

Abundance Annex

Ape Population Abundance Estimates

This annex presents ape abundance estimates at the site level. The term “site” refers to a protected area and/or its buffer zone, a logging concession or group of concessions, or any discrete area where a survey has taken place in the past two decades. This annex also lists a few sites that were last surveyed in the 1970s and 1980s.

Most of the estimates are drawn from peer-reviewed publications and gray literature; some have been reconfirmed by experts who have access to material that is not in the public domain (such as raw data and documents for third parties that may not be shared in their entirety without permission). The “survey year” columns indicate when data were collected in the field; for estimates that are based on model predictions rather than field surveys, the years are followed by “(model).” For orangutan taxa, all estimates are based on model predictions (see Tables 11–15). Since records of absolute ape numbers are rarely available, this annex uses abundance classes of population ranges, as defined in Table 1. For gibbons, available density estimates are provided.

TABLE 1
Abundance Class Definitions

Abundance class	Class definition
≤50	Up to 50 individuals
51–100	51–100 individuals
101–300	101–300 individuals
301–500	301–500 individuals
501–1,000	501–1,000 individuals
1,001–5,000	1,001–5,000 individuals
5,001–10,000	5,001–10,000 individuals
10,001–20,000	10,001–20,000 individuals
20,001–50,000	20,001–50,000 individuals
50,001–100,000	50,001–100,000 individuals
>100,000	More than 100,000 individuals
Present	Confirmed presence; population size unknown
Extirpated	Apes extirpated locally
Possibly extinct	Apes are possibly extinct nationwide
Extinct	Apes are extinct nationwide

Note: If only a population range is available, the mean is used to determine the abundance class. Population size may also be extrapolated from density estimates and then allocated to an appropriate abundance class.

In the following tables, asterisks in the abundance columns indicate which ape populations are stable (*) or increasing (**). Most ape populations, however, are in decline or the population trend is unknown.

Site names in **bold** are recognized as priority sites for African ape conservation by the Primate Specialist Group of the International Union for Conservation of Nature (IUCN) Species Survival Commission (SSC). While this prioritization is based on the most comprehensive available data, the authors recognize that data may be incomplete for some areas. Priority sites for orangutans and gibbons have not yet been identified.

Abbreviations and references are listed at the end of this annex.

Notes on Tables 5 and 9: Gorillas are often sympatric with chimpanzees, meaning that they occupy the same geographic range. Biologists who survey great apes usually count their nests as proxies for the apes themselves. In areas where gorilla and chimpanzee ranges overlap, it is not always possible to determine which species made each nest in the field, but this can be done post hoc using appropriate covariates collected for each nest (Sanz *et al.*, 2007). An additional column lists the number of species represented in each abundance estimate, showing a value of “1” for a single species (gorillas in Table 5, chimpanzees in Table 9) or “2” for both gorillas and chimpanzees, counted together as “apes”.

Notes on Tables 16–18: Since the discovery and identification of the Gaoligong hoolock (*Hoolock tianxing*), and further genetic studies on the western hoolock (*Hoolock hoolock*) and the eastern hoolock (*Hoolock leuconedys*), there have been new assessments of the density and distribution of these three species. The information available is rapidly changing and further updates will be published on the IUCN Red List.

The list of sites in these tables is not exhaustive as abundance estimates are not available for all ape populations. To inform us of any errors or omissions, please contact the A.P.E.S. database datamanager through the A.P.E.S. Portal (<https://www.iucngreatapes.org/apes-database>). Updates will be made available in digital form via the A.P.E.S. Portal.

Great Ape Abundance Estimates

TABLE 2

Mountain Gorilla (*Gorilla beringei beringei*) Abundance Estimates

Country	Site name	Abundance class	Survey year(s)	Source
Democratic Republic of Congo (DRC)	Virunga National Park (NP)	**501–1,000	2015–16	Granjon <i>et al.</i> (2020)
Rwanda	Volcanoes NP			
Uganda	Mgahinga Gorilla NP			
	Bwindi Impenetrable NP	301–500	2018	Hickey <i>et al.</i> (2019)

Note: The Virunga Massif covers the three national parks: Mgahinga Gorilla NP, Virunga NP and Volcanoes NP. As the gorillas move freely across international boundaries, the total number of mountain gorillas cannot be broken down by park or country.

TABLE 3

Grauer's Gorilla (*Gorilla beringei graueri*) Abundance Estimates

Country	Site name	Abundance class	Survey year(s)	Source
DRC	Balala	Extirpated	2014	Plumptre <i>et al.</i> (2015)
	Forêt pour le Développement Intégral (FODI)	≤50	2011	Kirkby <i>et al.</i> (2019)
	Itombwe	51–100	2013–14	Plumptre <i>et al.</i> (2015)
	Kahuzi-Biega Itebero	301–500	2017	Plumptre <i>et al.</i> (2021)
	Kahuzi-Biega Kasese	101–300	2015	Plumptre <i>et al.</i> (2021)
	Kahuzi-Biega Nzovu	101–300	2013–15	Plumptre <i>et al.</i> (2021)
	Kahuzi-Biega Tshivanga (Highland sector)	301–500	2015	Plumptre <i>et al.</i> (2021)
	Kahuzi-Biega NP (whole park)	1,001–5,000	2017	Plumptre <i>et al.</i> (2021)
	Kisimba-Ikobo	501–1,000	2013	Plumptre <i>et al.</i> (2015)
	Maiko (including Lubutu and Angumu)	101–300	2011–17	Fauna & Flora International and Institut Congolais pour la Conservation de la Nature, unpublished data (2017)
	Oku Community Reserve	1,001–5,000	2016–19	Plumptre <i>et al.</i> (2021)
	Réserve de Gorilles de Mukungiti et Kingombe	101–300	2013	Plumptre <i>et al.</i> (2015)
	Tayna Nature Reserve	101–300	2013	Plumptre <i>et al.</i> (2015)
	Usala	501–1,000	2010–13	Plumptre <i>et al.</i> (2015)
	Virunga NP (Mt. Tshiaberimu)	≤50	2021	Iyer <i>et al.</i> (2023)
	Walikale	501–1,000	2010	Nixon <i>et al.</i> (2012), cited in Plumptre <i>et al.</i> (2015)
Nationwide		5,001–10,000	2011–19	Plumptre <i>et al.</i> (2021)

TABLE 4**Cross River Gorilla (*Gorilla gorilla diehli*) Abundance Estimates**

Country	Site name	Abundance class	Survey year(s)	Source
Cameroon	Ebo proposed NP	≤50	2019	B. Morgan, personal communication (2021)
	Kagwene Gorilla Sanctuary	≤50	2006–08	De Vere <i>et al.</i> (2011)
	Mbulu Forest	≤50	2008	Warren and Bila (2008)
	Mone River Forest Reserve (FR) east	≤50	2008	Warren <i>et al.</i> (2008)
	Takamanda NP	≤50	2013	Ikfuingei and Kuchambi (2013)
	Tofala Hills	≤50	2012	Dunn <i>et al.</i> (2014)
Nigeria	Afi Mountain Wildlife Sanctuary	≤50	2020	Ayang (2020)
	Cross River NP Boshi Extension	≤50	2009	Imong, Mengnjo and Okeke (2009)
	Cross River NP Okwangwo Division	Present	2021	Idowu <i>et al.</i> (2021)
	Mbe Mountains	≤50	2020	Eban (2020)

TABLE 5**Western Lowland Gorilla (*Gorilla gorilla gorilla*) Abundance Estimates**

Country	Site name	Abundance class	No. spp.	Survey year(s)	Source
Angola	Maiombe (Cabinda)	1,001–5,000	1	Unknown (model)	Strindberg <i>et al.</i> (2018)
Cameroon	Boumba-Bek NP	1,001–5,000	1	2015	Nzooch <i>et al.</i> (2016b)
	Boumba-Bek NP (northern forest management units (FMUs): 10-020 to 10-023, 10-029 and 10-030)	1,001–5,000	1	2015	Nzooch <i>et al.</i> (2016b)
	Campo Ma'an (Dipikar Island)	≤50	1	2020	Beukou Tchoumbou <i>et al.</i> (2021)
	Campo Ma'an NP (North)	101–300	1	2020	Beukou Tchoumbou <i>et al.</i> (2021)
	Campo Ma'an – Operational Technical Unit (total for all strata of the landscape)	501–1,000	1	2020	Beukou Tchoumbou <i>et al.</i> (2021)
	Deng Deng FMU 10-065	*301–500	1	2012	Maisels <i>et al.</i> (2013)
	Deng Deng NP	301–500	2	2016	Benavides <i>et al.</i> (2016)
	Dja Biosphere (or Faunal) Reserve	1,001–5,000	1	2018	Bruce <i>et al.</i> (2018)
	FMU 09-021	51–100	1	2020	Beukou Tchoumbou <i>et al.</i> (2021)
	FMU 09-024	≤50	1	2020	Beukou Tchoumbou <i>et al.</i> (2021)
	FMU 09-025	101–300	1	2020	Beukou Tchoumbou <i>et al.</i> (2021)
	FMU 10-007, ZIC 28	1,001–5,000	2	2014–15	Nzooch <i>et al.</i> (2016a)
	FMUs 10-009 and 10-010, ZIC 29	1,001–5,000	2	2014–15	Nzooch <i>et al.</i> (2016a)
	FMU 10-011, ZICGC 1	1,001–5,000	2	2018	Beukou <i>et al.</i> (2019)
	FMU 10-012, ZIC 30	1,001–5,000	2	2018	Beukou <i>et al.</i> (2019)
	FMU 10-013, ZICGC 2	1,001–5,000	2	2018	Beukou <i>et al.</i> (2019)
	FMU 10-015	1,001–5,000	1	2015	Nzooch <i>et al.</i> (2016b)
	FMUs 10-027 and 10-028	501–1,000	1	2015	Nzooch <i>et al.</i> (2016b)

Country	Site name	Abundance class	No. spp.	Survey year(s)	Source
Cameroon cont.	FMUs 10-032 and 10-067	1,001–5,000	1	2015	Nzooch <i>et al.</i> (2016b)
	FMU 10-038	1,001–5,000	1	2001	Etoga (2001)
	FMU 10-039	Present	1	2001	Etoga (2002)
	FMU 10-047a	301–500	1	2007	Bombome (2007)
	FMU 10-063, ZICGC 3	1,001–5,000	1	2018	Beukou <i>et al.</i> (2019)
	FMU 10-064, ZIC 31	1,001–5,000	1	2018	Beukou <i>et al.</i> (2019)
	Lobéké NP	1,001–5,000	1	2018	Beukou <i>et al.</i> (2019)
	Mengamé Gorilla Sanctuary	1,001–5,000	1	2006	Ekobo (2006)
	Nanga-Eboko forest	Present	1	2002	Fotso, Eno Nku and Groves (2002)
	Ngoyla Mintom Complex	5,001–10,000	1	2015	Nzooch <i>et al.</i> (2016b)
	Nki NP	1,001–5,000	1	2015	Nzooch <i>et al.</i> (2016b)
	Sanaga-Yong	Present	1	2002	Fotso, Eno Nku and Groves (2002)
	ZICGC 9	Present	1	2007	Mahop (2007)
Central African Republic (CAR)	Dzanga NP	101–300	1	2015–16	N’Goran, Ndomba and Beukou (2016)
	Dzanga-Sangha Special Reserve	1,001–5,000	1	2015–16	N’Goran, Ndomba and Beukou (2016)
	Dzanga-Sangha landscape (total for all strata of the landscape)	1,001–5,000	1	2015–16	N’Goran, Ndomba and Beukou (2016)
	Ndoki NP	501–1,000	1	2015–16	N’Goran, Ndomba and Beukou (2016)
	SINFOCAM concessions	501–1,000	1	2015–16	N’Goran, Ndomba and Beukou (2016)
	Société de transformation de bois en Centrafrique (STBC) concession	501–1,000	1	2015–16	N’Goran, Ndomba and Beukou (2016)
Congo, Republic of	Bailly Swamps	1,001–5,000	1	2016	Brncic <i>et al.</i> (2018)
	Batanga	5,001–10,000	1	2017	Brncic <i>et al.</i> (2018)
	Batéké Forest	501–1,000	2	2017	Inkamba Nkulu <i>et al.</i> (2018)
	Conkouati-Douli NP	1,001–5,000	2	2013	Vanleeuwe (2014)
	Dimonika Biosphere Reserve	101–300	1	2009	Pintea <i>et al.</i> (2012)
	Djoua-Ivindo Forest	5,001–10,000	1	2014–15	Allam <i>et al.</i> (2016)
	Impfondo	Present	1	2008	Iyenguet <i>et al.</i> (2008)
	Kabo FMU	1,001–5,000	1	2016	Brncic <i>et al.</i> (2018)
	Lac Télé Community Reserve	5,001–10,000	1	2017	Brncic <i>et al.</i> (2018)
	Lossi Gorilla Sanctuary	Present	1	2006	Bassouama <i>et al.</i> (2006)
	Loundougou FMU	5,001–10,000	1	2016	Brncic <i>et al.</i> (2018)
	Loundougou swamp	1,001–5,000	1	2016	Brncic <i>et al.</i> (2018)
	Messok-Dja	1,001–5,000	1	2015–16	Allam <i>et al.</i> (2017)
Mokabi FMU South	501–1,000	1	2017	Brncic <i>et al.</i> (2018)	

