interdependence. The primary mechanism that governs international trade in endangered species is the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and it is in CITES that some of the solutions to illegal elephant killing and international ivory trading must be sought. The Convention provides for two levels of

* Correspondence to: K. Lindsay, P.O. Box 15135, Langata, Nairobi 00509, Kenya

** Correspondence to: K. Nowak, Zoology and Entomology, University of the Free State, Qwaqwa Campus, Phuthaditjhaba 9866, South Africa.

E-mail addresses: wkindsay@elephanttrust.org (K. Lindsay), knowak02@gmail.com (K. Nowak).<http://dx.doi.org/10.1016/j.biocon.2017.08.021>

Received 4 March 2017; Received in revised form 6 June 2017; Accepted 10 August 2017

Available online 09 October 2017

0006-3207/ © 2017 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

protection from over-exploitation under trade: Appendix II, which allows a regulated trade under a permit system based on quotas; the stricter Appendix I, which prohibits all international commercial trade. In the case of disagreements between countries over the degree of threat posed by trade to species occurring within their national boundaries, the possibility of CITES split-listings has emerged; four African countries currently list their elephants on Appendix II while the remaining 33 range States list theirs on Appendix I.

The decline in elephant numbers has recently been documented by the Great Elephant Census (GEC; Chase et al., 2016) and in the African Elephant Status Report of 2016 (AESR 2016) produced by the IUCN/SSC African Elephant Specialist Group, and rates of poaching and ivory seizures in reports by the Monitoring the Illegal Killing of Elephants (MIKE) and Elephant Trade Information System (ETIS) programs. According to the GEC, between 2007 and 2014, Africa's savanna elephant numbers plummeted by at least 30%. Forest elephant populations declined by over 60% between 2002 and 2011 (Maisels et al., 2013) and in some regions, poaching has driven their decline to up to 80% (Poulsen et al., 2017). The international nature of this threat is well-documented by studies of the global scale and rapid transit of illicit ivory (Cerling et al., 2016), the “neighborhood effects” of elephant declines in adjacent countries (Frank and Maurseth, 2006), and insecurity posed by poaching groups that fails to be contained by political boundaries. Examples of transfrontier trouble spots include Minkébe, on the Cameroon-Gabon border (Poulsen et al., 2017), and Garamba, at the borders of Democratic Republic of Congo (DRC) and South Sudan (African Parks, 2016). As a result, many elephant conservation projects now explicitly incorporate joint transboundary actions and commitments by multiple governments and state actors into their scopes of work.

In this paper we provide an analysis of data on elephant population sizes and distributions found in the AESR 2016 (Thouless et al., 2016), along with its narrative summaries, supplemented by results of the 2016 Great Elephant Census, radio-tracking work by the Botswana-based NGO Elephants without Borders, and observations by other experienced colleagues. We use these data to demonstrate that the majority of Africa's elephants live in transboundary areas, with relatively few strictly “belonging” to individual countries.

We emphasize the importance of transboundary thinking for conservation of African elephants, and how it should be reflected in reformed approaches in the operation of MEAs such as CITES. We discuss the issues emerging from the tension between nationalistic approaches to nature conservation and the emerging awareness of connectedness and the governance opportunities, as well as challenges, in the conservation of Africa's elephants. Finally we focus on CITES and how application of rigid criteria for Appendix listings based on political boundaries and national management units ignores ecological reality and life history, and misses opportunities for achieving effective conservation gains and fostering enduring transboundary and transregional alliances.

2. Transboundary conservation and elephant management

The concept of transnational management cooperation has been well established for marine species of many taxa and for terrestrial species such as migratory birds (embodied, for example, in the Migratory Bird Treaty signed by the USA and Canada a century ago) and gorillas (e.g., Treaty on the Greater Virunga Transboundary Collaboration signed in 2015; also see UNEP-CMS, 2007). Among other initiatives concerning transboundary conservation in Africa, a significant development has been the Transfrontier Conservation Area (TFCA) programme of the Southern African Development Community (SADC, 2013), a regional economic grouping of 15 member states. By 2013, five TFCAs had been established by treaty or other instrument, six were considered “emerging” with memoranda of understanding signed, and a further seven had been proposed.

The TFCA approach is now receiving international development assistance in all regions of Africa, particularly from the USA, Germany and the European Union (EU). In a continent-wide study and strategic plan (European Union, 2016), the EU identified Key Landscapes for Conservation (KLCs), composed of important protected areas embedded in areas of potentially compatible land use, that include intact ecosystems with populations of elephants as well as other significant species and habitats; the majority of these KLCs are in transboundary areas.

Many savanna elephants have large ranges and highly migratory-nomadic examples are found in Mali (Wall et al., 2013), Botswana (Chase, 2007), and Namibia (Lindeque, 1995), where surface water is scarce and where herds traverse borders on an annual or seasonal basis. The forest elephants of Central Africa are less constrained by habitat loss, as deforestation rates are relatively low (Hansen et al., 2011), but fragmentation of range occurs as extractive hunters and road networks penetrate ever further into forests (Blake et al., 2008; Poulsen et al., 2017). The importance of connectivity is growing as climate change increases the variability of seasonal food and water distribution, forcing elephants to travel ever farther for resources.

As the majority of Africa's protected areas are located at or near borders, away from country centers – a legacy of colonial rule, when the majority of areas protecting wildlife habitat were established at the fringes of national territories (Vasilijević et al., 2015) – elephants are often not confined within geopolitically separate, isolated populations. National elephant population estimates are compromised by this fact, and it has been acknowledged that savanna elephants can be double- or under-counted if surveys in boundary areas are not planned to coincide (Blanc et al., 2007). Although forest elephants are now concentrated mostly in central and coastal Gabon and north-central Republic of Congo (Maisels et al., 2013) there are several landscapes where they have been recorded crossing international borders between adjacent protected areas (Blake et al., 2001, 2008).

The benefits of facilitating elephants' cross-border movements include maintenance of meta-population processes (van Aarde and Jackson, 2007) and functional connectivity (Roever et al., 2013), allowing density-dependent dispersal from areas of high to lower local density to occur, helping reduce human-elephant contact, and promoting ecological processes including long-distance seed dispersal. Intensive, disruptive, and expensive management to exert control over local elephant densities, such as water provisioning, immunocontraception, and culling (or even more controversially, sale of live elephant calves to countries outside Africa), can be avoided if more natural processes of habitat choice and movement are maintained.

