Great Apes Status Report

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Great Apes Survival Partnership & International Union for Conservation of Nature

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Report to the CITES Standing Committee on the Status of Great Apes

1. Introduction

The 65th meeting of the Standing Committee of the Convention of International Trade in Endangered Species of Wild Fauna and Flora (CITES) mandated the CITES Secretariat (SC65, Doc37) to collaborate with the IUCN SSC Primate Specialist Group, the Great Apes Survival Partnership (GRASP) and other experts, to prepare a report on the status of great apes and the relative impact of illegal trade and other pressures on their status, for consideration by the Standing Committee. This report constitutes fulfilment of the mandate received from the CITES Secretariat and will address distribution and abundance trends related to all great ape species and sub-species, as well as threats to their conservation.

The great apes (bonobos, chimpanzees, eastern and western gorillas, Bornean, Sumatran and Tapanuli orangutans) face significant conservation threats and are listed as either Endangered or Critically Endangered by the IUCN Red List of Threatened Species (IUCN, 2017) and on Appendix I of CITES (CITES, 2017). All great apes have slow rates of reproduction due to their prolonged maturation and high investment in single (occasionally twin) offspring: age at first reproduction is late, their young take a long time to develop, and interbirth intervals are 4–9 years, depending on the species. Their populations are, therefore, highly vulnerable to even low levels of offtake, and unable to cope with significant and continued losses of individuals.

Great ape populations in Africa and Asia are threatened by the combined impacts of habitat loss, degradation and fragmentation, poaching, disease and illegal trade. It is illegal to kill or capture great apes and to trade live animals or their body parts in all great ape range States (IUCN, 2017). However, despite legal protection, law enforcement remains a major challenge in many countries, and poaching, especially for the illegal domestic (and some international, albeit mostly regional, between neighbouring countries) trade in bushmeat, is the most significant threat to the survival of most great apes (see Section 4 and Table 10).

This report presents the current distribution of African and Asian great apes, as well as temporal population trends (changes over time) and the main threats to their survival. It also highlights current conservation challenges and provides a list of recommendations to the CITES Parties, the CITES Secretariat and other relevant stakeholders.

2. African great apes

2.1. Current distribution of African great apes

African great apes occur in 21 countries across Equatorial Africa (Figure 1). There are four species and nine taxa overall (Table 1).

Table 1. The African great apes

Genus	Species	Subspecies
Gorilla 2 species	**eastern gorilla** *Gorilla beringei* 2 subspecies	**Grauer's gorilla** *Gorilla beringei graueri*
		mountain gorilla *Gorilla beringei beringei*
	western gorilla *Gorilla gorilla* 2 subspecies	**Cross River gorilla** *Gorilla gorilla diehli*
		western lowland gorilla *Gorilla gorilla gorilla*
Pan 2 species	**chimpanzee** *Pan troglodytes* 4 subspecies	**central chimpanzee** *Pan troglodytes troglodytes*
		eastern chimpanzee *Pan troglodytes schweinfurthii*
		Nigeria-Cameroon chimpanzee *Pan troglodytes ellioti*
		western chimpanzee *Pan troglodytes verus*
	bonobo *Pan paniscus*	**No subspecies currently recognized**

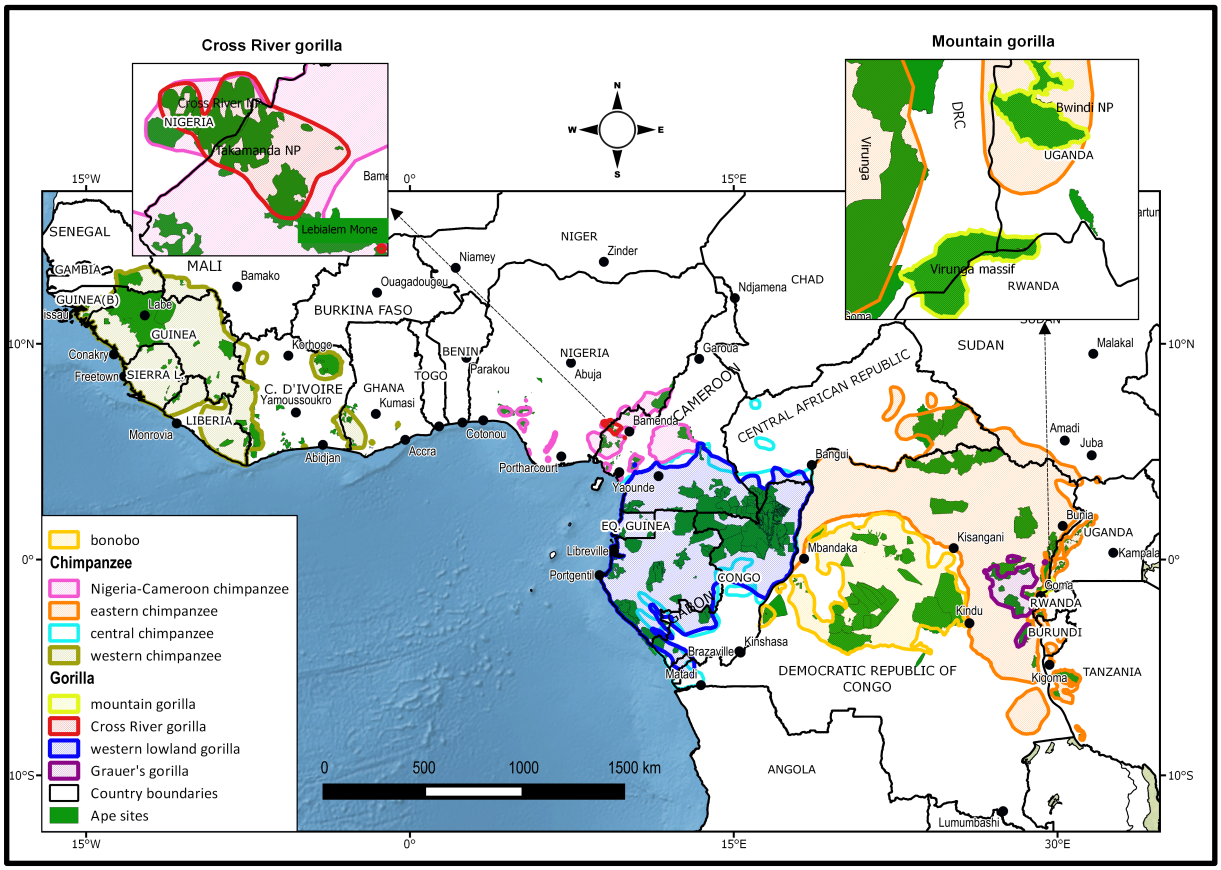

Figure 1. Geographic distribution of African great ape taxa and sites (IUCN SSC A.P.E.S. database, 2017[1]), Max Planck Institute for Evolutionary Anthropology.

2.2. African great ape population sizes

The African great ape population estimates in this report are based on surveys conducted in the past 10 years. "Site" in this text refers to any area in which surveys were conducted in the last 10 years, including amongst others protected areas and their buffer zones, a logging concession or a group of concessions. Population estimates presented in this report are drawn from peer-reviewed publications, published or unpublished reports, data from research and conservation organizations, or are expert estimates. Estimating population size is complex, because great apes are difficult to observe. All great apes build a new nest to sleep in every night, and these can be used as proxies for independent nest-building animals. A software package (Distance) incorporates animal sign production (in this case night nests) and decay rate to calculate the density of animal sign and of population (Thomas, et al., 2010). Because sample size can be small where ape density is low, the resulting estimates of abundance often show a great deal of variation in precision (see Kühl, et al., 2008). At some sites, genetic censusing is used (e.g. Arandjelovic, et al., 2011; Gray, et al., 2013; Roy, et al., 2014). An overview of survey methods can be found in Kühl, et al. (2008).

2.2.1. Population size estimates per country

There is great disparity in population estimates from taxon to taxon depending on the survey method used and sampling effort. Chimpanzee, gorilla and bonobo population estimates per range State are presented in Table 2. The Democratic Republic of Congo (DRC) and Congo host the highest combined population sizes of great apes in Africa, followed by Cameroon, Guinea and Gabon. Countries with the lowest great ape population numbers include Burundi, Ghana, Rwanda, Mali and Senegal, which each hosts a few hundred great apes.

[1] Ape Populations, Environments and Surveys database (http://apesportal.eva.mpg.de/)

Table 2. African great ape population estimates by country. *Except for mountain gorillas, estimates are based on the number of "nest builders", thus excluding infants. Estimates are derived from both surveys and modelling approaches. This is the best information available. However, survey effort is often highest in protected areas, while other areas remain unsampled, thus can lead to low country estimates.*

Country	Taxon	Abundance	Survey period	Source
Angola	western lowland gorilla	1,652 (1,174–13,311)	2005–2013	Strindberg, et al. (2018)*
	central chimpanzee	1,705 (1,027–4,801)	2005–2013	
Burundi	eastern chimpanzee	204 (122–339)	2011–2013	Hakizimana & Huynen (2013)
Cameroon	Cross River gorilla	132–194	2014	Dunn, et al. (2014)
	western lowland gorilla	38,654 (34,331–112,881)	2005–2013	Strindberg, et al. (2018)*
	central chimpanzee	21,489 (18,575–40,408)	2005–2013	IUCN SSC A.P.E.S. database (2017); Strindberg, et al. (2018)
	Nigeria-Cameroon chimpanzee	3,000–7,060	2004–2006	Morgan, et al. (2011); Mitchell, et al. (2015); Oates, et al. (2016)
Central African Republic	western lowland gorilla	5529 (3,635–8,581)	2015	N'Goran, et al. (2016)
	central chimpanzee	2,843 (1,194–4,855)	2015	Strindberg, et al. (2018)
	eastern chimpanzee	910 (538–1,534)	2012–2016	Aebischer, et al. (2017)
Congo	western lowland gorilla	215,799 (180,814–263,913)	2005–2013	Strindberg, et al. (2018)*
	central chimpanzee	55,397 (42,433–64,824)	2005–2013	
Côte d'Ivoire	western chimpanzee	580 (332–940)	2007–2015	Tiédoué, et al. (2016); IUCN SSC A.P.E.S. database (2017)
Democratic Republic of Congo	Grauer's gorilla	3,800	2011–2015	Plumptre, et al. (2016a)
	mountain gorilla	N/A†		
	central chimpanzee	present (population size unknown)	N/A	Inogwabini, et al. (2007)
	eastern chimpanzee	173,000–248,000	2010	Plumptre, et al. (2010)
	bonobo	15,000–20,000 minimum	2012	IUCN & ICCN (2012)
Equatorial Guinea	western lowland gorilla	1,872 (1,082–3,165)	2005–2013	Strindberg, et al. (2018)*
	central chimpanzee	4,290 (2,894–7,985)	2005–2013	
Gabon	western lowland gorilla	99,245 (67,117–178,390)	2005–2013	Strindberg, et al. (2018)*
	central chimpanzee	43,037 (36,869–60,476)		
Ghana	western chimpanzee	264	2009	Danquah, et al. (2012)
Guinea	western chimpanzee	21,210 (10,007–43,534)	2009–2014	WCF (2012; 2014) Kühl, et al. (2017)