Country	Site name	Abundance class	No. spp.	Survey year(s)	Source
Congo, Republic of cont.	Ngombe FMU	*50,001–100,000	1	2014	Maisels <i>et al.</i> (2015)
	Nouabalé-Ndoki NP	*1,001–5,000	1	2016	Brncic <i>et al.</i> (2018)
	Ntokou-Pikounda NP	10,001–20,000	1	2019	N’Goran <i>et al.</i> (2020)
	Odzala-Koukoua NP	5,001–10,000	1	2020	Bohm (2020)
	Pokola FMU	5,001–10,000	1	2016	Brncic <i>et al.</i> (2018)
	Tala-Tala FMU	1,001–5,000		2018	N’Goran <i>et al.</i> (2019)
	Tanga	1,001–5,000	2	2009	Malanda, Iyenguet and Madzoke (2010)
DRC	Maiombe	Extirpated	1	n/a	F. Maisels, personal communication (2022)
Equatorial Guinea	Nationwide	1,001–5,000	1	2011	Murai <i>et al.</i> (2013)
Gabon	Bambidie	101–300	1	2012	Haurez <i>et al.</i> (2014)
	Batéké Plateau NP	Present	2	2005–06	Bout (2006)
	Birougou NP	501–1,000	2	2006–07	Aba’a and Bezangoye (2007)
	Djouah-Zadie	1,001–5,000	2	2016	Le-Duc Yeno and N’Goran (2016)
	Evaro	Present	2	2005	Latour (2005)
	Gamba	101–300	2	2017–18	Vanthomme and Nzamba (2018)
	Ivindo concessions	501–1,000	2	2010	Motsaba and Maisels (2010)
	Ivindo NP	1,001–5,000	2	2009	Motsaba <i>et al.</i> (2009)
	Kivoro	301–500	2	2017–18	Vanthomme and Nzamba (2018)
	Loango NP	101–300	2	2017–18 (model)	Vanthomme and Nzamba (2018)
	Lopé NP	1,001–5,000	2	2008–09	Bezangoye and Maisels (2010)
	Lopé-Waka corridor	1,001–5,000	2	2007	Maisels, Abitsi and Bezangoye (2008)
	Mandji	101–300	2	2017–18	Vanthomme and Nzamba (2018)
	Mayombe	1,001–5,000	2	2011	Aba’a <i>et al.</i> (2011)
	Mayumba NP	*Present	2	2006–10	Makaya (2010)
	Minkébé NP	**Present	2	2012–13	ANPN (2013)
	Monts de Cristal NP	Present	2	2005	Aba’a (2006)
	Moukalaba Doudou NP	301–500	2	2017–18	Vanthomme and Nzamba (2018)
	Mwagna NP	**Present	2	2012	Maisels and Ella Akou (2013)
	Rabi	101–300	2	2017–18	Vanthomme and Nzamba (2018)
Waka NP	Present	2	2005–06	Abitsi (2006)	
Wonga Wongué	Present	2	2011	Motsaba and Aba’a (2011)	

Note: One asterisk (*) indicates that an ape population is stable; two asterisks (**) show that an ape population is growing. The “number of species” (No. spp.) column specifies whether the abundance estimate refers to gorillas only (1) or to gorillas and chimpanzees together (2). In the “survey years” column, “model” signifies that estimates are based on model predictions rather than field surveys. The abbreviations ZIC and ZICGC are used for hunting zones and community-managed hunting zones, respectively, based on the French terms “zone d’intérêt cynégétique” and “zone d’intérêt cynégétique à gestion communautaire.”

TABLE 6**Bonobo (*Pan paniscus*) Abundance Estimates**

Country	Site name	Abundance class	Survey year(s)	Source
DRC	Lac Tumba Bolobo	51–100	NA	IUCN and ICCN (2012)
	Lac Tumba Bolombo-Losombo	Present	2005	Inogwabini <i>et al.</i> (2007)
	Lac Tumba Botuali-Ilombe	101–300	2005	Inogwabini <i>et al.</i> (2007)
	Lac Tumba Botwali	51–100	2004	IUCN and ICCN (2012)
	Lac Tumba Lediima Reserve	Present	2014	Beudels-Jamar <i>et al.</i> (2015)
	Lac Tumba (Lokoso, Mankere, Mpelu and Nkala/Nkoo)	≤50	2011–13	Serckx (2014)
	Lac Tumba Malebo	1,001–5,000	2005	Inogwabini <i>et al.</i> (2007)
	Lac Tumba Mbala-Donkese	≤50	2005	Inogwabini <i>et al.</i> (2007)
	Lac Tumba Mbie Mokele	51–100	2006	IUCN and ICCN (2012)
	Lac Tumba Monieke-Bokote	Present	2006	IUCN and ICCN (2012)
	Lac Tumba Mpoka	Present	2009	IUCN and ICCN (2012)
	Lac Tumba Ngombe-Botuali	101–300	2005	Inogwabini <i>et al.</i> (2007)
	Lac Tumba Nkosso	Present	2006	IUCN and ICCN (2012)
	Lubefu	Present	2010	IUCN and ICCN (2012)
	Maringa-Lopori-Wamba landscape Bilya-lyondje	Present	2009	IUCN and ICCN (2012)
	Maringa-Lopori-Wamba landscape Boseka-Bokungu	51–100	2008	IUCN and ICCN (2012)
	Maringa-Lopori-Wamba landscape Cadjobe	301–500	2009	Reinartz and Guislain (2010)
	Maringa-Lopori-Wamba landscape lyondji Reserve	301–500	2012	Lushimba, Kasalevo and Fowler (2012)
	Maringa-Lopori-Wamba landscape K7	Present	2010	IUCN and ICCN (2012)
	Maringa-Lopori-Wamba landscape Kokolopori	301–500	2004–05	IUCN and ICCN (2012)
	Maringa-Lopori-Wamba landscape Lingomo	51–100	2008	IUCN and ICCN (2012)
	Maringa-Lopori-Wamba landscape Lomako-Yokakola Faunal Reserve	1,001–5,000	2015	Levo <i>et al.</i> (2015)
	Maringa-Lopori-Wamba landscape Lonua	Present	2006	IUCN and ICCN (2012)
Maringa-Lopori-Wamba landscape Luo	51–100	2003–05	IUCN and ICCN (2012)	
Maringa-Lopori-Wamba landscape Mompono-Bekumolokole	51–100	2008	IUCN and ICCN (2012)	

Country	Site name	Abundance class	Survey year(s)	Source
DRC cont.	Maringa-Lopori-Wamba landscape Mompono-Yaama	51–100	2008	IUCN and ICCN (2012)
	Maringa-Lopori-Wamba landscape Samba	51–100	2007	IUCN and ICCN (2012)
	Salonga landscape corridor	1,001–5,000	2017	Ikati <i>et al.</i> (2019)
	Salonga landscape Ikela-Bokungu	Present	2008	IUCN and ICCN (2012)
	Salonga landscape Lokoro-Lukenie	Present	2006–07	IUCN and ICCN (2012)
	Salonga landscape Lotoi-Lokoro	Present	2006–07	IUCN and ICCN (2012)
	Salonga landscape Lukenie-Sankuru	Present	2006–07	IUCN and ICCN (2012)
	Salonga landscape Lukuru	51–100	1994–95	IUCN and ICCN (2012)
	Salonga landscape Yetsi-Ikela	51–100	2008	IUCN and ICCN (2012)
	Salonga NP south	5,001–10,000	2016–18	Bessone <i>et al.</i> (2020)
	Salonga NP Watsi-Kengo and Mondjoko sectors combined	5,001–10,000	2016–17	Reinartz <i>et al.</i> (2017)
	Sankuru Nature Reserve (NR)	Present	2009	Liengola <i>et al.</i> (2009)
	Tshuapa-Lomami-Lualaba	5,001–10,000	2008–10	IUCN and ICCN (2012)

TABLE 7**Nigeria–Cameroon Chimpanzee (*Pan troglodytes ellioti*) Abundance Estimates**

Country	Site name	Abundance class	Survey year(s)	Source
Cameroon	Ako-Mbembe FR	Present	2005	Morgan <i>et al.</i> (2011)
	Assaka Forest	Present	2006	Ekinde and Ashu (2006)
	Bafut-Ngemba FR	Extirpated	2011	Ellioti.org (n.d.)
	Bakossi NP	Present	2009	Fonkwo, Angwafo and Mbida (2011)
	Banyang-Mbo Wildlife Sanctuary	501–1,000	2006–07	Greengrass and Maisels (2007)
	Ebo proposed NP	501–1,000	2011	Morgan <i>et al.</i> (2011)
	Ejagham FR	Present	2003	Eno Nku (2003a)
	Etinde Wildlife Reserve	51–100	2003	Eno Nku (2004b)
	FMU 00-004	51–100	2007	Ellioti.org (n.d.)
	FMU 11-002	Extirpated	2003	Eno Nku (2003b)
	Fungom FR	Present	2004	Ekinde, Ashu and Sunderland-Groves (2005)
	Kom-Wum FR	≤50	2014	O. Ndoumbe, unpublished data (2017)
	Korup NP	51–100	2015	M. Waltert, A. Binczik and K.S. Bobo, unpublished data (2015)

Country	Site name	Abundance class	Survey year(s)	Source
Cameroon cont.	Lake Barombi Mbo FR	Present	2004	Morgan <i>et al.</i> (2011)
	Mak-Betefou-Nkingkuoe	51–100	2011	Ellioti.org (n.d.)
	Makombe Forest	Present	n/a	WWF (2003)
	Manb'ra	Present	1997	Ellioti.org (n.d.)
	Mbam et Djerem NP core zone	301–500	2021	Ambahe <i>et al.</i> (2022)
	Mbulu Forest	Present	2008	Warren and Bila (2008)
	Mone River FR	101–300	2007	Warren and Ekinde (2008)
	Mpem & Njim NP	Present	2005	Ellioti.org (n.d.)
	Mt. Cameroon NP	301–500	2013	Eno Nku (2013)
	Mt. Kupe	Present	2009	Fonkwo, Angwafo and Mbida (2011)
	Mt. Nlonako Wildlife Reserve	51–100	2005	Ellioti.org (n.d.)
	Nkwende Hills	Extirpated	2011	Bobo, Ntumwel and Aghomo (2013)
	Nta Ali FR	Present	2005	Morgan <i>et al.</i> (2011)
	Rumpi Hills	Present	2005	Morgan <i>et al.</i> (2011)
	South Bakundu FR	Extirpated	2004	Eno Nku (2004a)
	Takamanda NP	Present	2013	Ikfuingei and Kuchambi (2013)
	Tubah-Awing Forest	≤50	2011	Ellioti.org (n.d.)
Vome Forest	Present	2008	Ellioti.org (n.d.)	
Nigeria	Afi Mountain Wildlife Sanctuary	Present	2020	Ayang (2020)
	Afi River FR	Present	2009	Imong, Mengnjo and Okeke (2009)
	Ago-Owu FR	Present	2005	Ogunjemite <i>et al.</i> (2006)
	Akure-Ofosu FR	Present	2012–13	Ikemeh (2013)
	Ala FR	Extirpated	2006	Greengrass (2006, 2009)
	Cross River NP Oban Division	Present	2021	Abanyam <i>et al.</i> (2021)
	Cross River NP Okwangwo Division	Present	2021	Idowu <i>et al.</i> (2021)
	Eba FR	Present	2004–05	Ogunjemite <i>et al.</i> (2006)
	Eti-Oni FR	Present	2004–05	Ogunjemite <i>et al.</i> (2006)
	Gashaka-Gumti NP	501–1,000	2021	S. Nixon, personal communication (2021)
	Idanre FR	51–100	2012–13	Ikemeh (2013)
	Ifon FR	Present	2006	Greengrass (2006, 2009)
	Ila FR	Present	2011	Ogunjemite (2011)
	Ise FR	≤50	2012	Ikemeh (2013)