It is thanks to elephants' cross-border movements that former sink habitats have been repopulated in the past. Following the 1989 international ivory trade ban, the recovery of Uganda's depleted elephant numbers was greatly facilitated by cross-border movements from eastern DRC; movements in the other direction are now reported (WCS, 2015). A famous historical example is the repopulation during the early 20th century of the heavily hunted area that is now Kruger National Park, South Africa, by elephants from neighboring Mozambique (Carruthers et al., 2001). After the end of the civil war in Angola, elephants returned across the border from Botswana, Namibia, and Zimbabwe (Chase and Griffin, 2011).

There have also been translocations of elephants between source and sink habitats for management purposes. Several non-border, insular populations of elephants contain individuals transferred from cross-border populations, for example, Pilanesberg National Park and Game Reserve, with elephants from Kruger National Park (Carruthers et al., 2001). Some translocations have removed elephants from “crowded” areas like Shimba Hills, Kenya, moving them to larger areas such as Tsavo National Park, connected to cross-border protected areas (Pinter-Wollman et al., 2009).

3. The role of CITES

If elephants are to be saved, a policy shift toward greater transnational cooperation must be promoted and consolidated. Agreed in 1973, CITES is the only multilateral environmental agreement (MEA) to bring biodiversity conservation to bear on international wildlife commerce. Despite this international accord, some powerful parties within CITES remain preoccupied with sovereignty over wildlife within national borders and with nations' bilateral trading exchanges without reference or obligations to neighbors with whom populations of elephants and other species are shared. Through the influence of these groupings, the CITES process as a whole has yet to accept the “big picture” transboundary thinking central to MEAs such as the Convention on Migratory Species (CMS), a 116-nation intergovernmental treaty aiming to conserve species throughout their range and across national borders. Actions taken at last year's CITES 17th Conference of the Parties (CoP17) served to maintain the convention's resistance to a growing transnational perspective.

As noted by [Wandesforde-Smith \(2016\)](#), CITES had embraced the concept of transnational cooperation up to the early 1990s but since turned increasingly toward the UN Principle of Permanent Sovereignty over Natural Resources. Observers (e.g. [Armstrong, 2015](#)) have noted that this principle was established primarily to prevent the exploitation of resources in developing countries by neocolonial interests, and that the desire for sovereignty should not block cooperation between neighboring states to avoid degradation of each other's environment, especially where species of concern are shared.

Cooperation between countries over the management of shared resources is central to many international environmental agreements. Embedded in the African Elephant Action Plan, adopted in March 2010 at CITES CoP15, is the strategy to “ensure connectivity, where possible, between elephant ranges within and among range States” ([CITES, 2010](#)). This strategy is also consistent with a number of other biodiversity-related MEAs, including the CMS and the Convention on Biodiversity (CBD) with which CITES has signed memoranda of understanding. The CMS considers landscape connectivity to be vital for wildlife adaptation and resilience to climate change, and CBD's Aichi Target 11 commits parties to protected area connectivity.

The African Elephant Coalition (AEC; <https://www.africanelephantcoalition.org/>) – now made up of 30 elephant range states – first came together in 2002 in an effort to conserve African elephants, including by unifying all populations under a single CITES Appendix listing. The transfer of all African elephants to Appendix I, a higher protection level, would prohibit all international commercial trade in ivory ([CITES, 2016a](#)). African elephants have been split-listed between two CITES Appendices since 1997. The criteria for amendment of CITES Appendices I and II ([CITES, 2016b](#)) note in Annex 3 of Resolution Conf. 9.24 (Rev. CoP17) that in the case of split listing “this should generally be on the basis of national or regional populations, rather than subspecies” but that “listing of a species in more than one appendix should be avoided in general in view of the enforcement problems it creates.” Annex 5 notes that “In Article I of the convention, the term ‘species’ is defined as “any species, subspecies or geographically separate population thereof,” but then it qualifies that definition by stating that, “Until now, the Conference of the Parties has interpreted ‘geographically separate populations’ as populations delimited by geopolitical boundaries.” Thus the criteria are contradictory as to whether populations should be defined on the basis of the species' geography and ecology or on the political dictates of range states.

South Africa, the host country of CoP17, led the vehement (and minority) opposition to AEC's proposal for a unified Appendix I listing. Maintaining the split-listing of elephant populations between two CITES Appendices was called a “victory for evidence-based conservation” by South Africa's Minister of Environmental Affairs, who was not alone in this view. Countries—including the USA, Canada, several in Latin America, and the EU (as a voting block of 28 countries)—as well

as some prominent NGOs also stated that African elephants should not receive uniform Appendix I status.

Three key reasons for maintaining the split-listing were given, and these arguments are examined:

1) Appendix I listing will make no difference to elephant conservation and could cause new problems.

Appendix II listings are subject to an annotation that specifies a moratorium on proposals to trade ivory stockpiles. This moratorium expires in 2017, but in any case proposals to trade must be passed by a two-thirds majority vote at a CoP. This approval will not be given by parties until elephants are considered safe, and controls on illegal trade are firmly in place. It was argued that the Appendix I listing has failed to protect elephants in most of Africa and that by forcing Appendix II countries to uplist could result in their taking a reservation to the Convention for African elephants. A reservation would take the relevant country outside the remit of CITES controls and allow unregulated trade with any other country also outside CITES, whether also having a reservation or a non-signatory.

However, preventing a uniform Appendix I listing and perpetuating the principle of ivory trading – only temporarily halted by a moratorium – for a small minority of Appendix II range states is not a clear statement that trade in ivory has ceased. Instead, it signifies only a temporary postponement of the trade, with resumption a potentially imminent prospect. This ambiguity maintains the interest and demand of consumers and speculators and the illegal markets and poaching networks that would supply them.

2) The financial value of elephants must be captured by rural communities exposed to human-elephant conflict (HEC).

Rural communities suffer economic losses to agricultural production and even human life from attacks by elephants—and other wildlife. It was claimed that communities will tolerate these losses if they derive significant additions to their household incomes from wildlife use, and that international sales of ivory are needed to provide this income (and maintain positive perspectives). For these reasons the prospect of ivory sales must not be withdrawn.