Guinea Bissau	western chimpanzee	1,000–1,500	2016	Chimbo Foundation (2017) unpubl. data
Liberia	western chimpanzee	7,008 (4,260–11,590)	2011–2012	Tweh, et al. (2015)
Mali	western chimpanzee	present (population size unknown)	2014	PanAf (2014) unpubl. data
Nigeria	Cross River gorilla	85–115	2014	Dunn, et al. (2014)
	Nigeria-Cameroon chimpanzee	730–2,095	2005	Morgan, et al. (2011); Oates, et al. (2016); S. Nixon, pers. comm.
Rwanda	mountain gorilla	N/A†		
	eastern chimpanzee	430	2009–2014	IUCN SSC A.P.E.S. database (2017)
Sierra Leone	western chimpanzee	5,580 (3,052–10,446)	2009	Brncic, et al. (2010)
Senegal	western chimpanzee	500–600	2016–2017	Pruetz & Wessling unpubl. data
South Sudan	eastern chimpanzee	present	2011	Plumptre, et al. (2016b)
Tanzania	eastern chimpanzee	2,500	2010–2012	Plumptre, et al. (2016b)
Uganda	mountain gorilla	400†	2011	Roy, et al. (2014)
	eastern chimpanzee	5,000	2006–2017	Plumptre, et al. (2016b)

** Strindberg, et al. (2018) estimate population sizes in 2013; western lowland gorilla populations will have declined by a further 13% overall by 2018.*
† Bwindi mountain gorilla population only.

2.2.2. Population size estimates per taxon

Western lowland gorillas and eastern chimpanzees are the most numerous great ape taxa, while the Cross River gorilla has the smallest population size, with approximately 300 or fewer mature individuals remaining.

Table 3. African great ape population estimates by taxon in descending order of abundance. *Except for mountain gorillas, estimates are based on the number of "nest builders", thus excluding infants. Estimates are derived from both surveys and modelling approaches. The IUCN Red List classification of most great ape taxa is based on the rate of decline over three generations (one generation time equating to 20–25 years, depending on the taxon).*

Taxon	Abundance	IUCN Status	Source
western lowland gorilla *Gorilla g. gorilla*	361,919 (302,973–460,093)*	Critically Endangered	Strindberg, et al. (2018)
eastern chimpanzee *Pan t. schweinfurthii*	181,000–256,000	Endangered	Plumptre, et al. (2010; 2016b)
central chimpanzee *Pan t. troglodytes*	128,760 (114,208–317,039)	Endangered	Strindberg, et al. (2018)
western chimpanzee *Pan t. verus*	18,000–65,000	Critically Endangered	Humle, et al. (2016); Kühl, et al. (2017)
bonobo *Pan paniscus*	15,000–20,000 minimum	Endangered	IUCN & ICCN (2012)
Nigeria-Cameroon chimpanzee *Pan t. ellioti*	4,400–9,345	Endangered	Morgan, et al. (2011); Oates, et al. (2016)
Grauer's gorilla *Gorilla b. graueri*	3,800 (1,280–9,050)	Critically Endangered	Plumptre, et al. (2015; 2016b)
mountain gorilla *Gorilla b. beringei*	>1,000	Critically Endangered	Roy, et al. (2014); Hickey, et al. (in prep.)§
Cross River gorilla *Gorilla g. diehli*	<300	Critically Endangered	Dunn, et al. (2014); Bergl, et al. (2016); R. Bergl & J. Oates pers. comm.

** Estimated in 2013. At an annual rate of decline of 2.7%, the population will be ~316,000 by the end of 2018.*
§ Hickey, et al. (in prep.) will report the results of the 2015–2016 survey in the Virungas; a survey of Bwindi Impenetrable National Park is still in progress.

2.3. Temporal trends in African great ape populations

With the exception of the mountain gorillas, all African great ape taxa are facing an overall decline, some of them drastic. The extent of the decline, however, differs between taxa, with Grauer's gorillas suffering the highest estimated losses over a short period of time (Table 4)[2].

Grauer's gorilla, *Gorilla beringei graueri*
In 1995, the Grauer's gorilla population was estimated at 16,900 (Hall, et al., 1998). By 2015, however, estimates placed their population at only 3,800 individuals, with an annual rate of decline of 7.2%. This represents a decline estimated at between 84–93% across the subspecies' range. Comparing the 1994 data to that of 2011–2015, researchers found a 77% reduction in abundance. The subspecies is classified as Critically Endangered. Source: Plumptre, et al. (2015; 2016a).

Mountain gorilla, *Gorilla beringei beringei*
Whilst the mountain gorilla is the only great ape taxon increasing in numbers, it has been listed as Critically Endangered with an estimate of 880 individuals in the early 2010s, increasing to over 1,000 individuals in 2016. There are two small isolated populations, the Virunga and the Bwindi populations, both of which have been the subject of intense conservation, research and census efforts over the last 40 years (e.g. Robbins, et al., 2011). Numbers in the Virungas dwindled to an estimated 250 individuals in 1981, before the population then almost doubled between 1989 and 2010. Between 2003 and 2010, the population increased by 26% at an annual rate of 3.7% (Gray, et al., 2013).

Cross River gorilla, *Gorilla gorilla diehli*
Cross River gorilla population changes are unknown. The subspecies is classified as Critically Endangered because of a small and highly fragmented population: each subpopulation is likely to number fewer than 50 mature individuals. Source: Bergl, et al. (2016).

Western lowland gorilla, *Gorilla gorilla gorilla*
The Critically Endangered western lowland gorilla population declined by 19.4% between 2005 and 2013, an annual loss of approximately 2.7% (Strindberg, et al., 2018). Although their geographic range is large, they are threatened by bushmeat poaching, disease (including the Ebola virus), and habitat loss and degradation.

Central chimpanzee, *Pan troglodytes troglodytes*
This subspecies is classified as Endangered, having experienced a significant population reduction since the 1970s. The principal threats to this taxon, as for western lowland gorillas, are poaching for meat, disease, and habitat loss and degradation. An analysis of nest survey data collected between 2003 and 2013 across the entire range of the taxon did not detect a statistically significant decline (Strindberg, et al., 2018). Unlike gorillas, where an adult male will confront danger, chimpanzees slip away stealthily, and more often escape being killed. However, all the factors known to reduce chimpanzee populations (lack of forest guards, remoteness from roads, human population density, degree of forest intactness, etc.) were found to be significantly correlated with population density in the direction predicted (Strindberg, et al., 2018). All of these factors are increasing in either extent or intensity, or both, so we predict that, as the longitudinal dataset increases, a decline will be statistically easier to detect.

Eastern chimpanzee, *Pan troglodytes schweinfurthii*
The Albertine Rift escarpment in DRC is a stronghold for eastern chimpanzees, but recent surveys indicate 80–98% declines at some key sites in just 20 years, contributing to the major population declines seen in recent decades. It is estimated that the populations in eastern DRC have declined significantly (range of estimated decline 22–45%) between 1994 and 2015. Eastern chimpanzees are listed as Endangered. Source: Plumptre, et al. (2016b).

Nigeria-Cameroon chimpanzee, *Pan troglodytes ellioti*
This taxon has the lowest estimated population size of any chimpanzee subspecies. Its range is limited to clearly defined areas in southern Nigeria and central-southwest Cameroon. Its Endangered listing is based on an inferred population size reduction of between 50–80% over a three-generation period from the mid-1980s to 2060. Source: Oates, et al. (2016). Past presence of chimpanzees in Benin and Togo has been very poorly documented, but if chimpanzees were in those countries, it is probable that they belonged to this subspecies.

[2] Some text in Sections 2.3 and 3.3 is taken from the IUCN Red List assessments, as indicated by "Source".

Western chimpanzee, *Pan troglodytes verus*
This subspecies, *Pan troglodytes verus*, has recently been upgraded to Critically Endangered as it is expected to experience a decline exceeding 80% over the next 69 years, i.e. three generations (Humle et al., 2016). It is found in West Africa from Senegal to Ghana but has almost certainly become extinct in Burkina Faso in the 20th century (Ginn, et al., 2013; Campbell & Houngbedji, 2015). With a likelihood of probably more than 18,850 individuals, Guinea now hosts the largest remaining western chimpanzee population. Liberia and Sierra Leone are also strongholds for this subspecies (Kühl, et al., 2017). Approximately 17,000 individuals (half of the total western chimpanzee population) live in the region of Fouta Djallon (Regnaut & Boesch, 2012). Between 1990 and 2015, the Côte d'Ivoire population declined by 80% (Kühl, et al., 2017); only a few hundred individuals remain in the Taï and Comoé National Parks (Campbell, et al., 2008). Between 2008 and 2011, the population in the Lagoas de Cufadas National Park in Guinea-Bissau declined by more than 60% (Carvalho, et al., 2013).

Bonobo, *Pan paniscus*
Endemic to the DRC, the *Pan paniscus* population is estimated to have declined sharply in the last 15–20 years. This decline is projected to exceed 50% over a 75-year period from 2003 to 2078. The species is listed as Endangered. Source: Fruth, et al. (2016).

Table 4. African great ape population trends by taxon in descending order of abundance. *Except for mountain gorillas, estimates are based on the number of "nest builders", thus excluding infants. Estimates are based on both surveys and modelled results.*

Taxon	Abundance	Trend	Annual rate of change	Total estimated change	Period assessed	Source of trend
western lowland gorilla *Gorilla g. gorilla*	361,919 (302,973–460,093)*	Declining ↘	–2.7%	–19.4%	2005–2013	Strindberg, et al. (2018)
eastern chimpanzee *Pan t. schweinfurthii*	181,000–256,000	Declining ↘	–5.1%	–22–45%†	1994–2014	Plumptre, et al. (2015; 2016b)
central chimpanzee *Pan t. troglodytes*	128,760 (114,208–317,039)*	Declining ↘	>–4.95%	>–50%	2005–2013	Maisels, et al. (2016b)
western chimpanzee *Pan t. verus*	18,000–65,000*	Declining ↘	–6.43%	–80%	1990–2015	Kühl, et al. (2017)
bonobo *Pan paniscus*	15,000–20,000 minimum	Declining ↘	–5.95%§	–54.9%	2003–2015	Fruth, et al. (2016)
			–1%ø	>–50%	2003–2078	
Nigeria–Cameroon chimpanzee *Pan t. ellioti*	4,400–9,345	Declining ↘	–0.92–2.14%	–50–80%	1985–2060	Oates, et al. (2016)
Grauer's gorilla *Gorilla b. graueri*	3,800 (1,280–9,050)	Declining ↘	–7.4%	–94.2%	1994–2015	Plumptre, et al. (2016a; 2016c)
mountain gorilla *Gorilla b. beringei*	>1,000	Increasing ↗	+3.7%	+26%‡	2003–2010	Gray, et al. (2013); Roy, et al. (2014); Hickey, et al. (in prep.)
Cross River gorilla *Gorilla g. diehli*	<300	Declining ↘	N/A	N/A	N/A	Dunn, et al. (2014); R. Bergl & J. Oates pers. comm.