Country	Site name	Abundance class	Survey year(s)	Source
Nigeria cont.	Mbe Mountains	≤50	2020	Eban (2020)
	Oba Hills FR	Extirpated	2006	Greengrass (2006, 2009)
	Ogbesse FR	Extirpated	2006	Greengrass (2009)
	Ogotun FR	Present	2006	Ogunjemite <i>et al.</i> (2006)
	Okeluse FR	Present	2004	Ogunjemite <i>et al.</i> (2006)
	Okomu NP	Present	2006	Greengrass (2006, 2009)
	Ologbo FR	Present	2006	Greengrass (2006)
	Oluwa FR	Present	2011 and 2012	Olaniyi, Ogunjemite and Dansu (2014)
	Omo FR	Present	2006	Greengrass (2006, 2009)
	Onisere FR	Present	2004–05	Ogunjemite <i>et al.</i> (2006)
	Owo FR	Present	2004–05	Ogunjemite <i>et al.</i> (2006)
	Shasha FR	Present	2006	Greengrass (2006, 2009)

TABLE 8**Eastern Chimpanzee (*Pan troglodytes schweinfurthii*) Abundance Estimates**

Country	Site name	Abundance class	Survey year(s)	Source
Burundi	Bururi FR	≤50	2006–07	Barakabuye <i>et al.</i> (2007)
	Kibira NP	101–300	2011–13	Hakizimana and Huynen (2013)
	Vyanda FR	≤50	1989	Anonymous (1989), cited in Barakabuye <i>et al.</i> (2007)
CAR	Bangassou	Extirpated	2004	Williamson <i>et al.</i> (2004)
	Chinko NR	501–1,000	2015	Aebischer <i>et al.</i> (2017)
	Zemongo Faunal Reserve	501–1,000	2010	Plumptre <i>et al.</i> (2010)
DRC	Balala	Extirpated	2011–15	Plumptre <i>et al.</i> (2015)
	Bili-Uélé forest	1,001–5,000	2016–19	Nkono (2020)
	Forêt pour le Développement Intégral	301–500	2011	Kirkby <i>et al.</i> (2019)
	Greater Virunga Semuliki	1,001–5,000	2008	Plumptre, Kujirakwinja and Matunguru (2008)
	Itombwe	1,001–5,000	2013–14	Plumptre <i>et al.</i> (2015)
	Ituri landscape Mai-Tatu (partial)	1,001–5,000	2015	Maisels <i>et al.</i> (2019)
	Ituri Okapi Faunal Reserve	5,001–10,000	2018	Madidi <i>et al.</i> (2019)
	Kahuzi-Biega Itebero	501–1,000	2017	Plumptre <i>et al.</i> (2021)
	Kahuzi-Biega Kasese	51–100	2015	Plumptre <i>et al.</i> (2021)
	Kahuzi-Biega Nzovu	501–1,000	2013–15	Plumptre <i>et al.</i> (2021)

Country	Site name	Abundance class	Survey year(s)	Source
DRC cont.	Kahuzi-Biega Tshivanga	301–500	2015	Plumptre <i>et al.</i> (2021)
	Kahuzi-Biega NP (whole Park)	1,001–5,000	2017	Plumptre <i>et al.</i> (2021)
	Lubutu	51–100	2011–15	Plumptre <i>et al.</i> (2015)
	Maganja Hills	101–300	2010	Plumptre <i>et al.</i> (2010)
	Maiko NP	51–100	2011–15	Plumptre <i>et al.</i> (2015)
	Misotshi-Kabogo	1,001–5,000	2007	Plumptre <i>et al.</i> (2008)
	Mt. Hoyo	101–300	2011–15	Plumptre <i>et al.</i> (2015)
	Oku Community Reserve	501–1,000	2016–19	Plumptre <i>et al.</i> (2021)
	Réserve de Gorilles de Mukingiti et Kingombe	101–300	2011–15	Plumptre <i>et al.</i> (2015)
	Rubi-Télé	501–1,000	2010	Plumptre <i>et al.</i> (2010)
	Tayna-Kisimba-Ikobo	51–100	2011–15	Plumptre <i>et al.</i> (2015)
	Tayna Nature Reserve	51–100	2011–15	Plumptre <i>et al.</i> (2015)
	Usala	51–100	2011–15	Plumptre <i>et al.</i> (2015)
	Virunga NP Rwenzori	501–1,000	2010	Plumptre <i>et al.</i> (2010)
	Watalinga	501–1,000	2010	Plumptre <i>et al.</i> (2010)
Rwanda	Gishwati FR	≤50	2008–10	Chancellor <i>et al.</i> (2012)
	Nyungwe NP	301–500	2014	Wildlife Conservation Society Rwanda, unpublished data (2014)
South Sudan	Nationwide	Present		Plumptre <i>et al.</i> (2010)
Tanzania	Greater Gombe Ecosystem	101–300	2011–12	Piel <i>et al.</i> (2013)
	Greater Mahale Ecosystem, including Masito-Ugalla	1,001–5,000	2020	Carvalho <i>et al.</i> (2022)
	Loasi FR	51–100	2008	Davenport <i>et al.</i> (2010)
	Masito-Ugalla Ecosystem	101–300	2014	Piel <i>et al.</i> (2015)
Uganda	Budongo NP	501–1,000	2010 (model)	Plumptre <i>et al.</i> (2010)
	Bugoma-Budongo Corridor	101–300	2011–14	McCarthy <i>et al.</i> (2015)
	Bugoma FR	501–1,000	2010 (model)	Plumptre <i>et al.</i> (2010)
	Bulindi	≤50	2014–15	van Dijk, Cibot and McLennan (2021)
	Bwindi Impenetrable NP	101–300	1999–2002	Plumptre, Cox and Mugume (2003)
	Echuya FR	Extirpated	1999–2002	Plumptre, Cox and Mugume (2003)
	Ibambaro FR	Extirpated	1999–2002	Plumptre, Cox and Mugume (2003)
	Kagombe FR	51–100	1999–2002	Plumptre, Cox and Mugume (2003)

Country	Site name	Abundance class	Survey year(s)	Source
Uganda cont.	Kagorra region	≤50	1999–2002	Plumptre, Cox and Mugume (2003)
	Kasato FR	≤50	1999–2002	Plumptre, Cox and Mugume (2003)
	Kibale-Itwara	1,001–5,000	2010 (model)	Plumptre <i>et al.</i> (2010)
	Kibego FR	≤50	1999–2002	Plumptre, Cox and Mugume (2003)
	Kitechura FR	Extirpated	1999–2002	Plumptre, Cox and Mugume (2003)
	Kyambura Wildlife Reserve	≤50	1999–2002	Plumptre, Cox and Mugume (2003)
	Maramagambo-Kalinzu-Kashyoha-Kitomi landscape	1,001–5,000	2010 (model)	Plumptre <i>et al.</i> (2010)
	Matiri FR	Extirpated	1999–2002	Plumptre, Cox and Mugume (2003)
	Muhangi FR	≤50	1999–2002	Plumptre, Cox and Mugume (2003)
	Otzi FR	≤50	1999–2002	Plumptre, Cox and Mugume (2003)
	Rwenzori Mountains NP	301–500	1999–2002	Plumptre, Cox and Mugume (2003)
	South Bugoma	≤50	1999–2002	Plumptre, Cox and Mugume (2003)
	Toro-Semliki Wildlife Reserve	101–300	2010–11	Samson and Hunt (2012)
	Wambabya FR	101–300	1999–2002	Plumptre, Cox and Mugume (2003)

Note: In the “survey years” column, “model” signifies that estimates are based on model predictions rather than field surveys.

TABLE 9

Central Chimpanzee (*Pan troglodytes troglodytes*) Abundance Estimates

Country	Site name	Abundance class	No. spp.	Survey year(s)	Source
Angola	Maiombe (Cabinda)	1,001–5,000	1	2013 (model)	Strindberg <i>et al.</i> (2018)
Cameroon	Boumba-Bek NP	501–1,000	1	2015	Nzooch <i>et al.</i> (2016b)
	Boumba-Bek NP (northern FMUs: 10-020 to 10-023, 10-029 and 10-030)	301–500	1	2015	Nzooch <i>et al.</i> (2016b)
	Campo Ma’an (Dipikar Island)	51–100	1	2020	Beukou Tchoumbou <i>et al.</i> (2021)
	Campo Ma’an NP (North)	101–300	1	2020	Beukou Tchoumbou <i>et al.</i> (2021)
	Campo Ma’an – Operational Technical Unit (total for all strata of the landscape)	301–500	1	2020	Beukou Tchoumbou <i>et al.</i> (2021)

Country	Site name	Abundance class	No. spp.	Survey year(s)	Source
Cameroon cont.	Deng Deng FMU 10-065	Present	1	2012	Maisels <i>et al.</i> (2013)
	Deng Deng NP	301–500	2	2016	Benavides <i>et al.</i> (2016)
	Dja Biosphere (or Faunal) Reserve	1,001–5,000	1	2018	Bruce <i>et al.</i> (2018)
	FMU 00-004	Present	1	2007	Ekobo (2007)
	FMU 09-021	≤50	1	2020	Beukou Tchoumbou <i>et al.</i> (2021)
	FMU 09-024	≤50	1	2020	Beukou Tchoumbou <i>et al.</i> (2021)
	FMU 09-025	≤50	1	2020	Beukou Tchoumbou <i>et al.</i> (2021)
	FMU 10-007, ZIC 28	1,001–5,000	2	2014–15	Nzooch <i>et al.</i> (2016a)
	FMU 10-013	Present	1	2003	Blake, Strindberg and Princée (2012)
	FMU 10-015	301–500	1	2015	Nzooch <i>et al.</i> (2016b)
	FMU 10-027 and 10-028	301–500	1	2015	Nzooch <i>et al.</i> (2016b)
	FMU 10-032 and 10-067	501–1,000	1	2015	Nzooch <i>et al.</i> (2016b)
	FMU 10-038	Present	1	2001	Etoga (2001)
	FMU 10-047a	301–500	1	2007	Bombome (2007)
	FMUs 10-08	Present	1	2005	Blake, Strindberg and Princée (2012)
	FMU 10-09 and 10-010, ZICGC 29	1,001–5,000	2	2015	Nzooch <i>et al.</i> (2016a)
	FMU 10-011, ZICGC 1	1,001–5,000	2	2018	Beukou <i>et al.</i> (2019)
	FMU 10-012, ZIC 30	1,001–5,000	2	2018	Beukou <i>et al.</i> (2019)
	FMU 10-013, ZICGC 2	1,001–5,000	2	2018	Beukou <i>et al.</i> (2019)
	FMU 10-063, ZIC 3	1,001–5,000	1	2018	Beukou <i>et al.</i> (2019)
	FMU 10-064, ZIC 31	1,001–5,000	1	2018	Beukou <i>et al.</i> (2019)
	Lobéké NP	1,001–5,000	1	2018	Beukou <i>et al.</i> (2019)
	Mengamé Gorilla Sanctuary	Present	1	2006	Ekobo (2006)
	Nanga-Eboko	Present	1	2002	Fotso, Eno Nku and Groves (2002)
	Ngoyla Mintom complex	1,001–5,000	1	2015	Nzooch <i>et al.</i> (2016b)
	Nki NP	301–500	1	2015	Nzooch <i>et al.</i> (2016b)
	Sanaga-Yong	Present	1	2002	Fotso, Eno Nku and Groves (2002)
ZICGC 9	Present	1	2007	Mahop (2007)	
CAR	Dzanga NP	≤50	1	2015–16	N'Goran, Ndomba and Beukou (2016)
	Dzanga-Sangha landscape (total for all strata of the landscape)	301–500	1	2015–16	N'Goran, Ndomba and Beukou (2016)
	Dzanga-Sangha Special Reserve	101–300	1	2015–16	N'Goran, Ndomba and Beukou (2016)