It is indisputable that rural communities across the breadth of Africa can benefit from programs that reduce human-wildlife conflicts and promote sustainable, conservation-compatible land use ([European Union, 2016](#)). However, in southern Africa there is an additional focus on treating wildlife species as commodities whose consumptive use (“harvesting”) can generate income to provide positive incentives to rural villagers; see, for example, [Child \(2000\)](#). While nature-based conservancies have begun to show promise in some areas, there is little evidence that international trade in endangered species has made any significant contribution to household incomes or to improved attitudes toward wildlife conservation ([Roe et al., 2015](#); [Wicander and Coad, 2015](#)). While all current evidence shows that overexploitation of elephants remains a threat for the foreseeable future, it is clearly inappropriate to promote ivory sales for social benefits that are at best dubious.

3) Biological criteria

The key “scientific” argument against uniform application of Appendix I listing was that national elephant populations in Appendix II countries do not meet the biological criteria for uplisting, notably a “marked decline”, suggested in Annex 5 of Res. Conf. 9.24 (Rev. CoP17) as a decrease in numbers of 50% or more over three generations – in the case of elephants, 75 years ([Blanc, 2008](#)). It was argued that these sovereign nations, all with stable or growing populations of elephants, should not be penalized for declines in elephant numbers in the three other African regions inhabited by elephants—West, Central, and East.

As the argument of biological criteria provides the crucial test of the linkage between policy and ecological science, we focus on and discuss this specific aspect below.

4. Re-framing biological criteria for CITES appendix listings

Although fragmentation of habitats is an increasing problem for elephants, we demonstrate that African elephant populations remain geographically linked across political borders throughout much of their continental range and that the concept of “national” elephant populations is a political, rather than scientific, construct.

We examined data in the AESR 2016 and included all available population estimates, ranging in quality from reliable surveys to best guesses, as many transboundary populations are located in remote areas that may receive relatively limited research attention. Our summary totals are thus not directly comparable to the population numbers and trends reported by the GEC (Chase et al. 2016), obtained from surveys employing well-established, standardized methodology. We categorized populations as “transboundary” if they were accompanied by reports of cross-border movements in the AESR text, or reports by NGOs active in the regions, or if they were clearly linked to such populations. We did not include estimates for populations now considered to be “lost” or otherwise questionable; our results are therefore conservative. Elephants enumerated in areas distinctly separated from transboundary populations were considered “insular”.

We identified 45 examples across Africa of elephant populations

straddling the national borders of 34 range States (excluding only Senegal and Guinea-Bissau, which may have no remaining elephants) (Table 1). Of these populations, 15 include more than a thousand individuals (Fig. 1). The estimated number of likely transboundary elephants (360,499) is more than three times the number of elephants in insular national populations (115,306); thus at least 76% of the continental total is found in transboundary populations. Six such populations, totalling 249,854 elephants, or 53% of the African total, are split-listed under CITES, including countries with both Appendix I and II listings. Elephants range across the boundaries of countries within all four regions of Africa—West, Central, East, and Southern—and some even cross regional lines. Much as with marine species, it is impossible to accurately delineate national or even regional populations of elephants to serve the definition of CITES biological criteria.

As noted above, the protected areas (PAs) of many countries in Africa form clusters along national borders and in many cases match up with similarly marginalized PAs of their neighbors. It is no surprise therefore that populations of elephants and other species are commonly found in these transfrontier areas. West African countries have a memorandum of understanding under the CMS for international cooperation in elephant conservation (CMS, 2016). A similar process was pursued in central Africa (AfESG, 2005), which resulted in a

Table 1
List of 45 cross-border elephant populations across Africa.

Region(s)	Transboundary population name	Countries	Population estimate	CITES appendix listing
W	Djambamakrou-Bia	Cote d'Ivoire-Ghana	176	I/I
W	Ziama-Wenegisi	Guinea-Liberia	114	I/I
W	Gola transfrontier area	Liberia-Sierra Leone	450	I/I
W	Gourma	Mali-Burkina Faso	304	I/I
W	WAP complex	Niger-Benin-Burkina Faso	8936	I/I
W	Kainji Lake + Benin border	Nigeria-Benin	7	I/I
W	Oti-Keran-Mandori - Benin/Burkina Faso	Togo-Benin-Burkina Faso	10	I/I
W-C	Takamanda-Cross River	Nigeria-Cameroon	20	I/I
W-C	Waza - Chad Basin	Nigeria-Cameroon	496	I/I
W-C	Cross River NP - Mbe Mtns./Korup NP	Nigeria-Cameroon	84	I/I
C	Bouba N'djida - Sena Oura - Benoue - Faro-Gagal landscape	Cameroon-Chad	107	I/I
C	Sangha Tri-National Landscape and Likouala	Cameroon-Congo-CAR	14,372	I/I
C	Rio Campo-Campo Ma'an Landscape	Cameroon-Equatorial Guinea	839	I/I
C	Tridom	Cameroon-Gabon-Congo	25,572	I/I
C	Binder-Léré, Waza	Chad-Cameroon	132	I/I
C	Dembo + CAR border	Chad-CAR	20	I/I
C	Conkouati-Mayumba-Mayombe	Congo-Gabon	1306	I/I
C	Mount Fouari complex	Congo-Gabon	200	I/I
C	Ogooue-Leketi - Bateke	Congo-Gabon	537	I/I
C	Birougou + Mayoko	Gabon-Congo	556	I/I
C	Southwest Chad	Chad-Cameroon	64	I/I
C	Monte Alen - Monts de Mitra- Monts de Cristal	Equatorial Guinea-Gabon	3300	I/I
C-E	Garamba Ecosystem	DRC-South Sudan	1924	I/I
C-E	Greater Virunga	DRC-Uganda-Rwanda	3105	I/I
C-S	N Angola - S DRC	DRC-Angola	20	I/I
C-S	Swa Kibula	DRC-Angola	20	I/I
E	Gash-Setit - Kafta-Sheraro	Eritrea-Ethiopia	400	I/I
E	Gambella NP/Boma NP	Ethiopia-South Sudan	606	I/I
E	Omo NP, Mago NP/Loelle NP	Ethiopia-South Sudan	491	I/I
E	Lamu - Lag Badana	Kenya-Somalia	60	I/I
E	Amboseli-W Kilimanjaro-Magadi-Natron	Kenya-Tanzania	3098	I/I
E	Mara-Serengeti	Kenya-Tanzania	7615	I/I
E	Tsavo-Mkomazi	Kenya-Tanzania	11,217	I/I
E	Boma-Badingilo	South Sudan-Ethiopia	606	I/I
E	Nimule-Otze	South Sudan-Uganda	124	I/I
E	Kidepo complex	South Sudan-Uganda-Kenya	621	I/I
E-S	Selous-Niassa	Tanzania-Mozambique	21,640	I/I
S	KAZA	Angola-Zambia-Namibia-Botswana-Zimbabwe	201,977	I/I/II/II*/II
S	Greater Mapungubwe TFCA	Botswana-South Africa-Zimbabwe	1449	II*/II/II
S	Nyika + Zambia border	Malawi-Zambia	47	I/I
S	Maputo-Tembe	Mozambique-South Africa	568	I/II
S	Limpopo TFCA	Mozambique-Zimbabwe-South Africa	33,785	I/II/II
S	Songimvelo-Malolotja	South Africa-Swaziland	108	II/I
S	Lower Zambezi - Mana Pools	Zambia-Zimbabwe	12,782	I/II
S	Nyatana - Tete	Zimbabwe-Mozambique	634	II/I