** Surveys conducted in 2003–2013 in western equatorial Africa were used to estimate total population size.*
† 22–45% decline estimated for eastern DRC only, not for the entire geographic range.
§ The confidence interval for this analysis is very large, suggesting an uncertainty in the data.

ø There is uncertainty surrounding the 5.95% annual decline; however, Fruth, et al. (2016) state that an annual loss of 1% would still lead to >50% decline of the bonobo population by 2078.
‡ Virunga population only. No estimate available for the Bwindi population due to changes in sampling method.

2.4. Threats to African great apes

Threats are discussed in detail in Section 4. The most important threats to great apes in Africa are poaching for bushmeat, habitat loss and degradation and infectious diseases. The term "poaching" is used as a synonym for illegal killing, but can have different motives, such as obtaining bushmeat or retaliation for crop foraging. Great apes may also become accidental victims of snares set for other species (see poaching categories in Table 10 of Section 4). Illegal trafficking of live infants is also an issue in some areas. The levels of these threats vary greatly between taxa (Table 5). Western lowland gorillas and central chimpanzees are treated together because their ranges overlap by 97% (Strindberg, et al., 2018).

Grauer's gorilla, *Gorilla beringei graueri*
Even though all killing, capture and consumption of great apes is illegal in the DRC, bushmeat poaching presents the most serious and immediate threat to Grauer's gorillas. This concerns the entire geographic range with a high demand for bushmeat created by the growing human population and widespread artisanal mining in remote areas (Kirkby, et al., 2015; Plumptre, et al., 2015; Plumptre, et al., 2016a). Miners working in Grauer's gorilla habitat admit to poaching gorillas, considering them as relatively easy to hunt with guns and providing large quantities of meat (Kirkby, et al., 2015, Spira, et al., 2017). Indiscriminate and conflict poaching also occur. Habitat loss and degradation, mainly driven by artisanal mining operations, farming (slash-and-burn agriculture) and livestock ranching to supply regional markets, also constitute a major threat. There is currently no commercial logging occurring in the Grauer's range, although artisanal logging is widespread. As parts of the DRC emerge from civil war, new concessions for timber, minerals and possibly petroleum will pose conservation challenges in the future. Another major threat to Grauer's gorillas is civil unrest in eastern DRC, which massively exacerbated the decline of this subspecies since the mid-1990s. Long-term conflict and insecurity resulted in rebel and civilian occupation of the forests, including protected areas, and severely restricted the ability of conservation organizations to monitor and protect gorillas, enforce hunting and protected area regulations and address intensifying threats. Only 26% of the predicted range of Grauer's gorillas overlaps with national parks and nature reserves. Source: Plumptre, et al. (2016c).

Mountain gorilla, *Gorilla beringei beringei*
Mountain gorillas live in the Bwindi Impenetrable National Park in Uganda and the Virunga Massif, shared by DRC, Rwanda and Uganda. Mountain gorilla habitat is well protected and conservation measures, including long-term activities such as intensive law enforcement, research, tourism and veterinary care have been proven to lower the impact of the main threats that are habitat loss, indiscriminate poaching and mortality due to disease (Robbins, et al., 2011). As a result of these conservation activities, population numbers have increased. Despite these positive results, challenges remain. Most poaching is indiscriminate (snares). There are occasional conflict killings and, in the past, mountain gorillas have been shot dead in both politically-motivated incidents and in crossfire (collateral). The mountain gorilla population is growing, but the habitat is surrounded by farms, limiting options for expansion. Another issue is climate change, which is likely to result in changes in food availability and habitat quality for the mountain gorillas, as well as the surrounding local communities, which could increase the challenges to conservation efforts. Source: Plumptre, et al. (2016d).

Cross River gorilla, *Gorilla gorilla diehli*
Cross River gorillas occur in 13 small forest fragments totalling approximately 600 km^2 in a landscape of 13,000 km^2. These fragments are surrounded by densely populated human settlements. Many of the subspecies' subpopulations are outside of protected areas and are at most risk from hunting and habitat loss. Although poachers do not specifically target gorillas, it is estimated that opportunistic bushmeat poaching removes 1–3 individuals from the population annually (though this may be an underestimate; Dunn, et al., 2014). Cross River gorillas are also occasionally killed or injured in snares (indiscriminate poaching). Their habitat is also under threat. Much of the suitable habitat in Cameroon has no protected status and there is rapid, ongoing conversion of forest to agriculture and grazing. There is also some habitat loss even inside the protected areas, and corridors between subpopulations are particularly vulnerable. For example, the Okwangwo Division of Nigeria's Cross River National Park and the adjacent Takamanda National Park in Cameroon contain enclaves of human settlements whose farmlands have spread beyond their legal boundaries. The small size of the Cross River population in general and its high level of fragmentation also make it more vulnerable to disease. The Ebola virus, which has caused significant mortality in *Gorilla g. gorilla* populations, has not been reported in *Gorilla g. diehli* populations. Nevertheless, their proximity to dense human populations and livestock heightens the risk of disease transmission (Dunn, et al., 2014). Source: Bergl, et al. (2016).

Western lowland gorilla, *Gorilla gorilla gorilla* and central chimpanzee, *Pan troglodytes troglodytes*
Poaching for bushmeat is the primary driver of decline in western lowland gorilla and central chimpanzee populations. Most of the terra firma forests outside the protected areas of their geographic range are now logging concessions (Global Forest Watch, 2017). A network of new logging roads provides rapid access to poachers and traffickers into previously inaccessible forests. Consignments of bushmeat can be rapidly sent, according to estimations, hundreds of kilometres out of the forests (Maisels, et al., 2016a). Infectious disease, especially the Ebola virus, is the second major driver of their decline. Surveys carried out since the 1980s show that a series of large great ape die-offs have occurred in a large forest region that straddles the border between northeastern Gabon and northwestern Congo. Approximately 14% of the total range of these taxa is thought to have been affected by the Ebola virus. At present, habitat loss (as opposed to habitat degradation) in the region is low, but this will change in the near future: 42% of the western lowland gorilla and central chimpanzee geographic range is considered suitable for oil palm, the progressive development of which could become a major threat to these taxa (Wich, et al., 2014). Approximately 80% of these two great ape subspecies live outside formally protected areas (Strindberg, et al., 2018), making them and their habitat vulnerable to habitat loss and bushmeat poaching. Sources: Maisels, et al. (2016a; 2016b).

Eastern chimpanzee, *Pan troglodytes schweinfurthii*
Bushmeat poaching is the greatest threat to great apes in eastern DRC, where large populations of eastern chimpanzees occur. Eastern chimpanzees are poached for bushmeat, especially around artisanal mining and logging camps, where bushmeat is often the main source of protein available. When adult chimpanzees are killed for bushmeat, their infants may end up in the ape trade as pets (Hicks, et al., 2010). Bushmeat poaching is evidenced by ongoing confiscations, as well as the hundreds of eastern chimpanzees housed in sanctuaries in the DRC (Plumptre, et al., 2015). In eastern DRC, armed groups involved in artisanal mining are responsible for much of the bushmeat poaching. In both eastern and northern DRC, poaching and illegal wildlife trafficking have been driven by insecurity over the past 20 years (Ondoua Ondoua, et al., 2017). Another major threat is habitat loss and degradation due to smallholder and shifting agriculture. Industrial agriculture (e.g. oil palm plantations) poses a potential future threat as eastern DRC stabilizes (Plumptre, et al., 2016b). Infectious diseases were identified as the major cause of death in chimpanzees at Gombe and Mahale in Tanzania (e.g. Goodall, 1986; Nishida, et al., 2003). The frequency of encounters between chimpanzees, humans and human waste is increasing as human populations expand, leading to higher risks of disease transmission to chimpanzees. Source: Plumptre, et al. (2016b).

Nigeria-Cameroon chimpanzee, *Pan troglodytes ellioti*
The two main threats to the survival of Nigeria-Cameroon chimpanzees are bushmeat poaching and habitat loss (Morgan, et al., 2011). These threats are exacerbated by the expansion of human populations in the subspecies' geographic range, as well as economic growth in Cameroon and Nigeria. Poaching represents the greatest threat to the survival of this taxon, both supplying bushmeat trade and, to a lesser extent, providing body parts for traditional medicine (superstition poaching) (Oates, et al., 2016). In 2002–2003, a six-month study in rural markets in southeastern Nigeria and southwestern Cameroon recorded 240 chimpanzee carcasses (Fa, et al., 2006). Furthermore, a five-week survey of eight markets in the transboundary region of Cross River State in Nigeria recorded six chimpanzee carcasses in 2009 (Oates, et al., 2016). Suitable habitat in Nigeria and Cameroon continues to be lost, degraded and fragmented by agriculture, logging, grazing and fire. In eastern Nigeria in particular, several forest reserves have been converted to farmland and to commercial oil palm and rubber plantations, while large areas of forest surrounding key protected areas, such as Okomu National Park, have already been converted to oil palm plantations. In Cameroon, extensive new oil palm developments are underway in both Littoral and Southwest Regions and new logging concessions continue to be established. The combined impacts of habitat loss and poaching have gradually fragmented *Pan t. ellioti* populations, so that many of those remaining are small and isolated. They are therefore at increased risk of extinction from disease and other unpredictable events. Source: Oates, et al. (2016).