Country	Site name	Abundance class	No. spp.	Survey year(s)	Source
CAR cont.	Ndoki NP	101–300	1	2015–16	N’Goran, Ndomba and Beukou (2016)
	SINFOCAM concessions	101–300	1	2015–16	N’Goran, Ndomba and Beukou (2016)
	STBC concession	51–100	1	2015–16	N’Goran, Ndomba and Beukou (2016)
Congo, Republic of	Bailly Swamps	1,001–5,000	1	2016	Brcic <i>et al.</i> (2018)
	Batanga	301–500	1	2017	Brcic <i>et al.</i> (2018)
	Batéké Forest	301–500	2	2017	Inkamba Nkulu <i>et al.</i> (2018)
	Conkouati-Douli NP	5,001–10,000	2	2013	Vanleeuwe (2014)
	Dimonika Biosphere Reserve	Present	1	2009	Pintea <i>et al.</i> (2012)
	Djoua-Ivindo Forest	5,001–10,000	1	2014–15	Allam <i>et al.</i> (2016)
	Impfondo	501–1,000	1	2008	Iyenguet <i>et al.</i> (2008)
	Kabo FMU	501–1,000	1	2016	Brcic <i>et al.</i> (2018)
	Lac Télé Community Reserve	501–1,000	1	2017	Brcic <i>et al.</i> (2018)
	Lossi Gorilla Sanctuary	Present	1	2004–05	Bermejo <i>et al.</i> (2006)
	Loundougou FMU	1,001–5,000	1	2016	Brcic <i>et al.</i> (2018)
	Loundougou swamp	501–1,000	1	2016	Brcic <i>et al.</i> (2018)
	Messok-Dja	501–1,000	1	2015–16	Allam <i>et al.</i> (2017)
	Mokabi FMU South	301–500	1	2017	Brcic <i>et al.</i> (2018)
	Ngombe FMU	5,001–10,000	1	2014	Maisels <i>et al.</i> (2015)
	Nouabalé-Ndoki NP	1,001–5,000	1	2016	Brcic <i>et al.</i> (2018)
	Ntokou-Pikounda NP	5,001–10,000	1	2019	N’Goran <i>et al.</i> (2020)
	Odzala-Koukoua NP	501–1,000	1	2020	Bohm (2020)
	Pokola FMU	1,001–5,000	1	2016	Brcic <i>et al.</i> (2018)
	Tala-Tala FMU	501–1,000		2018	N’Goran <i>et al.</i> (2019)
Tanga	≤50	1	2009	Malanda, Iyenguet and Madzoke (2010)	
DRC	Lac Tumba	Present	1	2007–10	Inogwabini <i>et al.</i> (2012)
	Maiombe (Luki)	Present	1	n/a	WWF (2018)
Equatorial Guinea	Nationwide	5,001–10,000	1	2012	Murai <i>et al.</i> (2013)
Gabon	Bambidie	Present	1	2012	Haurez <i>et al.</i> (2014)
	Batéké Plateau NP	Present	2	2005–06	Bout (2006)
	Birougou NP	501–1,000	2	2006–07	Aba’a and Bezangoye (2007)
	Evaro	Present	2	2005	Latour (2005)
	Djouah-Zadie	1,001–5,000	2	2016	Le-Duc Yeno and N’Goran (2016)
	Gamba	101–300	2	2017–18	Vanthomme and Nzamba (2018)

Country	Site name	Abundance class	No. spp.	Survey year(s)	Source
Gabon cont.	Ivindo concessions	501–1,000	2	2010	Motsaba and Maisels (2010)
	Ivindo NP	1,001–5,000	2	2009	Motsaba <i>et al.</i> (2009)
	Kivoro	301–500	2	2017–18	Vanthomme and Nzamba (2018)
	Loango NP	101–300	2	2017–18 (model)	Vanthomme and Nzamba (2018)
	Lopé NP	1,001–5,000	2	2008–09	Bezangoye and Maisels (2010)
	Lopé-Waka corridor	1,001–5,000	2	2007	Maisels, Abitsi and Bezangoye (2008)
	Mandji	101–300	2	2017–18	Vanthomme and Nzamba (2018)
	Mayombe	1,001–5,000	2	2011	Aba'a <i>et al.</i> (2011)
	Mayumba NP	*Present	2	2006–10	Makaya (2010)
	Minkébé NP	**Present	2	2012–13	F. Maisels, personal communication (2022)
	Monts de Cristal NP	Present	2	2005	Aba'a (2006)
	Moukalaba Doudou NP	301–500	2	2017–18 (model)	Vanthomme and Nzamba (2018)
	Mwagna NP	**Present	2	2012	Maisels and Ella Akou (2013)
	Pongara NP	Present	1	2006	Latour (2006)
	Rabi	101–300	2	2017–18	Vanthomme and Nzamba (2018)
Waka NP	Present	2	2005–06	Abitsi (2006)	
Wonga Wongué	Present	2	2011	Motsaba and Aba'a (2011)	

Note: One asterisk (*) indicates that an ape population is stable; two asterisks (**) show that an ape population is increasing. The “number of species” (No. spp.) column specifies whether the abundance estimate refers to chimpanzees only (1) or to chimpanzees and gorillas together (2). In the “survey years” column, “model” signifies that estimates are based on model predictions rather than field surveys. The abbreviations ZIC and ZICGC are used for hunting zones and community-managed hunting zones, respectively, based on the French terms “zone d’intérêt cynégétique” and “zone d’intérêt cynégétique à gestion communautaire.”

TABLE 10

Western Chimpanzee (*Pan troglodytes verus*) Abundance Estimates¹

Country	Site name	Abundance class	Survey year(s)	Source
Benin	Nationwide	Possibly extinct	2013–14	Campbell and Hougbedji (2015)
Burkina Faso	Nationwide	Possibly extinct	2012	Ginn <i>et al.</i> (2013)
Ghana	Atewa FR	Present	2006	Granier and Awotwe-Pratt (2007)
	Bia-Goaso	101–300	2009	Danquah <i>et al.</i> (2012)
	Boi-Tano FR	Present	2006	Oates (2006)
	Cape Three Points FR	Extirpated	2009	Gatti (2009)
	Draw River FR	Present	2003	Magnuson, Adu-Nsiah and Kpelle (2003)
	Subri River FR	Present	2011	Buzzard and Parker (2012)

Country	Site name	Abundance class	Survey year(s)	Source
Guinea	Bafing River area	1,001–5,000	2013–14	WCF (2014b)
	CBG-Halco concession	51–100	2015	WCF (2015)
	Diecke Classified Forest	51–100	2011	WCF (2012)
	Foutah Djallon	10,001–20,000	2011–12	WCF (2012)
	Gadha Woundou Classified Forest	≤50	2011	WCF (2012)
	Haut Niger NP Kouya core area	101–300	2011	WCF (2012)
	Haut Niger NP Mafou core area	101–300	2011	WCF (2012)
	Kankan Faunal Reserve	Present	2010–11	WCF (2012)
	Koumbia	101–300	2010	WCF (2012)
	Mt. Nimba Strict NR	101–300	2009	WCF (2012)
	Oure Kaba Classified Forest	51–100	2009	WCF (2012)
	Pic de Fon Classified Forest	51–100	2002	Herbinger and Tounkara (2002)
	Sangaredi Alumina Project	101–300	2014	WCF (2014a)
	Ziama Strict NR	≤50	2010–11	WCF (2012)
Guinea-Bissau	Boe area (including Boe NP)	1,001–5,000	2016	Chimbo Foundation, personal communication (2017)
	Cantanhez NP	301–500	2013	Hockings and Sousa (2013)
	Lagoas de Cufada NP	101–300	2010–11	Carvalho, Marques and Vicente (2013)
Ivory Coast	Azagny NP	≤50	2007	Herbinger (2007)
	Banco NP	≤50	2015	E. Normand, personal communication (2016)
	Bossematie Classified Forest	Present	2007	Campbell (2008)
	Cavally Classified Forest	51–100	2010	Normand, Singo and Boesch (2010)
	Comoé NP	101–300	2015–17	Lapiente <i>et al.</i> (2020)
	Dassiekro Classified Forest	Extirpated	2007	Campbell (2008)
	Dodo coastal forest	≤50	2018	Soiret <i>et al.</i> (2019)
	Duekoue Classified Forest	Extirpated	2007	Campbell (2008)
	Gobodienou Classified Forest	Extirpated	2007	Campbell (2008)
	Goin-Débé Classified Forest	≤50	2009	Normand, Singo and Boesch (2010)
	Haute Dodo	Present	2002	Sanderson <i>et al.</i> (2005)
	Mabi Classified Forest	Present	2007	Campbell (2008)
	Marahoué NP	≤50	2006	N'Goran (2007)
	Monogaga Classified Forest	Extirpated	2007	Campbell (2008)

Country	Site name	Abundance class	Survey year(s)	Source
Ivory Coast cont.	Mt. Peko NP	Extirpated	2015	E. Normand, personal communication (2016)
	Mt. Sangbe NP	Present	2014	Wild Chimpanzee Foundation, unpublished data (2015)
	Nimba Mountains	≤50	2009–11	Granier <i>et al.</i> (2014)
	Niouniourou Classified Forest	Extirpated	2007	Campbell (2008)
	Nizoro Classified Forest	Extirpated	2007	Campbell (2008)
	Okromodou Classified Forest	Extirpated	2007	Campbell (2008)
	Port Gauthier Classified Forest	Extirpated	2007	Campbell (2008)
	Tai NP	101–300*	2018	Tiédoúé <i>et al.</i> (2019)
Tamin Classified Forest	Extirpated	2007	Campbell (2008)	
Liberia	Foya proposed NP	Present	2019	Fauna & Flora International, unpublished data (2021)
	Gola Forest NP	51–100	2017	WCF (2018)
	Grebo-Krahn NP	101–300	2020	N. Cappelle and E. Normand, unpublished data (2021)
	Grebo-Sapo corridor	501–1,000	2015	Furnell <i>et al.</i> (2015)
	Sapo NP	1,001–5,000	2016	Tweh <i>et al.</i> (2018)
	Wologizi mountains	Present	2019	ELRECO (2020)
	Wonegizi mountains	Present	2018–19	ELRECO (2020)
Nationwide	5,001–10,000	2011–12	Tweh <i>et al.</i> (2015)	
Mali	Bafing Biosphere Reserve	≤50	2014	Pan African Programme: The Cultured Chimpanzee, unpublished data (2015)
Senegal	Fongoli	≤50	2005–06	Pruetz and Bertolani (2007)
	Nathia	Present	2010–11	Gašperšič and Pruetz (2011)
	Niokolo Koba NP	≤50	2000	Pruetz <i>et al.</i> (2002)
	Nationwide	501–1,000	2015	E. Wessling and J. Pruetz, unpublished data (2016)
Sierra Leone	Gola Rainforest NP	101–300	2015–16	B. Barca, personal communication (2017)
	Kambui FR	Present	2009–10	Brncic, Amarasekaran and McKenna (2010)
	Kangari FR	Present	2009–10	Brncic, Amarasekaran and McKenna (2010)
	Kilimi NP	51–100	2009–10	Brncic, Amarasekaran and McKenna (2010)
	Lake Sonfon proposed NP	Present	2009–10	Brncic, Amarasekaran and McKenna (2010)

Country	Site name	Abundance class	Survey year(s)	Source
Sierra Leone cont.	Loma Mountains NP	1,001–5,000	2019	Garriga (2019)
	Moyamba	Present	2009–10	Brcic, Amarasekaran and McKenna (2010)
	Nimini FR	Present	2009–10	Brcic, Amarasekaran and McKenna (2010)
	Outamba NP	501–1,000	2009–10	Brcic, Amarasekaran and McKenna (2010)
	Tingi FR	51–100	2009–10	Brcic, Amarasekaran and McKenna (2010)
	Tonkoli FR	Present	2009–10	Brcic, Amarasekaran and McKenna (2010)
	Western Area Peninsula FR	51–100	2009–10	Brcic, Amarasekaran and McKenna (2010)
	Nationwide	5,001–10,000	2009–10	Brcic, Amarasekaran and McKenna (2010)
Togo	Nationwide	Possibly extinct	2013–14	Campbell and Hougbedji (2015)

* Variation in the abundance estimate for Tai NP is attributed to changes in methodology, including the number of collectors on a transect, the type of transects, the layout of transect routes and sampling effort, not a decrease in the chimpanzee population.