* Botswana, currently on Appendix II, is planning to uplist elephants to Appendix I

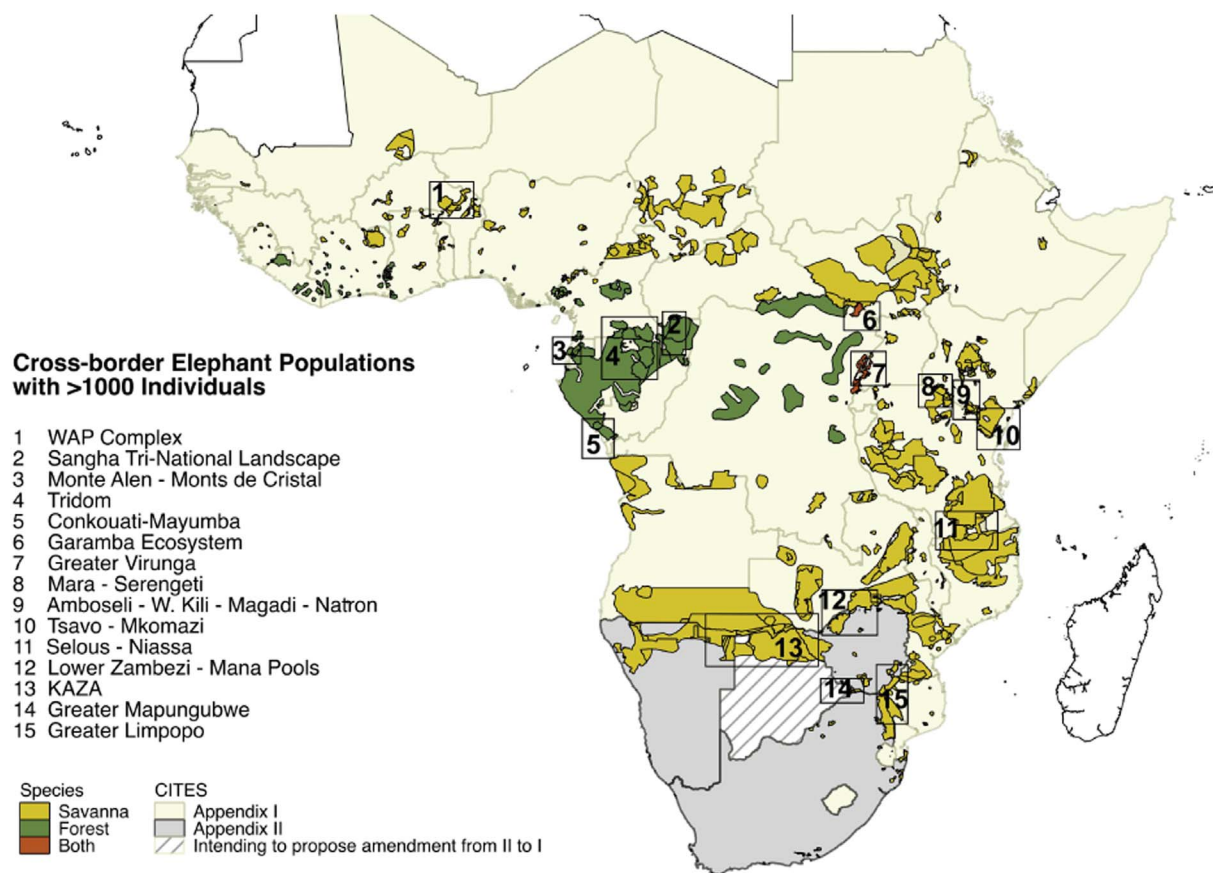


Fig. 1. Fifteen transboundary African elephant populations that exceed 1000 individuals.

conservation strategy signed by all range States in 2005. In the SADC region, as noted above, there is a clear policy to encourage the development of international/regional cooperation in Transfrontier Conservation Areas (Hanks, 2003; SADC, 2013). These commitments to cooperation stand in stark contrast to the nationalistic approach to wildlife trade taken by the southern African opponents of a uniform Appendix I listing.

The Kavango Zambezi Transfrontier Conservation Area (KAZA TFCA), in southern Africa, harbors half of Africa's elephants. This 440,000-square-kilometer landscape is the largest remaining wilderness area on the continent, with the largest free-ranging elephant population in the world, estimated at 216,000. Here elephants are able to roam over a contiguous landscape across the international borders of Angola (CITES Appendix I), Botswana (Appendix II, planning to uplist to I), a 30 km-wide strip of Namibia (Appendix II), Zambia (Appendix I), and Zimbabwe (Appendix II) (Fig. 2a–b). This multinational distribution means that it is effectively impossible to determine if individual elephants “belong” to an Appendix II country (Namibia) or one of the countries already on Appendix I (Angola and Zambia and possibly soon, Botswana).