Western chimpanzee, *Pan troglodytes verus*
Half of western chimpanzees reside in the region of Fouta Djallon in Guinea (Regnaut & Boesch, 2012). This area is characterized by traditional small-scale farming practices, predominantly by Fulani people, who neither eat nor kill chimpanzees for cultural reasons (Ham, 1998). The Fouta Djallon also contains the world's largest bauxite deposits and it is likely that industrial mining will occur in much of the chimpanzee habitat within the next decade (Kormos, et al., 2014). If mining proceeds at the scale planned, it will most certainly cause further population decline and thus threaten this stronghold of the subspecies (Kühl, et al., 2017). Mines also need electricity for their operations, and there are plans for hydrodams throughout the Fouta Djallon region, which could accelerate habitat loss (R. Kormos, pers. comm.). Other causes of the western chimpanzee decline include several types of poaching (bushmeat, indiscriminate, conflict, superstition), capture (and associated poaching and illegal trafficking), habitat loss and infectious diseases (Humle, et al., 2016); these threats and their underlying drivers have led to significant extirpation of chimpanzee populations, especially in Ghana and Côte d'Ivoire. Population declines in Côte d'Ivoire have been caused by large-scale deforestation inside and outside

of protected areas and classified forests. Such deforestation is a result of the rapidly growing human population, massive immigration from the Sahel Belt and the industrial-scale agricultural production of coffee, cacao, rubber and palm oil (Campbell, et al., 2008; Kühl, et al., 2017). The remaining strongholds of the western chimpanzee include Guinea, Sierra Leone and Liberia. Most chimpanzees in Sierra Leone and Liberia, however, occur outside protected areas, where subsistence agriculture has been a major driver of forest loss, and where coexistence with people is strained because chimpanzees consume crops and compete over wild resources, such as the oil palm. Chimpanzees in Liberia are threatened by poaching for bushmeat inside and outside protected areas (Greengrass, 2016), as well as by the rapidly developing mining, forestry and industrial-agricultural sectors (Junker, et al., 2015; Tweh, et al., 2015). Over 80% of the chimpanzee's geographic range outside protected areas in Liberia and Sierra Leone is at risk of industrialised agriculture and oil palm development (Wich, et al., 2014) and associated infrastructure, such as roads and hydrodams.

Bonobo, *Pan paniscus*

The most significant threat to bonobos is bushmeat poaching, followed by habitat loss through deforestation and fragmentation. Disease is likely to pose a threat in the future, with increased exposure to human populations. A number of indirect threats exist, including the proliferation of weapons in the region, weak law enforcement, weak stakeholder commitment to conservation, expansion of slash-and-burn agriculture and industrial scale commercial activities. Not only is there a massive demand for bushmeat stemming from the cities, but rebel factions and poorly paid government soldiers also add to that demand. Source: Fruth, et al. (2016).

Table 5. Major threats affecting African great apes at taxon level. *Some direct threats have a larger impact on great ape populations than others, but no quantitative comparisons are possible.*

Taxon	Main threats (direct)	Source
Grauer's gorilla *Gorilla b. graueri*	**Poaching** (types: bushmeat, indiscriminate, conflict, superstition, collateral). N.B. Illegal trafficking of live orphans is a by-product of bushmeat trade	Plumptre, et al. (2015; 2016c)
	Habitat loss, fragmentation and degradation due to artisanal mining, shifting and commercial agriculture	
	Disease	
	Climate change	
mountain gorilla *Gorilla b. beringei*	**Poaching** (types: indiscriminate, conflict, politically-motivated)	Gray, et al. (2010); Robbins, et al. (2011); Roy, et al. (2014)
	Disease	
	Climate change	
Cross River gorilla *Gorilla g. diehli*	**Habitat loss, fragmentation and degradation** due to shifting and commercial agriculture	Bergl, et al. (2016)
	Poaching (types: bushmeat, indiscriminate, conflict)	
western lowland gorilla *Gorilla g. gorilla*	**Poaching** (types: bushmeat, indiscriminate, conflict). N.B. Illegal trafficking of live orphans is a by-product of bushmeat trade	Maisels, et al. (2016a)
	Disease	
	Habitat loss and degradation and degradation due to extractive industries, commercial agriculture and infrastructure development	
western chimpanzee *Pan t. verus*	**Habitat loss, fragmentation and degradation** due to shifting and commercial agriculture, extractive industries and infrastructure development	Humle, et al. (2016); Kühl, et al. (2017)
	Poaching (types: bushmeat, indiscriminate, conflict, superstition, live capture)	
	Illegal trafficking of live animals	
	Disease	
Nigeria-Cameroon chimpanzee *Pan t. ellioti*	**Poaching** (types: bushmeat, indiscriminate, conflict)	Oates, et al. (2016)
	Habitat loss fragmentation and degradation due to shifting and commercial agriculture	
	Disease	

central chimpanzee *Pan t. troglodytes*	**Poaching** (types: bushmeat, indiscriminate). N.B. Illegal trafficking of live orphans is a by-product of bushmeat trade	Maisels, et al. (2016b)
	Disease	
	Habitat loss, fragmentation and degradation due to extractive industries, commercial agriculture and infrastructure development	
eastern chimpanzee *Pan t. schweinfurthii*	**Poaching** (types: bushmeat, indiscriminate, conflict, superstition). N.B. Illegal trafficking of live orphans is a by-product of bushmeat trade	Plumptre, et al. (2015; 2016b)
	Habitat loss, fragmentation and degradation due to shifting and commercial agriculture, artisanal and industrial mining, and infrastructure development	
	Disease	
	Climate change	
bonobo *Pan paniscus*	**Poaching** (types: bushmeat, indiscriminate, superstition). N.B. Illegal trafficking of live orphans is a by-product of bushmeat trade	Fruth, et al. (2016)
	Habitat loss and degradation from shifting agriculture, mining and infrastructure development	
	Disease	Sakamaki, et al. (2009); IUCN & ICCN (2012)

3. Asian great apes

3.1. Current distribution of Asian great apes

Orangutans are the only great apes found in Asia and exist solely on the islands of Sumatra and Borneo (Figure 2), in Indonesia and Malaysia (Wich, et al., 2008). There are three species of orangutans: the Bornean orangutan (*Pongo pygmaeus*), the Sumatran orangutan (*Pongo abelii*) and the recently described Tapanuli orangutan (*Pongo tapanuliensis*). Bornean orangutans are further divided into three subspecies: *Pongo pygmaeus pygmaeus*, *Pongo pygmaeus wurmbii* and *Pongo pygmaeus morio* (see Table 6).

Table 6. The Asian great apes

Genus	Species	Subspecies
Pongo 3 species	**Bornean orangutan** *Pongo pygmaeus* 3 subspecies	**northwest Bornean orangutan** *Pongo pygmaeus pygmaeus*
		southwest Bornean orangutan *Pongo pygmaeus wurmbii*
		northeast Bornean orangutan *Pongo pygmaeus morio*
	Sumatran orangutan *Pongo abelii*	**No subspecies currently recognized**
	Tapanuli orangutan *Pongo tapanuliensis**	**No subspecies currently recognized**

** New species described by Nater, et al. (2017)*

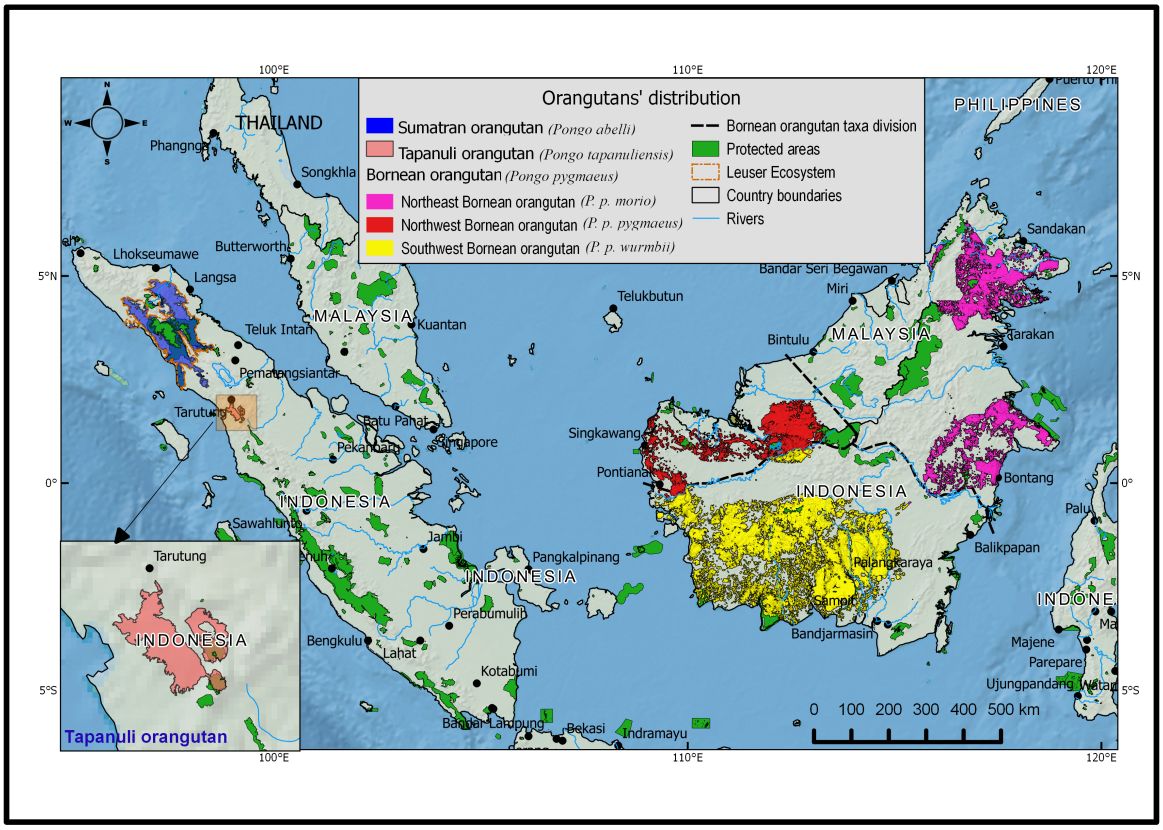

Figure 2. Geographic distribution of Asian great ape taxa (orangutans; IUCN SSC A.P.E.S. database, 2017), Max Planck Institute for Evolutionary Anthropology.

3.2. Asian great ape population sizes

3.2.1. Population size estimates per country

Table 7. All Asian great ape population estimates per country†

Country	Taxon	Abundance*	IUCN status	Year of estimate	Source
Indonesia	**northwest Bornean orangutan** *Pongo p. pygmaeus*	5,200 (3,800–7,200)	Critically Endangered	2018	Calculated from Voigt, et al. (2018)
	southwest Bornean orangutan *Pongo p. wurmbii*	97,000 (73,800–135,000)	Critically Endangered	2018	Calculated from Voigt, et al. (2018)
	northeast Bornean orangutan *Pongo p. morio*	24,800 (18,100–35,600)	Critically Endangered	2018	Calculated from Voigt, et al. (2018)
	Sumatran orangutan *Pongo abelii*	13,900 (5,400–26,100)	Critically Endangered	2016	Wich, et al. (2016)
	Tapanuli orangutan *Pongo tapanuliensis*	800 (300–1,400)	Critically Endangered	2016	Wich, et al. (2016)
Malaysia	**southwest Bornean orangutan** *Pongo p. wurmbii*	1,100 (800–1,600)	Critically Endangered	2018	Calculated from Voigt, et al. (2018)
	northeast Bornean orangutan *Pongo p. morio*	11,000 (8,000–18,000)	Critically Endangered	2005	Ancrenaz, et al. (2005)

† A PHVA workshop took place in Indonesia in 2016. The report awaits final approval.
** Numbers rounded to the nearest 100. 95% confidence intervals in parentheses.*

3.2.2. Population size estimates per taxon

Bornean orangutan, *Pongo pygmaeus*
Abundance estimates for *P. pygmaeus pygmaeus, P. pygmaeus wurmbii* and *P. pygmaeus morio*, all listed as Critically Endangered, are presented in Table 8.