TABLE 11

Sumatran Orangutan (*Pongo abelii*) Abundance Estimates

Country	Site name	Abundance class	Year of estimate	Source
Indonesia	East Leuser	1,001–5,000	2015	Wich <i>et al.</i> (2016, 2019), Hansen <i>et al.</i> (2013)
	Sikulaping	101–300		
	Siranggas, Batu Ardan	51–100		
	Tripa Swamp	51–100		
	Trumon-Singkil	1,001–5,000		
	West Leuser	1,001–5,000		

Note: Population sizes were recalculated based on Wich *et al.* (2016, 2019) and deforestation data from the Global Forest Watch (v1.7; Hansen *et al.*, 2013). The recalculation involved the removal of the percentage of forest lost between 2012 and 2019 per 1 km² and the same percentage was deducted from the number of individuals in that area, to correct for orangutan losses due to habitat loss. As the figures in this table do not cover any further losses related to killing or capture,² they are most probably overestimates. Information about the sites can be found in Utami-Atmoko *et al.* (2017). In some cases, a new site name may encompass multiple sites that were previously listed separately. As a result, orangutan numbers are not directly comparable over time at the site level.

TABLE 12**Tapanuli Orangutan (*Pongo tapanuliensis*) Abundance Estimates**

Country	Site name	Abundance class	Year of estimate	Source
Indonesia	Dolok Sibual-buali NR	≤50	2015	Wich <i>et al.</i> (2016, 2019), Hansen <i>et al.</i> (2013)
	East Batang Toru	101–300		
	West Batang Toru	501–1,000		

Note: The Tapanuli orangutan was first described in November 2017 (Nater *et al.*, 2017). The distribution and population estimates provided here are based on earlier surveys in the area where the Tapanuli orangutan occurs. Population sizes were recalculated based on Wich *et al.* (2016, 2019) and deforestation data from the Global Forest Watch (v1.7; Hansen *et al.*, 2013). The recalculation involved the removal of the percentage of forest lost between 2012 and 2019 per 1 km² and the same percentage was deducted from the number of individuals in that area, to correct for orangutan losses due to habitat destruction. As the figures in this table do not cover any further losses related to killing or capture,³ they are most probably overestimates.

TABLE 13**Northeast Bornean Orangutan (*Pongo pygmaeus morio*) Abundance Estimates**

Country	Site name	Abundance class	Year of estimate	Source
Indonesia	Belayan Senyuir landscape	101–300	2016	Voigt <i>et al.</i> (2018), Hansen <i>et al.</i> (2013)
	Bontang landscape	51–100		
	Kutai landscape	1,001–5,000		
	Lesan landscape	51–100		
	Sangkulirang landscape	301–500		
	Wehea landscape	501–1,000		
Malaysia	Bonggaya landscape	101–300	2016	Voigt <i>et al.</i> (2018), Hansen <i>et al.</i> (2013)
	Central Forest range landscape	5,001–10,000		
	Crocker range landscape	101–300		
	Lingkabau landscape	101–300		
	Lower Kinabatangan range landscape	1,001–5,000		
	North Kinabatangan range landscape and Ulu Tungud	1,001–5,000		
	Sepilok	101–300		
	Tabin range landscape	1,001–5,000		
	Trus madi landscape	101–300		
	Ulu Kalumpang range landscape	301–500		

Note: Population sizes were recalculated based on Voigt *et al.* (2018) and deforestation data from the Global Forest Watch (v1.7; Hansen *et al.*, 2013). The recalculation involved the removal of the percentage of forest lost between 2012 and 2019 per 1 km² and the same percentage was deducted from the number of individuals in that area, to correct for orangutan losses due to habitat destruction. As the figures in this table do not cover any further losses related to killing or capture,⁴ they are most probably overestimates. In some cases, a new site name may encompass multiple sites that were previously listed separately. As a result, orangutan numbers are not directly comparable over time at the site level.

TABLE 14**Northwest Bornean Orangutan (*Pongo pygmaeus pygmaeus*) Abundance Estimates**

Country	Site name	Abundance class	Year of estimate	Source
Indonesia	Betung Kerihun NP and protection forest	1,001–5,000	2016	Voigt <i>et al.</i> (2018), Hansen <i>et al.</i> (2013)
	Danau Sentarum and corridor	501–1,000		
	Pygmaeus fragmented North	≤50		
	Pygmaeus fragmented South	≤50		
Indonesia/ Malaysia	Bungoh NP–Gunung Nyiut NR, Penrisen protection forest	51–100	2016	Voigt <i>et al.</i> (2018), Hansen <i>et al.</i> (2013)
	Klingkang Range NP, Sintang Utara	51–100		
Malaysia (Sarawak)	Batang Ai-Lanjak Entimau landscape	1,001–5,000	2016	Voigt <i>et al.</i> (2018), Hansen <i>et al.</i> (2013)
	Ulu Sebuyau-Sedilu landscape	≤50		

Note: Population sizes were recalculated based on Voigt *et al.* (2018) and deforestation data from the Global Forest Watch (v1.7; Hansen *et al.*, 2013). The recalculation involved the removal of the percentage of forest lost between 2012 and 2019 per 1 km² and the same percentage was deducted from the number of individuals in that area, to correct for orangutan losses due to habitat destruction. As the figures in this table do not cover any further losses related to killing or capture,⁵ they are most probably overestimates. In some cases, a new site name may encompass multiple sites that were previously listed separately. As a result, orangutan numbers are not directly comparable over time at the site level.

TABLE 15**Southwest Bornean Orangutan (*Pongo pygmaeus wurmbii*) Abundance Estimates**

Country	Site name	Abundance class	Year of estimate	Source
Indonesia	Arabela Schwaner	10,001–20,000	2016	Voigt <i>et al.</i> (2018), Hansen <i>et al.</i> (2013)
	Barito Timur	101–300		
	Gunung Palung-Sungai Putri	1,001–5,000		
	Kahayan-Kapuas	1,001–5,000		
	Kapuas-Barito	1,001–5,000		
	Katingan (including Seruyan Sampit)	1,001–5,000		
	Kendawangan-Jelai	≤50		
	Kotawaringin-Lama	501–1,000		
	Kubu Raya	1,001–5,000		
	Lamandau-Sukumara	501–1,000		

Indonesia cont.	Pematang Gadung	501–1,000		
	Rungan River landscape	1,001–5,000		
	Sebangau	5,001–10,000		
	Sungai Tengar	101–300		
	Tanjung Puting	1,001–5,000		
	Tanjung Puting	1,001–5,000		

Note: Population sizes were recalculated based on Voigt *et al.* (2018) and deforestation data from the Global Forest Watch (v1.7; Hansen *et al.*, 2013). The recalculation involved the removal of the percentage of forest lost between 2012 and 2019 per 1 km² and the same percentage was deducted from the number of individuals in that area, to correct for orangutan losses due to habitat destruction. As the figures in this table do not cover any further losses related to killing or capture,⁶ they are most probably overestimates. In some cases, a new site name may encompass multiple sites that were previously listed separately. As a result, orangutan numbers are not directly comparable over time at the site level.

Gibbon Abundance and Density Estimates

The most effective measures for monitoring gibbon populations are density estimates, formulated as individuals or groups per square kilometer. Abundance classes may be obtained by extrapolating density estimates to larger areas. The following tables provide available density estimates alongside abundance estimates; in the absence of data, the word “present” is used to indicate that gibbons are known to occur.

TABLE 16
Gaoligong Hoolock (*Hoolock tianxing*) Abundance Estimates

Country	Site name	Abundance class/ density	Survey year(s)	Source
China	Baoshan	Present	2009	Fan <i>et al.</i> (2011)
	Mt. Gaoligong, Yunnan	101–300	2008–09	Chan <i>et al.</i> (2017)
	Yingjiang (county)	51–100	2009	Fan <i>et al.</i> (2011)
Myanmar	Bhamo east	Present	2010	Geissmann <i>et al.</i> (2013)
	Kachin state	Present	2022	Aung <i>et al.</i> (2023)
	Karen state	Present	2022	Aung <i>et al.</i> (2023)
	Kayah and Kayin states	10,001–20,000	2010	Geissmann <i>et al.</i> (2013)
	Maharmyaing	Present		Brockelman <i>et al.</i> (2009)
	Shan state	5,001–10,000	2022	Aung <i>et al.</i> (2023)
	Saw Law	2.05 groups/km ²	2009	Geissmann <i>et al.</i> (2013)

Note: Populations in Myanmar are distributed on the east bank of the Irrawaddy River and are thus likely to represent *Hoolock tianxing*, which had not yet been differentiated as a separate species when Fan *et al.* (2011) and Geissmann *et al.* (2013) were published (Fan *et al.*, 2017). The population in Myanmar’s Rakhine state has been identified as eastern hoolock (Fan, Turvey and Bryant, 2020).

TABLE 17**Western Hoolock (*Hoolock hoolock*) Abundance Estimates**

Country	Site name	Abundance class/ density	Survey year(s)	Source
Bangladesh	Adampur	Present	2002	Islam <i>et al.</i> (2006)
	Alikadam	Present	2002	Islam <i>et al.</i> (2006)
	Bamu	Present	2002	Islam <i>et al.</i> (2006)
	Bangdepa	Present	2002	Islam <i>et al.</i> (2006)
	ChunatiWS	Present	2002	Islam <i>et al.</i> (2006)
	DopachariWS	Present	2002	Islam <i>et al.</i> (2006)
	Gazipur Tea Estate	Present	2002	Islam <i>et al.</i> (2006)
	HimchariNP	Present	2002	Islam <i>et al.</i> (2006)
	Horinchara	Present	2002	Islam <i>et al.</i> (2006)
	InaniNP	Present	2000	Islam <i>et al.</i> (2006)
	Kalachara Forest Beat	≤50	2009	Akers, Islam and Nijman (2013)
	KaptaiNP	≤50	2002	Islam <i>et al.</i> (2006)
	Lathitila	Present	2002	Islam <i>et al.</i> (2006)
	Lawachara and Chunati	Present	1990–91	Feeroz and Islam (1992)
	LawacharaNP	Present	2003	Hasan and Feeroz (2011), Islam <i>et al.</i> (2006)
	Pablakhali_WS	Present	2002	Islam <i>et al.</i> (2006)
	Rajghat	Present	2002	Islam <i>et al.</i> (2006)
	Rema-KalengaWS	Present	2002	Islam <i>et al.</i> (2006)
	Satchari_NP	Present	2002	Islam <i>et al.</i> (2006)
	Sheikh Jamal Inani National Park	≤50	2020	Kabir <i>et al.</i> (2021)
TeknafWS	Present	1997	Islam <i>et al.</i> (2006)	
Thanchi	Present	2002	Islam <i>et al.</i> (2006)	
India	Assam	1,001–5,000	1994–2004	Das <i>et al.</i> (2005)
	Adj_Namdapha_NP	≤50	2006	Das <i>et al.</i> (2006)
	Balpakram_NP	51–100	2005	Choudhury (2006)
	Barail and Langting-Mupa Reserve Forests (North Cachar Hills), Hollongapar Reserve Forest (Jorhat district), Innerline Reserve Forest (Cachar)	Present	1986–88	Choudhury (2000)
	Borajan_RF	Present	2002	Kakati <i>et al.</i> (2009)
	Buridihing_RF	≤50	2002	Kakati <i>et al.</i> (2009)