The hallmark satellite tracking study by Elephants Without Borders (EWB) has revealed the changing patterns of transboundary elephant movements in KAZA. Botswana's elephants, following expansion of their range within the country in the 1980s–90s, started to move across international borders so that an elephant present in Botswana in the evening was very often recorded in Namibia, Zambia, or Angola by morning. The largest ever elephant home ranges had previously been recorded as averaging 2500 km²; EWB satellite-collared elephants moved over 32,000 km², with some elephants traversing a thousand kilometres in a month. During this successful trans-border migratory period (2002–2009), Botswana's refugee elephants were recorded as moving back to southeastern Angola, repopulating their ancestral

homeland. But with increased poaching, starting in 2010, cross-border movements have declined by up to 85%. Many elephants are no longer embarking on these epic transboundary migrations. Some former transboundary areas no longer support elephants—for example Bongola, between Angola and Namibia, and Massangena West, between Mozambique and Zimbabwe—and are described as “lost” in the AESR 2016. In recent times elephants have once again sought refuge, and as a result are more resident, in Botswana.

A similar telemetry study carried out in the early 2000s in the forests of Central Africa showed that collared elephants moved freely and frequently between the Republic of Congo and the Central African Republic (Blake et al., 2001, Blake et al., 2008), in different months using the mineral-rich clearings in both countries and areas of forest presumed to be food-rich. Seasonal movements are not particularly evident in forest elephants; they are likely instead driven by the need to regularly visit the crucial, localized nutrient hotspots (Turkalo and Fay, 2001; Turkalo et al., 2013; Metsio Sienne et al., 2014; Schuttler et al., 2012).

The conclusion to be drawn from these different sources of data is that, despite threats and declines continent-wide, the majority of Africa's elephants cannot be clearly ascribed as the “national property” of any one country. The application of biological criteria under CITES must therefore be applied to the taxon as a whole with the view of restoring conservation networks and functional connectivity in line with other MEAs.

A further problem with the application of biological criteria to elephant populations is the vulnerability of their rates of population increase to slight changes in mortality factors. Poaching effects are additive to drought mortality (Witemyer et al., 2014), which is episodic and occasionally catastrophic in savanna regions, whereas in forest elephants, very slow reproduction rates make their recovery from killing by people even less likely (Turkalo et al., 2017).

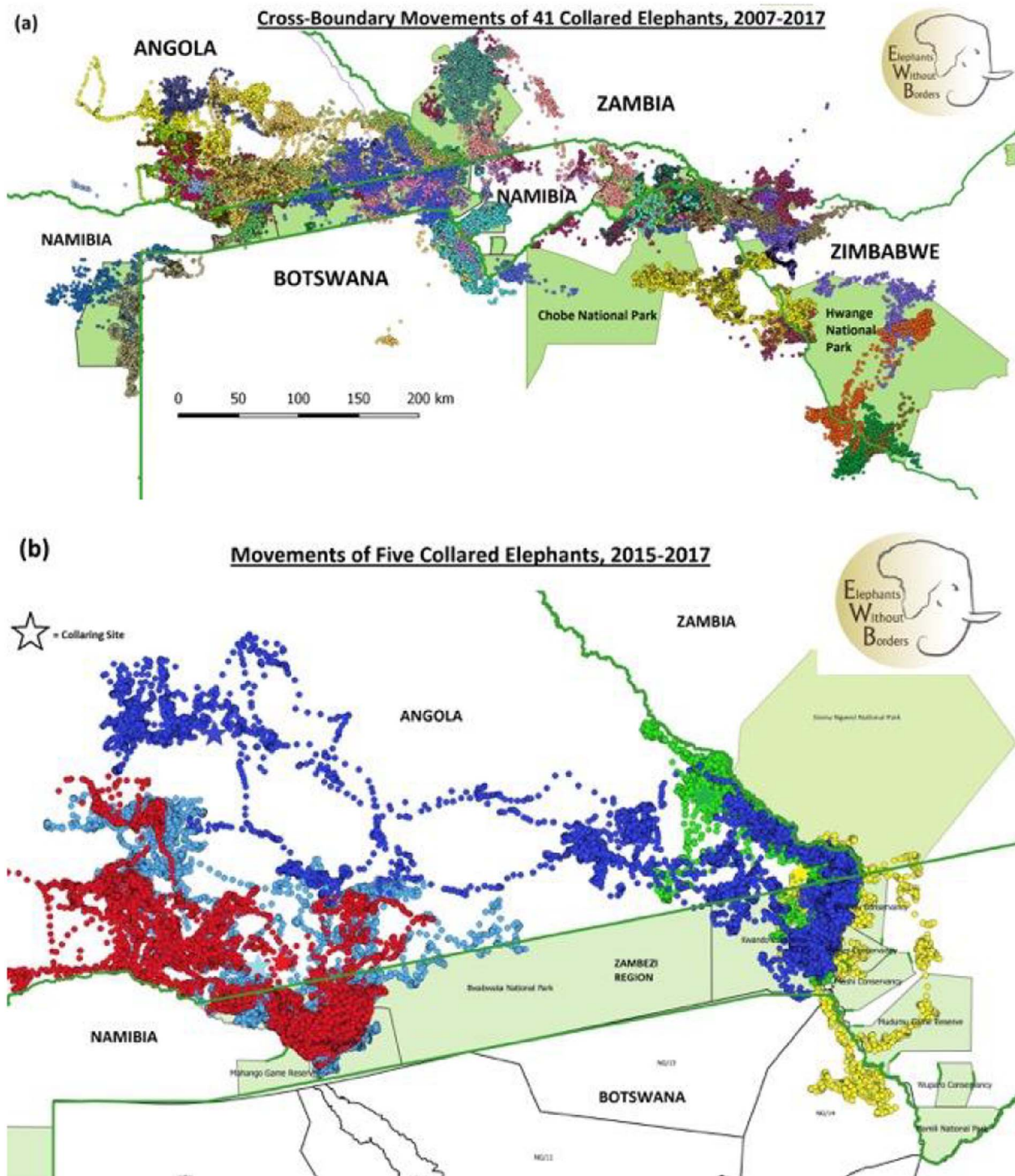


Fig. 2. a–b Elephant movements in KAZA based on tracking of individual elephants by the NGO Elephants without Borders.