Sumatran orangutan, *Pongo abelii*
Previously estimated to number 6,600 (Wich, et al., 2008), the most recent abundance estimate for the Sumatran orangutan is estimated at 13,900 individuals, in a total area of 16,775 km² of forest (Wich, et al., 2016). This latest estimate does not reflect an increase in Sumatran orangutan numbers, but it is explained by much improved survey techniques and coverage, and hence more accurate data. Considering only populations that are potentially viable over the long term (i.e. > 250 individuals), there are just 13,587 individuals left. The vast majority (95%) occurs in the Leuser ecosystem, while other populations are found in the Sidiangkat, Pakpak and Batang Toru forests (Singleton, et al., 2017). The overall numbers continue to decline dramatically (Wich, et al., 2016). The species is classified as Critically Endangered.

Tapanuli orangutan, *Pongo tapanuliensis*
This new great ape species was first described in 2017 (Nater, et al., 2017). The Nater, et al. (2017) study showed that an isolated orangutan population found in the Batang Toru ecosystem of Sumatra, in the southernmost range of extant Sumatran orangutans, is distinct from other Sumatran and Bornean populations. With a total estimated population of fewer than 800 individuals (Wich, et al., 2016), *Pongo tapanuliensis* is the great ape species with the lowest total number of individuals, and is Critically Endangered.

3.3. Temporal trends in Asian great ape populations

Table 8. Asian great ape population decline by taxon

Species	Subspecies	Abundance	Trend	Annual rate of change	Total estimated change	Period	Source of trend
Bornean orangutan	**northwest Bornean orangutan** *Pongo p. pygmaeus*	6,300 (4,700–8,600)	Declining ↘	–4.71%	–53%	1999–2015	Calculated from Voigt, et al. (2018)
	southwest Bornean orangutan *Pongo p. wurmbii*	97,000 (73,800–135,000)	Declining ↘	–4.71%	–53%	1999–2015	Calculated from Voigt, et al. (2018)
	northeast Bornean orangutan *Pongo p. morio*	30,900 (22,800–44,200)	Declining ↘	–4.45%	–52%	1999–2015	Calculated from Voigt, et al. (2018)
Sumatran orangutan	**Sumatran orangutan** *Pongo abelii**	13,900 (5,400–26,100)	Declining ↘	–2.37%	–30%*	2015–2030	Wich, et al. (2016)
Tapanuli orangutan	**Tapanuli orangutan** *Pongo tapanuliensis*	800 (300–1,400)	Declining ↘	–2.36% (for 1985–2060)	–83%	1985–2060	Nowak, et al. (2017)

**See temporal trends text for the Sumatran orangutan trend based on forest loss. Confidence intervals rounded to the nearest 100, 95% confidence intervals in parentheses. Under the current land-use scenario, as many as 4,500 individuals could disappear by 2030. Other scenarios are mentioned in Wich, et al. (2016).*

Bornean orangutan, *Pongo pygmaeus*; subspecies: *Pongo p. pygmaeus, Pongo p. wurmbii, Pongo p. morio*
Recent studies on the temporal trends of Bornean orangutans found declines of 25% over a 10-year period (~2000–2010; Santika, et al., 2017) and approximately 50% for the period of 1999–2015 (Voigt, et al., 2018). Based on predicted land-cover change alone, a further 43,000 Bornean orangutans could be lost by 2050, this is

an equivalent of 50–60% of the current estimated population (Voigt, et al., 2018). Climate change and land-cover prediction models further show that, under a business as usual scenario, 68–81% of the Bornean orangutan habitat will be lost by 2080 (Wich, et al., 2015).

Sumatran orangutan, *Pongo abelii*
The decline of the Sumatran orangutan to its current estimated population of 13,900 in 2016 (Wich, et al., 2016) has not been systematically quantified. However, forest loss data indicate that the decline must have been large. Between 1985 and 2007, the Sumatran orangutan lost 60% of its key forest habitat (>500 m). Future predictions of forest loss indicate that a further 4,500 Sumatran orangutans, about one-third of the current population, could be lost by 2030 (Wich, et al., 2016).

Tapanuli orangutan, *Pongo tapanuliensis*
A quantitative population viability analysis estimated that, in 1985, there would have been ~1,489 individuals of the Tapanuli orangutan, and that the population would decline to only 257 individuals over a 75-year period by 2060 (Nowak, et al., 2017). If the key threats are not effectively reduced, an 83% decline over the course of three generations is predicted. Source: Nowak, et al. (2017).

3.4. Threats to Asian great apes

Bornean orangutan, *Pongo pygmaeus*; subspecies: *Pongo p. pygmaeus, Pongo p. wurmbii, Pongo p. morio*
Widespread forest clearance for industrial plantations, cultivation for food, mining infrastructure and rural development, combined with illegal logging, fire and several types of poaching (bushmeat, conflict and live capture), are the main threats to this taxon and have dramatically reduced the number of Bornean orangutans (Wich, et al., 2008; Wich, et al., 2012b; Santika, et al., 2017; Voigt, et al., 2018). Data from the Global Forest Resources Assessment shows a 2.4% forest loss between 2000 and 2015 and a 0.7% loss between 2010 and 2015 for the whole of Borneo (FAO, 2015). This translates to an annual rate of deforestation estimated at more than 3,000 km^2 per year between 2000 and 2010 (Gaveau, et al., 2014). If this deforestation rate continues, it is predicted that 32,000 km² of forest could be lost by 2020, 129,000 km² by 2050 and 226,000 km² by 2080 (Wich, et al., 2015). Most of this deforestation occurs in peatlands that generally harbour large orangutan populations. In 2010, 80% of the range in Kalimantan was located outside protected areas, consisting of commercial forest reserves exploited for timber and forest areas earmarked for conversion to agriculture. The situation is different in Malaysia, where currently more than 80% of orangutans are found in fully-protected forests. Besides forest loss, poaching is another major cause of Bornean orangutan decline (see poaching categories in Table 10 of Section 4). On average, an estimated 1,950–3,100 orangutans were were killed per year within the lifetime of survey respondents (Meijaard, et al., 2011) principally for meat consumption (bushmeat poaching) or during human-orangutan conflict (conflict poaching) (Davis, et al., 2013; Voigt, et al., 2018). This means that habitat protection alone will not ensure the survival of orangutans and that effective reduction of orangutan killings is urgently needed (Ancrenaz, et al., 2016). Other threats are fires that contribute to habitat loss and fragmentation, lack of environmental awareness and climate change (Ancrenaz, et al., 2016; Santika, et al., 2017; Voigt, et al., 2018).

Sumatran orangutan, *Pongo abelii*
Habitat loss and fragmentation seriously threaten the survival of the Sumatran orangutan (Wich, et al., 2011; Wich, et al., 2016). Forests continue to be cleared on a large scale (hundreds of square kilometres) for oil palm plantations. On a smaller scale, logging for timber (both legal and illegal) remains a threat. In addition, the creation of new roads fragment populations and provide access for illegal settlements and further encroachment for agriculture and plantations (also frequently illegal) and to wildlife poachers (Singleton, et al., 2017). Sumatran orangutans are frequently killed deliberately during human-wildlife conflict (conflict poaching), and surviving infants end up in the illegal pet trade (Nijman, 2009; Singleton, et al., 2017). A significant spatial threat to the Sumatran orangutan comes from the 2013 Aceh province spatial land-use plan allowing large areas of the Leuser ecosystem, which hosts 90% of Sumatran orangutans, to be designated for oil palm plantations as well as timber and mining concessions (Wich, et al., 2016). With the same Leuser ecosystem designated in 1997/98 as a National Strategic Area for its environmental function under Aceh's special autonomy law, and it being the main stronghold of the Sumatran orangutan, revising the spatial land-use plan as a priority would have meaningful benefits for future orangutan populations.

Tapanuli orangutan, *Pongo tapanuliensis*
The Tapanuli orangutan is under considerable threat from high levels of habitat loss and fragmentation, as well as from bushmeat poaching, killing during crop conflict (conflict poaching) and illegal trade in young orangutans, fuelled by a population influx from the west of Sumatra. A substantial section of its range is threatened by habitat conversion for small-scale agriculture, mining exploration and exploitation, a large-scale hydroelectric scheme and geothermal development (Nowak, et al., 2017). Due to their slow reproduction rate, with a generation time of about 25 years (Wich, et al., 2004; Wich, et al., 2009), orangutans on Sumatra are

unable to cope with significant and continued individual losses. The small population size and geographic isolation of *Pongo tapanuliensis* may lead to inbreeding depression (Hedrick & Kalinowski, 2000) and threaten population persistence (Allendorf, et al., 2013).

Table 9. Summary of threats facing Asian great apes per taxon

Species	Main threats	Source
Bornean orangutan *Pongo pygmaeus*	**Habitat loss, fragmentation and degradation** due to agriculture, extractive industries and fire	Ancrenaz, et al. (2016); Voigt, et al. (2018)
	Poaching (types: bushmeat, conflict)	
	Climate change	Struebig, et al. (2015)
Sumatran orangutan *Pongo abelii*	**Habitat loss, fragmentation and degradation** due to agriculture, extractive industries, and infrastructure (roads)*	Wich, et al. (2012a; 2016); Singleton, et al. (2017)
	Poaching (type: conflict)	Wich, et al. (2012a); Singleton, et al. (2017)
Tapanuli orangutan *Pongo tapanuliensis*	**Habitat loss, fragmentation and degradation** due to agriculture, extractive industries and construction of large-scale infrastructure (e.g. hydroelectric dam)	Nowak, et al. (2017)
	Poaching (types: bushmeat, conflict)	Wich, et al. (2012a)

**Cases of illegal trade as a by-product of habitat loss have been reported (Singleton, et al., 2017), but in these cases trade is not a direct threat; the direct threat is habitat loss.*

4. Description of threats

The most important direct threats to great apes are habitat loss, degradation and fragmentation, infectious disease, bushmeat poaching, indiscriminate poaching, and deliberate killing due to conflicts over resources, usually cultivated foods. The relative importance of these threats varies by taxon and location. Areas with high human population densities tend to have the most degraded habitats and the lowest ape densities. Many range States are among the poorest countries in the world, with growing populations and development aspirations, including DRC, Guinea, Liberia, Rwanda and Uganda. Sub-Saharan African human population growth rates are among the highest in the world, at about 2.7% overall (World Bank, 2018). This places ever-increasing pressure on land, natural resources and wildlife. Consequently, a thorough understanding of local circumstances is required to address the main threats to great apes, as they cannot be considered in isolation from each other.