India cont.	Dampa Tiger Reserve	≤50	2010–11	Pachuau <i>et al.</i> (2013)
	DampaWS	Present	2011	Pachuau <i>et al.</i> (2013)
	DehningEast_RF	≤50	2002	Kakati <i>et al.</i> (2009)
	DehningWest_RF	Present	2002	Kakati <i>et al.</i> (2009)
	Dirok_RF	Present	2002	Kakati <i>et al.</i> (2009)
	Doomdooma_RF	Present	2002	Kakati <i>et al.</i> (2009)
	FakimWS	≤50	2004	Choudhury (2006)
	Hallowgaon_RF	Present	2010	Chetry and Chetry (2010)
	Hatikhali_Cachar	Present	1920	GBIF.org (2020)
	Hollongapur FR	Present	1971–73	Tilson (1979)
	Inner-LineRF_adj	≤50	2011	Islam, Choudhury and Bhattacharjee (2013)
	IntankiNP	≤50	2004	Choudhury (2006)
	Jeypore_RF	≤50	2002	Kakati <i>et al.</i> (2009)
	Kakojan_RF	≤50	2002	Kakati <i>et al.</i> (2009)
	Kaziranga_NP	Present	2002	GBIF.org (2020)
	KhawnglungWS	≤50	2000	Choudhury (2006)
	Kukuramura	0.65 groups/km ²	2010	Chetry, Chetry and Bhattacharjee (2012)
	Kumsang_RF	Present	2002	Kakati <i>et al.</i> (2009)
	KundilKolia	0.65 groups/km ²	2010	Chetry, Chetry and Bhattacharjee (2012)
	LongaiRF	Present	2012	Deb, Rai and Bhattacharjee (2014)
	MahaoWSandAdj	101–300	2008	Chetry <i>et al.</i> (2010), Choudhury (2013)
	Margharita	Present	2002	GBIF.org (2020)
	Murlen_WS	≤50	2000	Choudhury (2006)
	Namdapha NP	1,001–5,000; 3.65 groups/km ²	2012	Ray <i>et al.</i> (2015)
	Namdapha_NP	2.4 groups/km ²	2006	Das <i>et al.</i> (2006), Ray <i>et al.</i> (2015)
	Ngengpui_WS	≤50	2000	Choudhury (2006)
	NokrekNP	≤50	2005	Choudhury (2006)
	Phawngpui_NP	≤50	2000	Choudhury (2006)
	SijuWS	≤50	2005	Choudhury (2006)
	Tarani_RF	Present	2002	Kakati <i>et al.</i> (2009)
Tokowani_RF	Present	2002	Kakati <i>et al.</i> (2009)	
Yangoupokpi_WS	≤50	2001	Choudhury (2006)	
Zubza_Naga	Present	1940	GBIF.org (2020)	

Myanmar	Ann	Present	2009	Geissmann <i>et al.</i> (2013)
	Kabawvalley	Present	1916	Jenkins (1990)
	Kamhti	Present	1935	Morris (1936)
	Karamati	1.27 groups/km ²	2009	Geissmann <i>et al.</i> (2013)
	Kyaukpandaung	0.32 groups/km ²	2010	Geissmann <i>et al.</i> (2013)
	Middel_RY	0.88 groups/km ²	2008	Geissmann <i>et al.</i> (2013)
	Naga Hills and West Chindwin Lowlands, Sagaing	3.03 groups/km ²	2005–6	Geissmann <i>et al.</i> (2013)
	Natmataung	0.32 groups/km ²	2010	Geissmann <i>et al.</i> (2013)
	Natyekan	1.04 groups/km ²	2013	Myers, Thway and Lin (2019)
	North_rakhine	3.14 groups/km ²	2009	Geissmann <i>et al.</i> (2013)
	Rakhine state	10,001–20,000	2008–09	Geissmann <i>et al.</i> (2013)
	South_HK	Present	1935	Morris (1936)
	South_RY	2.00 groups/km ²	2008	Geissmann <i>et al.</i> (2013)

Note: Global Biodiversity Information Facility (GBIF) data are used to obtain occurrence information from which presence is determined.

TABLE 18

Eastern Hoolock (*Hoolock leuconedys*) Abundance Estimates

Country	Site name	Abundance class/ density	Survey year	Source
India	Adj Namdapha NP	≤50	2006	Das <i>et al.</i> (2006)
	Hallowgaon_RF	Present	2010	Chetry and Chetry (2010)
	Kukuramura	0.65 groups/km ²	2010	Chetry, Chetry and Bhattacharjee (2012)
	KundiKolia	0.65 groups/km ²	2010	Chetry, Chetry and Bhattacharjee (2012)
	MahaoWSandAdj	101–300	2008	Chetry <i>et al.</i> (2010), Choudhury (2013)
	Namdapha NP	3.65 groups/km ²	2012	Ray <i>et al.</i> (2015)
Myanmar	Bhamo	Present	1879	Groves (1972)
	Central_Myanmar	Present	2000	Lynam (2003)
	Gangawtaung (Gantkawtaung)	2.07 groups/km ²	2010	Geissmann <i>et al.</i> (2013)
	Homalin	Present	1935	Morris (1936)
	Hpongan	1.3 groups/km ²	2009	Geissmann <i>et al.</i> (2013)
	Htamanthi	1.36 groups/km ²	2015	WCS (2015)
	Hukawng	1.46 groups/km ²	2000	Lynam (2003)
	Indawgyi	4.64 groups/km ²	2019	Lwin, Sukumal and Savini (2021)
	Kayin	0.6 groups/km ²	2010	Geissmann <i>et al.</i> (2013)
	Kyaikhtiyoe	Present	1980	Geissmann <i>et al.</i> (2013)

Myanmar cont.	N_KhinBum	Present	2012	FFI (2012)
	Naungmon	1.35 groups/km ²	2009	Geissmann <i>et al.</i> (2013)
	Paunglaung	Present	2000	Lynam (2003)
	Pitaung	Present	1937	Kingdon Ward (1949)
	Pyadalin	Present	2002	Geissmann <i>et al.</i> (2013)
	Pyaunggaung	Present	1913	Riley and Shortridge (1913)
	Sumprabum (Samparbum)	2.23 groups/km ²	2009	Geissmann <i>et al.</i> (2013)

TABLE 19**Abbott's Gray Gibbon (*Hylobates abbotti*)**

There are no accurate population density estimates for Abbott's gray gibbon. Population estimates for the species in Indonesia and Malaysia are extrapolations based on data for related species. While a significant population probably exists outside protected areas, it remains to be assessed. The impact of plantations (especially oil palm plantations) on gibbon populations is unknown; more data are needed before an evaluation may be made.

TABLE 20**Agile Gibbon (*Hylobates agilis*) Abundance Estimates**

Country	Site name	Abundance class/ density	Survey year(s)	Source
Indonesia	Air Tarusan Reserve	Present	2015	A.B. Chanee, unpublished data (2015)
	Batang Gadis NP	9.9–15.5 individuals/km ²	2008	Sultan, Mansjoer and Bismark (2009)
	Bukit Barisan Seletan	1.4–2.8 individuals/km ²	2001	O'Brien <i>et al.</i> (2004)
	Harapan Rainforest	Present	2009–10	Lee, Powell and Lindsay (2015)
	Kerinci Seblat NP	6.0–11.4 individuals/km ²	1998	Yanuar (2009)
	Way Kambas	1.9 individuals/km ²	1992	Yanuar (2009)
Malaysia	Sungai Dal	19.0 individuals/km ²	1978	Gittins (1979)

TABLE 21**Bornean White-bearded Gibbon (*Hylobates albibarbis*) Abundance Estimates**

Country	Site name	Abundance class	Density	Survey year(s)	Source
Indonesia	Bawan	20,001–50,000	4.78 groups/km ²	2010	Harrison <i>et al.</i> (2012)
	Block C Ex-Mega Rice Project	5,001–10,000	2.33 groups/km ²	2011	Cheyne (2011)
	Bukit Baka Bukit Raya NP	10,001–20,000	2.78 groups/km ²	2003	S. Cheyne, unpublished data (2003)
	Gunung Palung NP	5,001–10,000	Unknown	2014	Marshall, Beaudrot and Wittmer (2014)
	Mungku Baru	1,001–5,000	2.26 groups/km ²	2010	Harrison <i>et al.</i> (2010)
	Pararawan Reserve	Unknown	Unknown	2014	A.B. Chanee, unpublished data (2015)
	Sebangau NP	**10,001–20,000	2.65 groups/km ²	2007–16	Cheyne <i>et al.</i> (2016)

Note: Two asterisks (**) indicate that an ape population is growing.

TABLE 22**Bornean Gray Gibbon (*Hylobates funereus*) Abundance Estimates**

Country	Site name	Abundance class	Density	Survey year(s)	Source
Indonesia	Betung Kerihun NP	Present	Unknown	Unknown	S. Cheyne, unpublished data (2010)
	Danau Sentarum-Betung Kerihun	Present	Unknown	Unknown	S. Cheyne, unpublished data (2014)
	Kayan Mentarang NP	10,001–20,000	2.1–2.9 groups/km ²	2004	Nijman and Menken (2005)
	Kutai NP	Present	Unknown	2014	S. Cheyne, unpublished data (2014)
	Sankulirang karst area	Present	Unknown	2014	S. Cheyne, unpublished data (2014)
	Wehea Protection Forest	1,001–5,000	1.3 groups/km ²	2013	Cheyne <i>et al.</i> (2016)
Malaysia	Crocker Range NP	Present	Unknown	None	M. Ancrenaz, personal communication (2018)
	Danum Valley	Present	Unknown	None	M. Ancrenaz, personal communication (2018)
	Imbak Canyon Conservation Area	Present	Unknown	None	M. Ancrenaz, personal communication (2018)
	Kinabatangan	Present	Unknown	None	M. Ancrenaz, personal communication (2018)
	Malinau Basin	Present	Unknown	None	M. Ancrenaz, personal communication (2018)

Note: No population information could be found for this species in Brunei.

TABLE 23**Kloss's Gibbon (*Hylobates klossii*) Abundance Estimates**

Country	Site name	Abundance class	Survey year	Source
Indonesia	Saraboa and Sikakap	Present	1970	Tenaza and Hamilton (1971)
	Siberut Island NP	10,001–20,000	2012	Höing <i>et al.</i> (2013)

TABLE 24**Lar Gibbon (*Hylobates lar*) Abundance Estimates**

Country	Site name	Abundance class	Survey year(s)	Source
China	Nangunhe NR, southwest Yunnan	Extirpated	2007	Grueter <i>et al.</i> (2009)
Indonesia	Ketambe Research Station	Present	1991	Palombit (1995)
Lao People's Democratic Republic (PDR)	Nam Pouy National Protected Area (NPA)	Present	2010	Boonratana <i>et al.</i> (2011)
Thailand	Khao Yai NP	Present	1992–96	Reichard and Sommer (1997)
	Mo Singto, Khao Yai NP	Present	1994–95	Bartlett (2009)

Note: No population information could be found for this species in Malaysia or Myanmar.