5. Sovereignty versus cooperative management

Differences in management approaches of transboundary wildlife by neighboring countries extend beyond CITES and include issues like trophy hunting (although also within the CITES mandate), ecotourism, community-based conservation and revenue/benefits sharing schemes, and domestic trade. It is unrealistic to advocate for harmonization across countries in all these aspects of wildlife management. However, and as noted above, the Principle of Permanent Sovereignty over Natural Resources should not be applied by any country where it harms the resources of a neighboring country or countries. This distinction should apply to elephant management. There are existing examples of

the recognition that sovereignty over transboundary elephants should be shared including in coordination of aerial surveys between Tanzania and Kenya in the Serengeti-Maasai Mara, Kilimanjaro-Amboseli, Mkomazi-Tsavo ecosystems, and anti-poaching patrols along the Sangha River and the Central African Republic-Congo border in the Sangha Trinational. Transfrontier management agreements have been formalized for the WAP complex in Burkina-Faso, Benin, and Niger; the TNS landscape in Cameroon, Congo, and the Central African Republic; and the TRIDOM landscape in Cameroon, Republic of Congo, and Gabon.

Isolationist tendencies of several Southern African nations in the context of CITES are paradoxically at odds with the strong commitment

to transfrontier conservation made by the Southern African Development Community, and it would be more in keeping with regional coordination for southern African governments to support greater harmonization in the management of their elephant populations with the rest of the continent. The case was made repeatedly during interventions in Committees 1 and 2 at CITES CoP17 that elephant populations occupy areas that cross the borders of all of the southern African countries now on Appendix II and enter territories of Appendix I countries; these elephants could not therefore be claimed convincingly as the exclusive “property” of any single country. Nevertheless, these incontrovertible arguments for cross-border coordination failed to change the viewpoints of the opponents of a continent-wide Appendix I listing at this most critical of times for African elephants.

Further, the threat of reservation strikes at the core of CITES: By submitting to this threat, parties are weakening the convention and its ability to protect endangered species.

An additional issue running alongside the commercial trade aspects of Appendix listings is the confusion introduced by trophy hunting. CITES appears to allow quotas for the trophy hunting of endangered species, and even export of the body parts of such species, under an Appendix I listing. While it is argued that such hunting is strictly controlled and does not constitute commercial trade in animal products, it does introduce an apparent loophole for smuggling ivory and, it could be argued, lends legitimacy to the international shipment of ivory pieces. Further exploration of the pros and cons of allowing trophy hunting of Appendix I species is warranted but is beyond the scope of this paper.

6. Conclusions

Our analysis has shown that 76% of African elephants occupy transboundary ranges, linking countries and regions. CITES biological criteria should therefore be applied to the continental species population as a whole rather than artificially, and incorrectly, defined ‘national populations’ (van Aarde and Ferreira, 2009).

African elephants remain under serious threat through the ivory trade. The GEC found that between 2007 and 2014, Africa's savanna elephant numbers declined by at least 30%, representing a net loss of 144,000 elephants – more than those which currently exist in insular national populations. While elephant populations in South Africa and Namibia appear to have remained steady or growing slightly since 2006, Botswana's population apparently declined by 15%, and Zimbabwe's by 11%, with declines of more than 70% in some northern areas of that country. Southern African countries are not impervious to elephant poaching; for example, MIKE data showed a 23% increase in the proportion of elephants killed illegally in South Africa's Kruger National Park between 2014 and 2015 (CITES, 2016c).

Botswana, with the continent's largest elephant population and a refuge attracting elephants from neighboring countries, has recognized the threat of a CITES split-listing and broke ranks with its SADC neighbors at CoP17 by supporting the majority view of the African Elephant Coalition to transfer all elephants to Appendix I. This recognition by the key country in the southern African region that Africa's elephants are a shared – and threatened – heritage represents a major step-change in conservation thinking and practice.

Botswana's intended transition to Appendix I will lend further support for the biological argument for a uniform listing of African elephants (see Fig. 1). The transboundary perspective is aligned with other biodiversity-related MEAs, such as the CMS and CBD, as well as the recently drafted African Common Strategy for Tackling Illegal Wildlife Trade (African Union, 2015). In this period of unprecedented threats to elephants, CITES is overdue in abandoning its drift toward greater national sovereignty, and would do better to adopt a scaled-up continental thinking about elephants, cooperate on transboundary actions embodied in the CMS West African Elephant Agreement and the TFCAs of southern Africa (Selier et al., 2014), and thereby promote the pooling

and sharing of resources and capacity for elephant protection.

Indications that transboundary concerns are entering into CITES policy include the recently initiated development of Non-Detriment Findings (NDFs) approaches on a regional level for sharks and rays by the Secretariat of the Pacific Regional Environment Programme (SPREP). SPREP's plan for a regional process of establishing NDFs, a compulsory step that CITES parties' scientific authorities undertake during the export process, signals a break with conventional CITES practice of carrying out NDFs and setting of export quotas at national levels. Regional NDFs should be developed for wide-ranging terrestrial species such as African elephants before it is too late.

Three clear actions by CITES parties would demonstrate commitment to transboundary thinking:

1. A uniform Appendix I listing of African elephants.
2. A joint, multi-national NDF approach to elephant protection and management.
3. Greater support for a species-wide, consistent approach in treatment of elephants and penalties of crimes against them.

As long as we compartmentalize Africa's elephants into national management units, we will fail to save, recover and manage them as a functional and interconnected whole (van Aarde and Ferreira, 2009). It is unavoidably clear that isolationist policies and politically motivated compromises are helping neither elephants nor people (Linnell et al., 2016).

Acknowledgments

We thank F. Maisels, K. Gobush, R. Hepworth, P. Awori, P. Omondi, and N. Burgess for their helpful edits and comments on earlier versions of this manuscript. We are grateful to P. Beier and one anonymous reviewer for their feedback thanks to which our paper was much improved. We wish to dedicate this paper to conservationist Wayne Lotter, whose bold efforts to stem wildlife crime helped both elephants and people.