Habitat loss, degradation and fragmentation
Great apes depend on forest ecosystems, but these are increasingly threatened by industrial and small-scale agriculture, resource extraction such as logging and mining, as well as infrastructure development (e.g. Ancrenaz, et al., 2015). Mirroring the major role that palm oil has played in the loss of great ape habitats in Asia, the progressive development of plantations is a future threat to the African great apes (Wich, et al., 2014). Once a forest habitat is lost, it is very difficult to restore and repopulate it. Laurance, et al. (2015) describes the environmental costs of 33 planned or under-construction development corridors in Sub-Saharan Africa. It is important to note that some great ape taxa can survive in reduced-impact logging areas (gorillas and chimpanzees: Morgan, et al., 2017; orangutans: Ancrenaz, et al., 2010). However, survival in low impact logging areas is only possible when the logging is carefully controlled, does not lead to subsequent uncontrolled logging and further habitat deterioration and when bushmeat poaching is not a threat (Morgan & Sanz, 2007; Ancrenaz, et al., 2010). Any progressive loss of forest resources (as opposed to rapid loss or habitat conversion) also necessitates high levels of tolerance from people in surrounding areas if great apes are to persist, especially if great apes turn to foraging on crops to supplement their diet, which is the case for orangutans in Asia and many chimpanzee populations in West and East Africa (Hockings & Humle, 2009; Campbell-Smith, et al., 2012; Bryson-Morrison, et al., 2016, Garriga, et al., 2017).

Disease
Great apes and humans are very closely related and are susceptible to the same deadly diseases (Gilardi, et al., 2015). Such diseases include Ebola, anthrax, Marburg viruses and respiratory diseases, with the risk of

transmission growing as human populations expand into great ape territories (Leendertz, et al., 2006). Pathogen transfer goes both ways and the consumption of bushmeat can contribute to infections in humans (Leendertz, et al., 2017). The spread of disease in great apes is facilitated by habitat fragmentation, close proximity between ape populations and human settlements and high frequency of human-great ape interactions (Gilardi, et al., 2015).

Poaching
The term "poaching" is used as a synonym for illegal killing, but can have different purposes (see Table 10). We categorize (but do not attempt to quantify) the key types of poaching according to motivation and/or context in which killing takes place.

Table 10. Key categories of poaching (illegal killing)

Type 1: Great apes are targeted and killing is intentional		
a	Bushmeat	Most killing in this context is opportunistic, i.e. great apes are killed while hunters are tracking other species, such as antelopes or monkeys. However, in some range States, great apes are occasionally killed deliberately to serve their meat as a delicacy or high-status food at traditional or political functions. N.B. If infants are captured alive when their mothers are killed for bushmeat, these orphans may be illegally trafficked. This trade is a by-product of poaching for bushmeat, so is classed as bushmeat poaching (see also 1d below).
b	Conflict	Great apes are killed over competition for natural resources (see Hockings & Humle, 2009). Retribution killings motivated by crop-foraging or injuries to people are in this category. Illegal killing and capture may occur on a large-scale when land is cleared or converted to other land uses.
c	Superstition	Great apes are sometimes killed for traditional ceremonies and "medicine" – superstitious beliefs, including black magic. N.B. Body parts from a dead ape that are used for superstitious purposes when the primary motivation for killing was to obtain meat (1a above) are secondary uses and therefore classed as bushmeat poaching; e.g. bones or digits used to confer "strength" upon hunters or human infants.
d	Live	Live capture and associated killing covers taking live infant great apes as the primary motivation (as opposed to the primary motivation being to obtain bushmeat). Live capture is in itself illegal, but obtaining an infant necessitates killing the mother and usually other group or community members. N.B. The majority of orphaned infants thought to be destined for the illegal wildlife trade were not targeted by poachers with the intention of trading them – this trafficking is a "by-product" of bushmeat poaching (1a above).
e	Politically-motivated	Killing of great apes can result from conflict with government, usually the protected area authorities, or specifically with law enforcement agents.

Type 2: Great apes are not targeted or killing is not intentional		
a	Indiscriminate	Great apes are accidentally caught in snares intended for other species. Often the apes are maimed and lose a hand or foot. These incidents are fatal when the animals are unable to free or feed themselves, or when they develop gangrene or septicaemia.
b	Collateral	Great apes have been shot in civil conflicts – killed in crossfire. Even when the killing is accidental, the ape is usually eaten. N.B. Civil war and insecurity exacerbate illegal activities, including bushmeat poaching (1a above).

CITES, INTERPOL and World Customs Organization (WCO) databases (SC65, Doc. 37) only record international trade, thereby under-representing domestic trade. This highlights the need for domestic monitoring.

A) Domestic trade
Poaching is a key threat to all great ape taxa (Tables 5 and 9). Almost all wildlife species (mammals, birds, reptiles, amphibians and even insects) are eaten throughout West and Central Africa, and a huge bushmeat trade network has developed where very large numbers of animals are hunted in remote forest areas and brought to industrial camps (logging, mining), towns and cities for profit, often over very long distances (e.g. Nasi, et al., 2008; Fa & Brown, 2009; Wilkie, et al., 2011; Wilkie, et al., 2016; Ziegler, 2016). For example, animals are hunted in Salonga National Park in central DRC and the meat is smoked and then transported on foot and by bicycle, hundreds of kilometres south to the mining towns in Katanga, where the purchasing power of

consumers is far higher than in the source villages (e.g. Colom, 2006; Steel, et al., 2008; Abernethy, et al., 2010).

Great ape populations in West and Central Africa are highly threatened by the bushmeat trade (e.g. Refisch & Koné, 2005; Plumptre, et al., 2010; Plumptre, et al., 2015; Fruth, et al., 2016; Maisels, et al., 2016c). New roads to remote forest areas facilitate the expansion of the bushmeat trade. For example, in Congo, the road from Brazzaville to Ouesso opens access to remote landscapes and enables transport of bushmeat. Illegal and unsustainable killing has brought many species to the brink of extinction, causing the "empty forest" syndrome (Redford, 1992; Wilkie, et al., 2011). Although great apes are killed for their meat, they are not generally specifically targeted. The killing of a mother may enable opportunistic capture of infants, which may then be trafficked illegally (e.g. Plumptre, et al., 2016b, 2016c; Singleton, et al., 2017). There is evidence of deliberate hunting of Cross River gorillas for bushmeat in Cameroon (Dunn, et al., 2014). Some communities, particularly in Africa, consider great apes to be their close relatives and hence the killing of them is a taboo (e.g. in some parts of West Africa; Kormos, et al., 2003); or along the Congolese coast (Dowsett & Dowsett-Lemaire, 1991). However, in Central Africa, these taboos against eating western lowland gorillas and central chimpanzees only exist in approximately 1% and 5% of their geographic ranges, respectively (Strindberg, et al., 2018). African apes are also killed for traditional medicine or witchcraft. For example, Sá, et al. (2012) suggest that poaching for superstitious reasons threatens chimpanzee populations in Guinea-Bissau.

Poaching of orangutans for food occurs extensively in Borneo, especially in the Indonesian parts of the island (Davis, et al., 2013), and to a lesser extent in the range of the Tapanuli orangutan on Sumatra (Wich, et al., 2012b). It is not known how much trade in orangutan meat occurs, but orangutans have been killed to sell their meat to local communities (Davis, et al., 2013). Sumatran and Tapanuli orangutans are similarly at risk from bushmeat poaching and killing as a result of habitat destruction or human-wildlife conflict (Nowak, et al., 2017; Singleton, et al., 2017).

Although funding has gone into providing alternative protein, the impact of such investments has been marginal and, indeed, rarely quantified. Wicander & Coad (2015) investigated 64 projects in Central Africa that aimed to encourage the production of alternative sources of protein, and in some cases, to increase revenue of the target communities. Unfortunately, very few of these projects monitored the impact of their efforts, so no conclusion could be reached as to whether they succeeded in their aims. Possibly because there were, in most cases, either no mechanisms for compliance, or no sanctions for noncompliance, or both, many participants were likely to develop new protein sources as an additional activity, rather than an alternative activity. In other words, new activities were added to hunting and bushmeat trade rather than replacing them. In some cases, commercial hunters from outside the communities posed a far higher threat to wildlife or ecosystems than did the local communities themselves, rendering project activities ineffective in the face of external pressure. It is essential to build in and budget for monitoring of project impacts, or it will be impossible to gauge success and failure in order to improve the effectiveness of future approaches.

B) International trade

Poaching for bushmeat poses particular challenges to enforcement, with species-specific identification of bushmeat being a key to addressing this threat. Numerous publications have investigated bushmeat issues in Africa and Asia (for examples see: Nasi, et al., 2008; Fa & Brown, 2009; Meijaard, et al., 2011; Wilkie, et al., 2011; Wilkie, et al., 2016; Foerster, et al., 2012; Coad, et al., 2013; Ziegler, 2016). However, the volume of bushmeat that crosses international borders – which is specifically relevant to CITES – is particularly difficult to estimate. The vast majority of transborder trade in great ape meat is not transcontinental but rather across neighbouring country boundaries, where detection is weak. All smuggled goods, including ape meat, can easily be transported in small boats across rivers, which form highly porous international boundaries. Across terrestrial borders, trafficked goods often travel undiscovered in bush taxis, minibuses, motorcycles, or even on foot through unpatrolled forests. The vast majority of gorillas, for example, live in Gabon and Congo and their meat is trafficked mostly within those two countries and across the borders to the cities of neighbouring countries. Kinshasa in DRC, Yaoundé and Douala in Cameroon, and Bata in Equatorial Guinea are major destinations for all types of bushmeat, including great ape meat, which is trafficked from the more wildlife-rich parts of the region. Intercontinental trade does occur, but is completely dwarfed by the subregional illegal trade. Only two studies at airports in Europe have been carried out. These indicate that there is an active international bushmeat trade from West and Central Africa to Paris, which could be used as transit points to other European countries (Chaber, et al., 2010; Wood, et al., 2014). However, more research is required to determine how much great ape meat is involved in this trade (Chaber, et al., 2010).

Illegal live trade

The illegal trade in live great apes has been recognized as a threat to their survival since the 1980s (e.g. SC66 Doc. 48.2). The current scale of this trafficking is unknown. Indications of ongoing live trade include records from the United Nations Office on Drugs and Crime (UNODC) of 208 live apes seized since 2000 (UNODC,

2016). In 2017 alone, 20 great ape traffickers were arrested, and 12 live chimpanzees were seized in three African great ape range States, Cameroon, Gabon and Guinea (EAGLE Network, 2017). In most cases of illegal live ape capture and trafficking, adults must be killed to obtain infants (see, for example, Plumptre, et al., 2015; Humle, et al., 2016; Singleton, et al., 2017). Evidence indicates that illegal trade in live great apes is a secondary effect of habitat loss and poaching or conflict-related killing. Great apes are often captured and traded opportunistically, as opposed to poachers entering the forest to deliberately capture infants (e.g., Nijman, 2009; Davis, et al., 2013; Plumptre, et al., 2016b, 2016c; Humle, et al., 2016; Singleton, et al., 2017).