TABLE 25**Moloch Gibbon (*Hylobates moloch*) Abundance Estimates**

Country	Site name	Abundance class/density	Survey year(s)	Source
Indonesia	Bojongpicung	Present	1994–2002	Nijman (2004)
	Cisolok	Present	1994–2002	Nijman (2004)
	Gede Pangrango	101–300	2007	Iskandar (2007)
	Lengkong	Present	1994–2002	Nijman (2004)
	Leuweung Sancang	Present	1994–2002	Nijman (2004)
	Mt. Burangrang-Tangkuban Perahu	51–100	1994–2002	Nijman (2004)
	Mt. Ciremai	Present	1994–2001	Nijman (2004)
	Mt. Dieng	1,001–5,000	2018–2021	Widyastuti <i>et al.</i> (2023)
	Mt. Halimun Salak NP	1,001–5,000	2007	Iskandar (2007)
	Mt. Halu	Present	1994–2002	Nijman (2004)
	Mt. Jayanti-Tangkuban Perahu	Present	1994–2001	Nijman (2004)
	Mt. Lawet/Cupu-Simembut/Jaran	51–100	1994–2002	Nijman (2004)
	Mt. Malang	Present	1994–2002	Nijman (2004)
	Mt. Manglayang	Present	1994–2002	Nijman (2004)
	Mt. Masegit-Kareumbi	Present	1994–2002	Nijman (2004)
	Mt. Papandayan	101–300	1994	Nijman (2004)
	Mt. Pongkor	Present	1994–2002	Nijman (2004)
	Mt. Porang	Present	1994–2002	Nijman (2004)
	Mt. Sawal	Present	1994–2001	Nijman (2004)
	Mt. Segara	51–100	1994–2002	Nijman (2004)
	Mt. Simpang	501–1,000	1994	Nijman (2004)
	Mt. Slamet	101–300; 1.7 individuals/km ²	2009–10	Setiawan <i>et al.</i> (2012)
	Mt. Tilu	51–100	1994–2002	Nijman (2004)
	Mt. Wayang	101–300	1994	Nijman (2004)
	Pasir Susuru	Present	1994–2002	Nijman (2004)
	Sanggabuana	51–100	1994–2002	Nijman (2004)
	Takokak	Present	1994–2002	Nijman (2004)
	Telaga Warna-Megamendung	51–100	1994–2002	Nijman (2004)
	Ujung Kulon (Honje-Tereleng)	501–1,000	1994–2002	Nijman (2004)

TABLE 26**Müller's Gibbon (*Hylobates muelleri*) Abundance Estimates**

Country	Site name	Abundance class	Survey year	Source
Indonesia	Gunung Lumut Reserve (Hutan Lindung)	5,001–10,000	2011	A.B. Chanee, unpublished data (2015)
	Sungai Wain Protection Forest	1,001–5,000	2012	Gilhooly, Rayadin and Cheyne (2015)
	Uut Murung (mixed community and unprotected)	50,001–100,000	2011	Cheyne <i>et al.</i> (2016)

TABLE 27**Pileated Gibbon (*Hylobates pileatus*) Abundance Estimates**

Country	Site name	Abundance class	Density	Survey year(s)	Source
Cambodia	Bokor NP	1,001–5,000	0.62 groups/km ²	2003	Traeholt <i>et al.</i> (2005)
	Botum Sakor NP	5,001–10,000	1.55 groups/km ²	2003	Traeholt <i>et al.</i> (2005)
	Central Cardamoms NP	10,001–20,000	2.02 groups/km ²	2003	Traeholt <i>et al.</i> (2005)
	Kirirom NP	1,001–5,000	1.40 groups/km ²	2003	Traeholt <i>et al.</i> (2005)
	Kulen Promtep Wildlife Sanctuary	1,001–5,000	1.7 groups/km ²	2003	Traeholt <i>et al.</i> (2005)
	Phnom Aural Wildlife Sanctuary	1,001–5,000	1.32 groups/km ²	2003	Traeholt <i>et al.</i> (2005)
	Phnom Samkos Wildlife Sanctuary	5,001–10,000	1.32 groups/km ²	2003	Traeholt <i>et al.</i> (2005)
	Prey Long Wildlife Sanctuary	1,001–5,000	0.55 groups/km ²	2003	Traeholt <i>et al.</i> (2005)
	Samling concession	1,001–5,000	1.30 groups/km ²	2003	Traeholt <i>et al.</i> (2005)
	Southern Cardamom NP	10,001–20,000	1.19 groups/km ²	2003	Traeholt <i>et al.</i> (2005)
Thailand	Khao Ang Rue Nai Wildlife Sanctuary	1,001–5,000	1.02 groups/km ²	2007–08	Phoonjampa <i>et al.</i> (2011)
	Khao Soi Dao Wildlife Sanctuary	1,001–5,000	Unknown	2004–05	Phoonjampa and Brockelman (2008)
	Khao Yai NP	1,001–5,000	Unknown	2004–05	Phoonjampa and Brockelman (2008)
	Pang Sida and Tab Lan NPs	1,001–5,000	Unknown	2004–05	Phoonjampa and Brockelman (2008)

Note: No population information could be found for this species in Lao PDR.

TABLE 28**Northern Yellow-cheeked Crested Gibbon (*Nomascus annamensis*) Abundance Estimates**

Country	Site name	Abundance class	Survey year	Source
Cambodia	Vensai Siempang NP	Present	2017	Conservation International Cambodia, unpublished data (2017)
	Virachey NP	Present	2017	General Directorate of the Administration for Nature Conservation and Protection, Ministry of Environment, Cambodia, unpublished data (2017)
Lao PDR	Bolaven Northeast	Present	1995	Duckworth (2008)
	Bolaven Southwest	Present	1995	Duckworth (2008)
	Dakchung plateau	Present	1994	Duckworth (2008)
	Dong Ampham NPA	Present	2007	Duckworth (2008)
	Dong Hua Sao NPA	Present	2008	Duckworth (2008)
	Dong Kapho Production Forest	Present	2005	Duckworth (2008)
	Dong Nathat conservation area	Extirpated	Pre-1990	Duckworth (2008)
	Dong Phou Vieng NPA	Present	2008	Duckworth (2008)
	Dong Sithouan production forest	Present	2005	Duckworth (2008)
	Laongam production forest	Present	2002	Duckworth (2008)
	Muang Kaleum	Present	2008	Duckworth (2008)
	Muang Lamam	Present	2008	Duckworth (2008)
	Muang Nong	Present	2007	Duckworth (2008)
	Muang Paksong	Present	2007	Duckworth (2008)
	Muang Pathoumphon	Present	2005	Duckworth (2008)
	Muang Samakhixai	Present	2007	Duckworth (2008)
	Muang Sanamxai	Present	2007	Duckworth (2008)
	Muang Somoy	Present	2008	Duckworth (2008)
	Muang Taoy	Present	2007	Duckworth (2008)
	Nam Ghong Provincial Protected Area	Present	2007	Duckworth (2008)
	Phou Ahyon	Present	1996	Duckworth (2008)
	Phou Khathong proposed NPA	Present	2008	Duckworth (2008)
	Phou Talava production forest	Present	2005	Duckworth (2008)
	Phou Theung proposed NPA	Present	2006	Duckworth (2008)
	Phou Xiang Thong NPA	Present	2008	Duckworth (2008)
	Silivangveun production forest	Present	2002	Duckworth (2008)
Thateng	Present	1989	Duckworth (2008)	
Xe Bang-Nouan NPA	Present	2008	Duckworth (2008)	
Xe Khampho proposed NPA	Present	1995	Duckworth (2008)	

Country	Site name	Abundance class	Survey year	Source
Lao PDR cont.	Xe Kong Pine Forest	Present	1992	Duckworth (2008)
	Xe Pian NPA	Present	2008	Duckworth (2008)
	Xe Sap NPA	Present	2008	Duckworth (2008)
Viet Nam	A Luoi Watershed	≤50	2009	Rawson <i>et al.</i> (2011)
	An Toan NR	101–300	2016	Duc, Bang and Covert (2017)
	Ba Na-Nui Chua NR	Present	2006	Rawson <i>et al.</i> (2011)
	Bach Ma NP	Present	2010	Rawson <i>et al.</i> (2011)
	Chu Mom Ray NP	≤50	2007	Rawson <i>et al.</i> (2011)
	Dak Rong NR	51–100	2010	Rawson <i>et al.</i> (2011)
	Dakroong and Tam Lap state forest enterprise (SFE)	≤50	2008	Rawson <i>et al.</i> (2011)
	Kon Cha Rang NR	≤50	2010	Rawson <i>et al.</i> (2011)
	Kon Ka Kinh NP	101–300	2010	Rawson <i>et al.</i> (2011)
	Kon Plong SFE	≤50	2009	Rawson <i>et al.</i> (2011)
	Nam Dong Watershed Forest	≤50	2007	Rawson <i>et al.</i> (2011)
	Ngoc Linh NR	Present	2006	Rawson <i>et al.</i> (2011)
	Ngoc Linh proposed NR	Extirpated	2005	Rawson <i>et al.</i> (2011)
	Phong Dien NR	≤50	2010	Rawson <i>et al.</i> (2011)
	Quang Nam Saola NR	Present	2005	Rawson <i>et al.</i> (2011)
	Que Son proposed Species and Habitat Conservation Area	Present	2009	Rawson <i>et al.</i> (2011)
	Song Thanh NR	≤50	2004	Rawson <i>et al.</i> (2011)
	Thua Thien Hue Saola NR	Present	2010	Rawson <i>et al.</i> (2011)
	Western Ba To proposed NR	101–300	2016	Duc, Bang and Covert (2017)

TABLE 29**Western Black-crested Gibbon (*Nomascus concolor*) Abundance Estimates**

Country	Site name	Abundance class	Survey year(s)	Source
China	Ailaoshan National NR	101–300	2009–10	Li <i>et al.</i> (2011)
	Ailaoshan National NR and Xiping Ailaoshan County-level NR	301–500	2009–10	Li <i>et al.</i> (2011)
	Lanbanghe Provincial NR	Present	2011	Sun <i>et al.</i> (2012)
	Lancangjiang Provincial NR	Present	2011	Sun <i>et al.</i> (2012)
	Northern part of Nangunhe National NR	Present	2011	Sun <i>et al.</i> (2012)
	Yongdedaxueshan National NR	≤50	2011	Sun <i>et al.</i> (2012)
	Zhenyuan	≤50	2010	Luo (2011)

Lao PDR	Houay Nam Loi	Present	1991	Duckworth (2008)
	Louang-Namtha	Present	2006	Duckworth (2008)
	Nam Ha NPA	Present	2007	Duckworth (2008)
	Nam Kan NPA	301–500	2013	Timmins and Duckworth (2013)
	Nam Kong Provincial Protected Area	Present	1997	Duckworth (2008)
Viet Nam	Hoang Lien NR and vicinity	Present	2009	Rawson <i>et al.</i> (2011)
	Hoang Lien-Van Ban NR	≤50	2009	Rawson <i>et al.</i> (2011)
	Mu Cang Chai Species and Habitat Conservation Area	≤50	2010	Rawson <i>et al.</i> (2011)
	Muong La Watershed Protection Forest	≤50	2010	Rawson <i>et al.</i> (2011)
	Pan Village, Muong Do Commune, Phu Yen district	Present	2000	Rawson <i>et al.</i> (2011)
	Tram Tau	Present	2000	Rawson <i>et al.</i> (2011)
	Xuan Son NR	Present	2000	Rawson <i>et al.</i> (2011)

TABLE 30**Southern Yellow-cheeked Crested Gibbon (*Nomascus gabriellae*) Abundance Estimates**

Country	Site name	Abundance class	Survey year	Source
Cambodia	Phnom Prich Wildlife Sanctuary	Present	2008	Gray, Phan and Long (2010)
	Seima Biodiversity Conservation Area	Present	2015	Wildlife Conservation Society Cambodia, unpublished data (2015)
Viet Nam	A Yun Pa proposed NR	Present	1998	Rawson <i>et al.</i> (2011)
	Bi Dup-Nui Ba NR	≤50	2010	Rawson <i>et al.</i> (2011)
	Bu Gia Map NP	101–300	2010	Rawson <i>et al.</i> (2011)
	Cat Tien NP	301–500	2010	Rawson <i>et al.</i> (2011)
	Chu Yang Sin NP	≤50	2009	Rawson <i>et al.</i> (2011)
	Cu Jut district	Present	2007	Rawson <i>et al.</i> (2011)
	Dong Nai NR	≤50	2010	Rawson <i>et al.</i> (2011)
	Ea So NR	Present	2006	Rawson <i>et al.</i> (2011)
	Ea Sup/Ea H'leo district	Present	1998	Rawson <i>et al.</i> (2011)
	Ea Trang Commune, M'drak	Present	1998	Rawson <i>et al.</i> (2011)
	Hon Ba NR	101–300	2015	Duc, Bang and Covert (2015)
	Khanh Hoa SFE and Tram Huong Forestry Company	101–300	2015	Duc, Bang and Covert (2015)
	Krong No district	Present	1998	Rawson <i>et al.</i> (2011)
Loc Bac SFE	≤50	2004	Rawson <i>et al.</i> (2011)	