References

- AfESG, 2005. Central African elephant conservation strategy. IUCN African Elephant Specialist Group, p. 41. Available from: https://www.iucn.org/sites/dev/files/import/downloads/str_afc0512_en.pdf, Accessed date: January 2017.
- African Parks, 2016. Garamba overview. African Parks Foundation. Available from: <https://www.african-parks.org/the-parks/garamba/overview>, Accessed date: January 2017.
- African Union, 2015. Draft African common strategy for tackling illegal wildlife trade. Available from: http://unep.org/PDF/Brazzaville_Strategy.pdf, Accessed date: January 2017.
- Armstrong, C., 2015. Against ‘permanent sovereignty’ over natural resources. *Polit. Philos. Econ.* 14, 129–151.
- Blake, S., Douglas-Hamilton, I., Karesh, W.B., 2001. GPS telemetry of forest elephants in Central Africa: results of a preliminary study. *Afr. J. Ecol.* 39, 178–186.
- Blake, S., Deem, S.L., Strindberg, S., Maisels, F., Momont, L., Isia, I.-B., Douglas-Hamilton, I., Karesh, W.B., Kock, M.D., 2008. Roadless wilderness area determines forest elephant movements in the Congo Basin. *PLoS One* 3, e3546.
- Blanc, J., 2008. *Loxodonta africana*. The IUCN red list of threatened species 2008: e.T12392A3339343. Available from: <http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T12392A3339343.en>, Accessed date: February 2017.
- Blanc, J.J., Barnes, R.F.W., Craig, G.C., Dublin, H.T., Thouless, C.R., Douglas-Hamilton, I., Hart, J.A., 2007. African Elephant Status Report 2007: An update from the African Elephant Database. Occasional Paper Series of the IUCN Specialist Survival Commission, No. 33. IUCN/SSC African Elephant Specialist Group. IUCN, Gland, Switzerland, pp. 276 (vi + 276 pp.).
- Carruthers, J., Boshoff, A., Slotow, R., Biggs, H.C., Avery, G., Matthews, W., 2001. The elephant in South Africa: history and distribution. In: Scholes, R.J., Mennell, K.G. (Eds.), *Elephant Management A Scientific Assessment for South Africa*. Wits University Press, Johannesburg, pp. 23–83.
- Chase, M.J., Schlossberg, S., Griffin, C.R., Bouché, P.J.C., Djene, S.W., Elkan, P.W., Ferreira, S., Grossman, F., Kohi, E.M., Landen, K., Omondi, P., Peltier, A., Selier, S.A.J., Sutcliffe, R., 2016. Continent-wide survey reveals massive decline in African savannah elephants. *PeerJ*. <http://dx.doi.org/10.7717/peerj.2354>. (e2354).
- Cerling, T.E., Barnette, J.E., Chesson, L.A., Douglas-Hamilton, I., Gobush, K.S., Uno, K.T., Wasser, S.K., Xu, X., 2016. Radiocarbon dating of seized ivory confirms rapid decline in African elephant populations and provides insight into illegal trade. *Proc. Natl.*