Known instances of apes being targeted for capture and subsequent trade include Guinea, where highly organised syndicates have used fraudulent CITES papers to trade chimpanzees with China (CITES mission to Guinea in 2011).

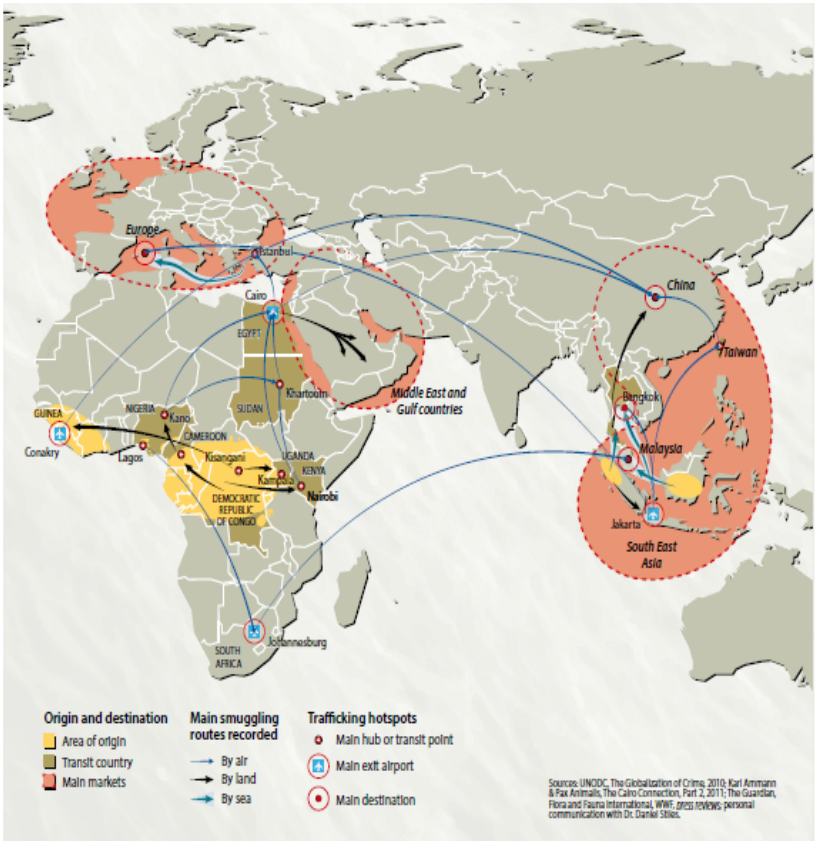

Figure 3. Main international routes for the illegal trade of live great apes (Stiles, et al., 2013).

Combined impacts of economic development

Many great ape range States are rich in natural resources, for example Guinea, DRC and Indonesia. The expanding extractives sector is one of the key drivers collectively accelerating the threats faced by great apes. This poses new challenges for great ape conservation, due to the difficulties in reconciling conservation priorities with urgently needed economic development. Alongside the direct impact of habitat loss caused by mines, logging concessions, roads and other infrastructure (e.g., transmission lines or dams), new development attracts huge numbers of people from far away in search of new opportunities (Rainer, et al., 2014). This often leads to uncontrolled additional development including artisanal mining and farming, and the associated threat of poaching for bushmeat. For example, Poulsen & Clark (2010) described poaching for bushmeat inside logging concessions and Spira, et al. (2017) discuss the increase in bushmeat poaching of gorillas and chimpanzees around mines.

5. International agreements specific to great ape range States

The Agreement on the Conservation of Gorillas and Their Habitats (or Gorilla Agreement) was developed under the auspices of Convention on the Conservation of Migratory Species of Wild Animals (CMS) and has been in force since November 2008. At the 12th CMS Conference of the Parties, in 2017, chimpanzees were listed as a migratory species under CMS.

The Gorilla Agreement is an important international legal instrument, as it is a Multilateral Environmental Agreement covering all 10 gorilla range States. The agreement provides governments, IGOs, NGOs, scientists, local people and the international community at large with a legally-binding framework to maintain and rehabilitate gorilla populations and their habitats. The Agreement is administered by the CMS Secretariat, which works closely with GRASP and benefits from partnerships with other organizations, including CITES and the IUCN Species Survival Commission (SSC). Central African Republic, Congo, DRC, Gabon, Nigeria, Rwanda and Uganda are Parties to the agreement. Equatorial Guinea has signed but not ratified, and Angola and Cameroon have not signed yet (Gorilla Agreement, 2008: www.cms.int/en/legalinstrument/gorilla-agreement).

As many great ape habitats extend beyond political state borders, land-use planning and protected areas management require cross-border cooperation. However, transboundary conservation efforts can easily become complex. To be successful, they require high-level political commitment, sustained financial and technical support, cross-sectorial collaboration, strong institutional coordination and inclusion of all impacted stakeholders in the decision-making process. Examples of particularly encouraging initiatives include transboundary collaboration between DRC, Rwanda and Uganda in the Greater Virunga Landscape (Refisch & Jenson, 2016); the Sangha Trinational which includes Congo, the Central African Republic and Cameroon; the Transboundary Peace Park for Sierra Leone and Liberia which unites the Gola Rainforest National Park in Sierra Leone and the Gola Forest National Park in Liberia; the Mayombe Transboundary Initiative encompassing Luki Reserve in DRC, Dimonika Reserve in Congo and Maiombe National Park in Cabinda, Angola (Ron & Refisch, 2013); and the Heart of Borneo Initiative uniting the interior regions of Indonesian and Malaysian Borneo and Brunei Darussalam.

6. Challenges and solutions

Almost all great ape populations are in decline in both Africa and Asia, sometimes so drastically that the population viability is in doubt. Following similar developments in Southeast Asia, the African landscape will soon experience a dramatic change through large-scale investments in extractive industries, transport infrastructure and commercial agriculture (Edwards, et al., 2014; Wich, et al., 2014; Laurance, et al., 2015; Rainer, et al., 2015; Sloan, et al., 2016). While these industries can help lift people out of poverty, operations must be sensitive to the local biodiversity values and ecosystem services on which local communities and wildlife heavily rely. Hence, inclusive and integrated land-use planning processes and implementation of biodiversity-friendly business practices are required if such economic activities are to be accommodated sustainably in great ape habitats. The most sensitive and rich ecosystems in great ape habitats should be protected, ideally through designation as off-limits to habitat modification. In this respect, a number of initiatives seek to minimize the negative impact of industrial activities (logging, industrial scale agriculture and extractives) on biodiversity. These efforts include the Forestry Stewardship Council (FSC) for sustainable logging, the Roundtable for Sustainable Palm Oil (RSPO), the Business and Biodiversity Offsets Programme (BBOP) and associated standards (BBOP Standard on Biodiversity Offsets), the International Finance Cooperation (IFC) Performance Standard 6, the Equator Principles, the Global Oil and Gas Industry Association for Environmental and Social issues (IPIECA), the International Council on Mining and Metals (ICMM) and other initiatives. The description of each initiative and its potential benefit for the conservation of great apes and their habitats goes beyond the purpose of this report.

Law enforcement is currently insufficient to halt illegal trafficking of live great apes or great ape body parts. Arrests and convictions for holding or selling great apes (or bushmeat of any kind, including ape meat) remain rare (Nijman, 2005). *Stolen Apes* reported just 27 arrests for great ape trade between 2005 and 2011 – one quarter of which were never prosecuted (Stiles, et al., 2013). Peer-reviewed studies found weak enforcement and lenient sentencing insufficient to deter further crime, and only one prosecution in two provinces of West Kalimantan, Indonesia for orangutan trading between 2006-2016 (Freund, et al., 2017; Nijman, 2017). Freund, et al. (2017) found that of 145 orangutan cases reported and 133 rescues/confiscations during the study period, none resulted in prosecution or charges. Nijman (2017) found that across Indonesia, between 1993 and 2016, at least 440 formal confiscations and surrenders of orangutans to law enforcement agencies resulted in only seven successful convictions. Reported convictions have been criticized for light sentences, which may not deter further crime. For example, four oil palm workers were sentenced to 8–10 months in prison for killing two orangutans and four people were sentenced to eight months in prison for killing 20 orangutans (Jakarta Post, 2012). Corruption can render wildlife law enforcement ineffectual, as deterrence become difficult to achieve (Bennett, 2015). Many of the world's great ape range States score poorly on the Corruption Perceptions Index (Transparency International, 2018). In many cases, convicted and incarcerated criminals have been able to bribe their way to liberty (Martini, 2013; WWF & TRAFFIC, 2015; Wyatt & Ngoc Cao, 2015). Without convictions and effective deterrence, it will not be possible to reduce the rates of illegal killing that threaten all great ape taxa. In this context, understanding the whole chain of actors involved in the bushmeat trade is necessary in

order to address the threat. Caspary, et al. (2001) described the entire bushmeat network around the Tai National Park in Côte d'Ivoire, including urban bushmeat markets and restaurants.

Improvements in law enforcement efforts are underway in several countries. The EAGLE network, which started in Cameroon, has now been replicated in Benin, Congo, Gabon, Guinea, Côte d'Ivoire, Madagascar, Senegal, Togo and Uganda, with increasingly visible success (EAGLE Network, 2018). Partnerships between EAGLE members and national governments result in environmental crimes being detected, followed up and brought to justice. The emphasis is usually on ivory as well as on great ape meat and live trade. For example, efforts by the EAGLE network member LAGA in Cameroon, in collaboration with the government, resulted in a record number of eight court judgments against 13 wildlife traffickers in Cameroon in 2017, with two traffickers receiving maximum penalties of three years imprisonment (EAGLE Network, 2017). In Indonesia in 2016, three orangutan smugglers were sentenced to up to 2.5 years in prison (Tempo, 2016), and in 2017, an orangutan killer was given a sentence of two years and nine months in prison (Robin des Bois, 2016; the organisation produces a quarterly newsletter of wildlife illegal trade records across the world). More work is needed to build on these efforts and establish deterrence against further illegal capture, killing, holding or sale of great apes across all range States.

In the context of the CITES mandate, more research is required to understand the scale of illegal cross-border trade in live great apes and their body parts. As detailed above, bushmeat crosses borders with little or no control. It is often difficult to identify body parts to species level (meat can be smoked and/or cut into sections) or by country of origin.

Both illegal meat and live trade are facilitated by corruption, lack of law enforcement, and in some range States, impunity. High profit margins and low risks to wildlife criminals have meant that people engaged in other types of crime (e.g. drugs trafficking) have added wildlife crime to their activities. Furthermore, e-commerce has given suppliers and smugglers unprecedented access to new markets (Estrada, et al., 2017). The development of social media outlets as venues for wildlife trade is responsible for an explosion of illegal trade in numerous species that are now sold illicitly through the Internet (CITES CoP17 Doc. 29; Harrison, et al., 2016). CITES Decisions 17.92-17.96 direct Parties, the CITES Secretariat and the CITES Standing Committee to review and develop measures to combat this wildlife cybercrime (CITES CoP17 Decisions, 2016). The online trade is stimulated by the countless photos on social media of people holding wild animals taken in various situations (be they captive, in zoos, orphanages and elsewhere, semi-captive or in the wild). These pictures can influence the perceptions people have of those species' status and promote the idea of possessing them as pets (Ross, et al., 2008; Nekaris, et al., 2013; Leighty, et al., 2015). Great apes are highly symbolic in the global illegal wildlife trade. The media is increasingly covering this topic and regular reports give cause for continued concern (e.g. Shukman, 2017). However, until recently, there has been a significant lack of verified quantitative and qualitative data on the trade in great apes, including the circumstances surrounding a confiscation, making it hard to define longer-term strategies to combat this high-profile issue. To address this gap, GRASP, together with its technical partner, the UNEP-World Conservation Monitoring Centre (UNEP-WCMC), has developed the first phase of the Apes Seizure database (https://database.un-grasp.org/). This database includes data on live ape trade and the illegal trade in great ape parts and carcasses. The application was launched at the 17th CITES Conference of the Parties, in October 2016, in Johannesburg, and is currently undergoing a data validation process. It is anticipated that the database will provide analytics on illegal trade for a Status Report to the CITES CoP18 in 2019.

Further development of the Apes Seizure database can work hand-in-hand with the application of new advances in genetic recognition technology. According to CITES regulations, when possible, live victims of illegal wildlife trade should be repatriated to their countries of origin. However, when a great ape is confiscated, it carries little identification other than its DNA. Substantial genetic data collected to date on many wild great ape populations are a good starting point for a genetic recognition resource (e.g. Goldberg, 1997; Hvilsom, et al., 2013). Additional reference samples will be required, with particular attention paid to populations less well-documented by existing research projects. In cases of illegally-trafficked great apes or great ape meat, DNA can be analysed to inform decisions on repatriation of live individuals to country of origin, and to identify the source population, thus better directing future law enforcement efforts. Progress has been made in the development of mobile DNA sequencers (e.g. MiniIon from Oxford Nanopore Technologies). Providing sequencing units to law enforcement and customs officers, along with the necessary training, would enable genetic sampling on the spot and improve the identification of bushmeat or the origin of live animals.

In 2016, CITES introduced a new annual report format for illegal trade, but only a very small number of records of illegal trade in great apes have been included in the reports submitted so far.

Given the wide range of different threats and their complex interlinkages, it is reasonable to assume that addressing any one of the threats alone will not be enough to achieve conservation goals. Great ape habitats

continue to be degraded, because developmental spatial planning does not take conservation into account, spatial land-use planning is rarely done at a national scale, and law enforcement is weak, or a combination of these factors. Human populations continue to grow rapidly (especially in Sub-Saharan Africa, doubling every 30 years, and in Indonesia where it will double in about 70 years (World Bank, 2018)), putting ever-increasing pressure on land and natural resources. Great ape meat (and live apes) will thus continue to appear in the illegal wildlife trade. A holistic approach is required to tackle these challenges effectively, with strong political commitment and coordination between the various actors involved in law enforcement and conservation, including across borders. Responses to address the drivers of the local bushmeat trade and of international illegal live ape by criminal cartels are required.

One approach to addressing the complex interlinkages is the coordination among different law enforcement stakeholders at national and regional level, which remains a challenge. The International Consortium on Combatting Wildlife Crime (ICCWC) is one example where main law enforcement actors try to coordinate and pool efforts. Within this Consortium, CITES, UNODC, INTERPOL and WCO partner to strengthen criminal justice systems and provide coordinated support at national, regional and international level to combat wildlife and forest crime (https://cites.org/eng/prog/iccwc.php).

Tourism with great apes is often proposed as an opportunity – a means of generating revenue to fund conservation efforts and to protect great apes and their habitats, or as a way for local communities to participate in, and benefit from, conservation activities. The success of mountain gorilla tourism has shown the considerable potential of conservation-based great ape tourism; however, it will not be possible to replicate this success everywhere. The number of significant risks to great apes that can arise from tourism require a cautious approach. If great ape tourism is not based on sound conservation principles, economic objectives are likely to take precedence, the consequences of which could be detrimental to the great apes their habitat. See IUCN Best Practice Guidelines for Great Ape Tourism (Macfie & Williamson 2010).

7. Recommendations

This report recommends the following actions directed to CITES Parties, recognizing that effective steps to protect great apes involve both great ape range States and countries that import, or act as trade conduits for, live great apes, great ape meat, other body parts and derivatives, as well as other natural resources extracted from great ape habitats:

1. Recognizing that some CITES Parties may have already undertaken this analysis, all Parties are recommended to review relevant national and regional level legislation, policies and sanctions to ensure adequate protection of great apes through improved legal frameworks, with support from independent legal experts and with reference to the International Consortium in Combating Wildlife Crime (ICCWC)'s Wildlife and Forest Crime Analytic Toolkit and USAID's *Measuring Efforts to Combat Wildlife Crime: A Toolkit for Improving Action and Accountability*;

2. Recognizing that many CITES Parties are already undertaking relevant actions in this regard, all Parties are recommended to increase law enforcement efforts by ensuring that existing laws are effectively applied and appropriate judicial processes are adhered to, with reference to the ICCWC and USAID toolkits mentioned above. This can be attained by corruption mitigation strategies, and better training of local practitioners and rangers in law enforcement, prosecution evidence gathering, and modern forensic methods, as well as training of customs agents to profile suspect shipments and identify animal species to combat cross-border illegal trade;

3. All Parties are recommended to oblige, by national law, all private actors in the extractive, logging, energy and agricultural sectors to comply with national and international laws and with IUCN and industry best practices in minimising impact on great ape populations and habitat, and should enforce clear penalties for cases of non-compliance[3]. Of particular benefit would be the inclusion of great apes as Species at Risk (SAR) in the FSC standards;

4. Great ape conservation partners are encouraged to contribute to, further develop and use the GRASP Apes Seizure database. These partners include the national law enforcement agencies and wildlife

[3] Industry best practices bodies are, for forestry: Forestry Stewardship Council (FSC), and IUCN guidelines on reduced impact logging and great apes (Morgan & Sanz, 2007), and on great apes and FSC standards (Morgan, et al., 2013); for industry in general: the Business and Biodiversity Offsets Program (BBOP) and BBOP Standard on Biodiversity Offsets, International Finance Corporation (IFC) Performance Standard 6, Equator Principles, IPIECA (global oil and gas industry association for environmental and social issues), and the International Council on Mining and Metals (ICMM).

departments likely to hold data on seizures of trafficked bushmeat and live animals, relevant conservation NGOs involved in supporting law enforcement and compliance, researchers and wildlife sanctuaries;

5. All Parties are encouraged to accumulate all data at their disposal (e.g. protected area and conservation NGO reports, police reports, judiciary outcomes, etc.) in order to more consistently report illegal trade data to CITES in a timely manner in accordance with the annual illegal trade report format[4], and should share data on illegal trade in great apes and great ape parts with GRASP for inclusion in the GRASP Apes Seizure database;

6. All Parties are recommended to use existing DNA sequence databases to establish the origin of confiscated apes, and/or to support the potential repatriation of live animals;

7. All range State Parties are encouraged to consolidate data from protected area Authorities, research and conservation organizations, commercial partners or other relevant stakeholders, in order to contribute great ape survey data and other relevant information to the IUCN SSC A.P.E.S. database by contacting Dr. Tenekwetche Sop (tenekwetche_sop@eva.mpg.de);

8. All Parties that have not already done so are encouraged to ratify and fully implement the UN Convention against Transnational Organized Crime;

9. Recognizing the negative impact that corruption plays at all levels in support of the illegal capture and trade in great apes, all Parties that have not already done so are encouraged to ratify and fully implement the UN Convention against Corruption, and to solicit the support of national and international NGOs which specialize in combatting corruption, to enhance efforts to eradicate corruption and ensure appropriate judiciary process as it pertains to wildlife law enforcement;

10. All Parties are encouraged to study dietary alternatives to bushmeat, and to monitor the implementation and impacts of projects piloting alternatives to bushmeat, in order to determine their efficacy;

11. All range State Parties are encouraged to adopt legally binding transboundary agreements and foster collaborative judiciary proceedings with respect to evidence exchange, sentencing and extradition to enhance enforcement of illegal cross border trade in live apes, ape parts and bushmeat;

12. All Parties are encouraged to reject any applications for trade in potentially wild caught great apes (permits with source codes “W”, “U” or “I”). Given the rarity of these taxa and the large numbers of captive-bred great apes currently held in zoos and other ex-situ collections, wild-caught great apes are not acceptable for trade among zoos, safari parks or other educational or scientific institutions except under extraordinary circumstances.

The following recommendation is directed to the CITES Secretariat:

13. The Secretariat, in collaboration with other funders and partners such as UNODC where appropriate, is encouraged to provide technical and financial assistance to range States to further strengthen their criminal justice responses to wildlife crime, including tracing and recovering the proceeds of crime and clamping down on corruption.

The following recommendation is directed to private and public donors:

14. All private and public donors are encouraged to provide financial support to enable these recommendations to be implemented.

8. Main sources of information

Information on great ape population estimates and change over time has been derived from the IUCN SSC A.P.E.S. database. However, data from the more recent publications has not been entered yet. In these cases, we used information from the IUCN Red List to ensure that the information presented in this report is as up-to-date as possible.

[4] https://cites.org/sites/default/files/reports/E-Guidelines-IllegalTR.pdf

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Annex I. Acronyms

A.P.E.S. database	Ape Populations, Environments and Surveys database
CITES CoP	CITES Conference of the Parties
CMS	Convention on the Conservation of Migratory Species of Wild Animals
DNA	Deoxyribonucleic acid
GRASP	Great Apes Survival Partnership
ICCN	Institut Congolais pour la Conservation de la Nature
IGO	Intergovernmental organisation
INTERPOL	International Criminal Police Organisation
IUCN	International Union for Conservation of Nature
JGI	Jane Goodall Institute
NGO	Non-governmental organisation
LAGA	The Last Great Ape Organisation Cameroon
PanAf	The Pan African Programme
PSG	Primate Specialist Group
SGA	Section on Great Apes
SSC	Species Survival Commission
TRAFFIC	The Wildlife Trade Monitoring Network
UNEP	United Nations Environment Programme
USAID	United States Agency for International Development