- Acad. Sci. 113, 13330–13335. <http://dx.doi.org/10.1073/pnas.1614938113>.
- Chase, M.J., 2007. Home ranges, transboundary movements and harvest of elephants in northern Botswana and factors affecting elephant distribution and abundance in the Lower Kwando River Basin. Electronic doctoral dissertations for UMass Amherst. Paper AAI3290051. Available from: <http://scholarworks.umass.edu/dissertations/AAI3290051>, Accessed date: December 2016.
- Chase, M.J., Griffin, C.R., 2011. Elephants of south-east Angola in war and peace: their decline, re-colonization and recent status. *Afr. J. Ecol.* 49, 353–361.
- Child, B., 2000. Making wildlife pay: converting wildlife's comparative advantage into real incentives for having wildlife in African Savannas, case studies from Zimbabwe and Zambia. In: Prins, H.H.T., Grootenhuis, J.G., Dolan, T.T. (Eds.), *Wildlife Conservation by Sustainable Use*, Volume 12 of Conservation Biology Series. Springer, Netherlands, pp. 335–387.
- CITES, 2010. African elephant action plan. In: CoP15 Inf.68. Fifteenth Meeting of the Conference of the Parties Doha (Qatar), 13–25 March 2010.
- CITES, 2016a. CoP17 Prop.16: Consideration of Proposals for Amendment of Appendices I and II - The Inclusion of All Populations of *Loxodonta africana* (African elephant) in Appendix I Through the Transfer From Appendix II to Appendix I of the Populations of Botswana, Namibia, South Africa and Zimbabwe. Seventeenth Meeting of the Conference of the Parties.
- CITES, 2016b. Criteria for Amendment of Appendices I and II. (Resolution Conf. 9.24 Rev Cop17).
- CITES, 2016c. African elephants still in decline due to high levels of poaching. Press Release, 3 March 2016. Available from: https://cites.org/eng/news/pr/african_elephants_still_in_decline_due_to_high_levels_of_poaching_03032016.
- CMS, 2016. Memorandum of understanding concerning conservation measures for the West African populations of the African elephant. Convention on migratory species secretariat. Available from: <http://www.cms.int/west-african-elephants/>, Accessed date: January 2017.
- Delsink, A., Vanak, A.T., Ferreira, S., Slotow, R., 2013. Biologically relevant scales in large mammal management policies. *Biol. Conserv.* 167, 116–126.
- European Union, 2016. Larger than Elephants. Inputs for an EU Strategic Approach to Wildlife Conservation in Africa – Regional Analysis. Directorate-General for International Cooperation and Development, European Commission, Brussels.
- Frank, B., Maurseth, P.B., 2006. The spatial econometrics of elephant population change. *Ecol. Econ.* 60, 320–323.
- Hanks, J., 2003. Transfrontier conservation areas (TFCAs) in Southern Africa: their role in conserving biodiversity, socioeconomic development and promoting a culture of peace. In: Goodale, U.M., Stern, M.J., Margoluis, C., Lanfer, A.G., Fladland, M. (Eds.), *Transboundary Protected Areas: The Viability of Regional Conservation Strategies*. The Haworth Press, Inc., New York, pp. 127–148.
- Hansen, M.C., Stehman, S.V., Potapov, P., 2011. Quantification of global gross forest cover loss. *Proc. Natl. Acad. Sci. U. S. A.* 107, 8650–8655.
- Lindeque, M., 1995. Conservation and management of elephants in Namibia. *Pachyderm* 19, 49–53.
- Linnell, J.D.C., Boitani, L., 2012. Building biological realism into wolf management policy: the development of the population approach in Europe, *Hystrix. Ital. J. Mammal.* 23, 80–91. <http://dx.doi.org/10.4404/hystrix-23.1-4676>.
- Linnell, J.D.C., et al., 2016. Border security fencing and wildlife: the end of the transboundary paradigm in Eurasia? *PLoS Biol.* 14, e1002483. <http://dx.doi.org/10.1371/journal.pbio.1002483>.
- Maisels, F., et al., 2013. Devastating decline of forest elephants in Central Africa. *PLoS One* 8, e59469. <http://dx.doi.org/10.1371/journal.pone.0059469>.
- Metsio Sienna, J., Buchwald, R., Wittemyer, G., 2014. Differentiation in mineral constituents in elephant selected versus unselected water and soil resources at Central African bais (forest clearings). *Eur. J. Wildl. Res.* 60, 377–382.
- Pinter-Wollman, N., Isbell, L.A., Hart, L.A., 2009. Assessing translocation outcome: comparing behavioral and physiological aspects of translocated and resident African elephants (*Loxodonta africana*). *Biol. Conserv.* 142, 1116–1124.
- Poulsen, J.R., et al., 2017. Poaching empties critical Central African wilderness of forest elephants. *Curr. Biol.* 27, R1–R3.
- Roe, D., et al., 2015. Are alternative livelihood projects effective at reducing local threats to specified elements of biodiversity and/or improving or maintaining the conservation status of those elements? *Environ. Evidence* 4, 1–22.
- Roeber, C.L., van Aarde, R.J., Leggett, K., 2013. Functional connectivity within conservation networks: delineating corridors for African elephants. *Biol. Conserv.* 157, 128–135.
- SADC, 2013. SADC Programme for Transfrontier Conservation Areas. (SADC Secretariat Gaborone, October 2013.).
- Schuttler, S.G., Blake, S., Eggert, L.S., 2012. Movement patterns and spatial relationships among African forest elephants. *Biotropica* 44, 445–448.
- Selier, S.-A.J., Page, B.R., Vanak, A.T., Slotow, R., 2014. Sustainability of elephant hunting across international borders in southern Africa: a case study of the greater Mapungubwe Transfrontier conservation area. *J. Wildl. Manag.* 78, 122–132.
- Selier, S.-A.J., Slotow, R., Blackmore, A., Trouwborst, A., 2016a. The legal challenges of transboundary wildlife management at the population level: the case of a trilateral elephant population in southern Africa. *J. Int. Wildl. Law Policy* 19, 101–135. <http://dx.doi.org/10.1080/13880292.2016.1167460>.
- Selier, S.-A.J., Slotow, R., Di Minin, E., 2016b. The influence of socioeconomic factors on the densities of high-value cross-border species, the African elephant. *PeerJ* 4, e2581. <http://dx.doi.org/10.7717/peerj.2581>.
- Thouless, C.R., Dublin, H.T., Blanc, J.J., Skinner, D.P., Daniel, T.E., Taylor, R.D., Maisels, F., Frederick, H.L., Bouché, P., 2016. African Elephant Status Report 2016: An Update From the African Elephant Database. Occasional Paper Series of the IUCN Species Survival Commission, No. 60 IUCN/SSC African Elephant Specialist Group. IUCN, Gland, Switzerland (Vi + 309pp).
- Turkalo, A.K., Fay, J.M., 2001. Forest elephant behaviour and ecology: observations from the Dzanga saline. In: Weber, W., White, L., Vedder, A., Naughton, L. (Eds.), *Conservation and Ecology of the African Rain Forest*. Yale University Press, Ithaca, pp. 207–213.
- Turkalo, A.K., Wrege, P.H., Wittemyer, G., 2013. Long-term monitoring of Dzanga Bai forest elephants: forest clearing use patterns. *PLoS One* 8, e85154.
- Turkalo, A.K., Wrege, P.H., Wittemyer, G., 2017. Slow intrinsic growth rate in forest elephants indicates recovery from poaching will require decades. *J. Appl. Ecol.* 54, 153–159. <http://dx.doi.org/10.1111/1365-2664.12764>.
- UNEP-CMS, 2007. Agreement on the Conservation of Gorillas and Their Habitats (Gorilla Agreement). Secretariat, UNEP-CMS, pp. 16.
- van Aarde, R.J., Ferreira, S.M., 2009. Elephant populations and CITES trade resolutions. *Environ. Conserv.* 36, 8–10.
- van Aarde, R.J., Jackson, T.P., 2007. Megaparks for metapopulations: addressing the causes of locally high elephant numbers in southern Africa. *Biol. Conserv.* 134, 289–297.
- Vasilijević, M., Zuncel, K., McKinney, M., Erg, B., Schoon, M., Rosen Michel, T., 2015. Transboundary conservation: a systematic and integrated approach. In: *Best Practice Protected Area Guidelines Series No. 23*, (Gland, Switzerland: IUCN. xii + 107 pp). <http://dx.doi.org/10.2305/IUCN.CH.2015.PAG.23.en>.
- Wall, J., Wittemyer, G., Klinkenberg, B., LeMay, V., Douglas-Hamilton, I., 2013. Characterizing properties and drivers of long distance movements by elephants (*Loxodonta africana*) in the Gourma, Mali. *Biol. Conserv.* 157, 60–68.
- Wandesforde-Smith, G., 2016. Looking for law in all the wrong places? Dying elephants, evolving treaties, and empty threats. *J. Int. Wildl. Law Policy* 19, 365–381.
- WCS, 2015. Uganda's elephants increasing in number. WCS newsroom, May 27, 2015. Wildlife conservation society. Available at: <https://newsroom.wcs.org/News-Releases/articleType/ArticleView/articleId/6761/Ugandas-Elephants-Increasing-in-Number.aspx>, Accessed date: January 2017.
- Wicander, S., Coad, L., 2015. Learning Our Lessons: A Review of Alternative Livelihoods Projects in Central Africa. ECI, University of Oxford and Gland, Switzerland: IUCN, Oxford, UK.
- Wittemyer, G., Northrup, J.M., Blanc, J., Douglas-Hamilton, I., Omondi, P., Burnham, K.P., 2014. Illegal killing for ivory drives global decline in African elephants. *Proc. Natl. Acad. Sci.* 111, 13117–13121. <http://dx.doi.org/10.1073/pnas.1403984111>.