Country	Site name	Abundance class	Survey year	Source
Viet Nam cont.	Nam Nung NR	≤50	2010	Rawson <i>et al.</i> (2011)
	Ninh Son SFE	101–300	2015	Duc, Bang and Covert (2015)
	Nui Ong NR	≤50	2010	Rawson <i>et al.</i> (2011)
	Phuoc Binh NP	101–300	2015	Duc, Bang and Covert (2015)
	Quang Truc commune, Dak Rlap district	101–300	2013	Duc <i>et al.</i> (2014)
	Ta Dung NR	51–100	2010	Rawson <i>et al.</i> (2011)
	Yok Don NP	Present	2007	Rawson <i>et al.</i> (2011)

TABLE 31**Hainan Gibbon (*Nomascus hainanus*) Abundance Estimates**

Country	Site name	Abundance class	Survey year	Source
China	Bawangling National NR	≤50	2012	Bryant (2014)

TABLE 32**Northern White-cheeked Crested Gibbon (*Nomascus leucogenys*) Abundance Estimates**

Country	Site name	Abundance class	Survey year(s)	Source
China	Huanglianshan National NR	Extirpated	2005	Ni and Ma (2006)
	Xishuangbanna National NR	Extirpated	2012	Fan, Fei and Luo (2014)
Lao PDR	Muang Fu Ang	Present	1999	Duckworth (2008)
	Muang Hinheup	Present	1999	Duckworth (2008)
	Muang Houamouang	Present	2006	Duckworth (2008)
	Muang Kasi	Present	1999	Duckworth (2008)
	Muang Met	Present	1999	Duckworth (2008)
	Muang Sangthong	Present	1996	Duckworth (2008)
	Muang Vangviang	Present	1999	Duckworth (2008)
	Muang Viangthong	Present	2008	Duckworth (2008)
	Muang Xanakham	Present	2003	Duckworth (2008)
	Muang Xiangkho	Present	2008	Duckworth (2008)
	Nam Et-Phou Louey NPA	Present	2008	Duckworth (2008)
	Nam Gniap catchment	Present	2008	Duckworth (2008)
	Nam Kading NPA	Present	2007 and 2008	Thinh <i>et al.</i> (2010)
	Nam Xam NPA	Present	2000	Duckworth (2008)
Northern Xiangkhouang	Present	2008	Duckworth (2008)	
Phou Dendin NPA	Present	2005	Duckworth (2008)	

Country	Site name	Abundance class	Survey year(s)	Source
Lao PDR cont.	Phou Khaokhoay NPA	Present	2007	Duckworth (2008)
	Phou Phanang NPA	Present	1983	Duckworth (2008)
	Southern Xiangkhouang	Present	1996	Duckworth (2008)
Viet Nam	Ben En NR	Extirpated	1998	Rawson <i>et al.</i> (2011)
	Hang Kia-Pa Co NR	Extirpated	2009	Rawson <i>et al.</i> (2011)
	Huong Son Forest	≤50	2011	Rawson <i>et al.</i> (2011)
	Ke Go NR	≤50	2010	Rawson <i>et al.</i> (2011)
	Long Luong Commune	≤50	2011	Rawson <i>et al.</i> (2011)
	Muong Nhe NR	≤50	2010	Rawson <i>et al.</i> (2011)
	Ngoc Son-Ngo Luong	Extirpated	2007	Rawson <i>et al.</i> (2011)
	Pu Hoat NR	≤50	2010	Rawson <i>et al.</i> (2011)
	Pu Hu NR	Extirpated	2003	Rawson <i>et al.</i> (2011)
	Pu Huong NR	≤50	2009	Rawson <i>et al.</i> (2011)
	Pu Luong NR	Extirpated	2008	Rawson <i>et al.</i> (2011)
	Pu Mat NP	≤50	2011	Rawson <i>et al.</i> (2011)
	Sop Cop NR	≤50	2011	Rawson <i>et al.</i> (2011)
	Thach Tuong Commune	Extirpated	Post-2000	Rawson <i>et al.</i> (2011)
	Vu Quang NR	≤50	2011	Rawson <i>et al.</i> (2011)
	Xuan Lien NR	≤50	2007	Rawson <i>et al.</i> (2011)
Xuan Nha NR	Extirpated	2011	Rawson <i>et al.</i> (2011)	

TABLE 33**Cao Vit Gibbon (*Nomascus nasutus*) Abundance Estimates**

Country	Site name	Abundance class	Survey year(s)	Source
China	Ailaoshan National NR	51–100	2006 and 2010	Li and Lu (2010)
	Huanglianshan National NR	≤50	2003–04	Ni and Ma (2006)
	Xilongshan (in Fenshuiling National NR)	≤50	2003–04	Ni and Ma (2006)
China/ Viet Nam	Bangliang Gibbon NR, China, and Cao Vit Gibbon Conservation Area, Trung Khanh, Viet Nam	101–300	2016	Hoàn, Dững and Tr'ò'ng (2016)
Viet Nam	Kim Hy NR	Extirpated	2009	Rawson <i>et al.</i> (2011)
	Lung Ri	Extirpated	2009	Rawson <i>et al.</i> (2011)
	Than Sa-Phuong Hoang NR	Extirpated	2011	Rawson <i>et al.</i> (2011)
	Thanh Hen Lake	Extirpated	1998	Rawson <i>et al.</i> (2011)

TABLE 34**Southern White-cheeked Crested Gibbon (*Nomascus siki*) Abundance Estimates**

Country	Site name	Abundance class	Survey year(s)	Source
Lao PDR	Dong Phousoi production forest	Present	2005	Duckworth (2008)
	Muang Boulapha	Present	1998	Duckworth (2008)
	Nakai plateau	Present	2008	Duckworth (2008)
	Nakai-Nam Theun NPA	Present	2014	Coudrat and Nanthavong (2014)
	Nam Kading NPA	Present	2007 and 2008	Thinh <i>et al.</i> (2010)
	Nam Theun Corridor	Present	2004	Duckworth (2008)
	Nam Theun Extension	Present	2007 and 2008	Duckworth (2008)
	Nongkapat production forest	Present	2005	Duckworth (2008)
	Phou Hinpoun	Present	2008	Duckworth (2008)
	Xe Bang Fai headwaters	Present	1998	Duckworth (2008)
Viet Nam	Bac Huong Hoa NR	≤50	2009	Rawson <i>et al.</i> (2011)
	Giang Man proposed NR	≤50	2004	Rawson <i>et al.</i> (2011)
	Khe Giua SFE	≤50	2006	Rawson <i>et al.</i> (2011)
	Khe Net proposed NR	Extirpated	2010	Rawson <i>et al.</i> (2011)
	Phong Nha–Ke Bang NP	51–100	2009	Rawson <i>et al.</i> (2011)
	Truong Son SFE	≤50	2009	Rawson <i>et al.</i> (2011)

Note: In view of uncertainty about which species are represented in Lao PDR, many areas with possible gibbon populations are not listed here.

TABLE 35**Siamang (*Symphalangus syndactylus*) Abundance Estimates**

Country	Site name	Abundance class	Survey year(s)	Source
Indonesia	Air Tarusan Reserve	Present	2012	A.B. Chanee, unpublished data (2014)
		Present	2014	A.B. Chanee, unpublished data (2014)
	Bukit Barisan Selatan NP	20,001–50,000	1998–2002	O'Brien <i>et al.</i> (2003)
	Kalaweit Supayang Reserve	Present	2014	A.B. Chanee, unpublished data (2014)
Malaysia	Ulu Sempam and Krau Game Reserve, Gunong Benom	Present	1969–73	Chivers (1974)

Note: No population information could be found for this species in Thailand.

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- Tacugama Chimpanzee Sanctuary
- The Nature Conservancy
- Total Gabon
- United Nations Educational, Scientific and Cultural Organization
- United Nations Educational, Scientific and Cultural Organization/Central Africa World Heritage Forest Initiative
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List of Abbreviations

CCAR	Central African Republic
DRC	Democratic Republic of Congo
FMU	Forest management unit
FR	Forest reserve
IUCN	International Union for Conservation of Nature
Lao PDR	Lao People's Democratic Republic
No. spp.	Number of species
NP	National park

NPA	National protected area
NR	Nature reserve
SFE	State forest enterprise
SSC	Species Survival Commission
STBC	Société de transformation de bois en Centrafrique
ZIC	Zone d'intérêt cynégétique (hunting zone)
ZICGC	Zone d'intérêt cynégétique à gestion communautaire (community-managed hunting zone)

Endnotes

- 1 Previous abundance annexes have included Gambia; however, primatologists are now convinced that the country was not part of the western chimpanzee's range (E.A. Williamson, personal communication, 2019).
- 2 The capture of an orangutan by government or sanctuary staff is sometimes referred to as a "rescue." This annex uses the term "capture" to indicate that, in many cases, the orangutans are healthy individuals who could have been given the opportunity to remain where they were while solutions were found for their coexistence with local communities and/or companies.
- 3 See note 2, above.
- 4 See note 2, above.
- 5 See note 2, above.
- 6 See note 2, above.
- 7 Department of Zoology, Senckenberg Museum of Natural History, Görlitz (www.senckenberg.de/en/institutes/museum-of-natural-history-goerlitz/zoology).
- 8 IUCN SSC Primate Specialist Group Section on Small Apes (<https://gibbons.asia>), Borneo Nature Foundation (www.borneonaturefoundation.org) and Oxford Brookes University (www.brookes.ac.uk).
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- 10 Wildlife Conservation Society (www.wcs.org) and Faculty of Natural Sciences, University of Stirling (www.stir.ac.uk).
- 11 Liverpool John Moores University (www.ljmu.ac.uk) and University of Amsterdam (<https://ibed.uva.nl>).
- 12 Faculty of Natural Sciences, University of Stirling (www.stir.ac.uk).
- 13 HUTAN–Kinabatangan Orang-utan Conservation Programme (www.hutan.org.my).
- 14 Wild Chimpanzee Foundation (www.wildchimps.org/index.html).
- 15 Kalawit Gibbon Rehabilitation Project (www.kalawit.org).
- 16 Fauna & Flora International Myanmar Programme (www.facebook.com/ffmyanmar).
- 17 Borneo Futures (www.borneofutures.org).
- 18 Oxford Brookes University (www.brookes.ac.uk).
- 19 Chester Zoo (www.chesterzoo.org).
- 20 Wild Chimpanzee Foundation (WCF) (www.wildchimps.org/index.html).
- 21 PanEco Foundation (<https://paneco.ch/en>).

References

- Abaà, R. (2006). *Abondance relative des grands mammifères et des activités humaines au Parc National des Monts de Cristal et sa périphérie (Gabon, 2005)*. Libreville, Gabon: Wildlife Conservation Society (WCS) and Parcs Gabon. Unpublished report.
- Abaà, R. and Bezangoye, A. (2007). *Estimation de la densité, de l'abondance et de la distribution relative des grands mammifères et l'impact des humains au Parc National des Monts Birougou et ses environs: établissement d'une ligne de base pour le monitoring*. Libreville, Gabon: Wildlife Conservation Society (WCS). Unpublished report.

- Aba'a, R., Maisels, F., Starkey, M. and Memiaghe, H.R. (2011). *Inventaire des grands mammifères et l'impact humaine dans le Mayombe. Activité 3.1b part 1: rapport final*. Libreville, Gabon: Wildlife Conservation Society (WCS). Unpublished report.
- Abanyam, P., Effiong, B., Ibenyenwa, C. and Ova, S. (2021). *Wildlife Conservation Society 2021 annual report of law enforcement monitoring, education and livelihood support in Cross River National Park (Oban Division)*. Calabar, Nigeria: Wildlife Conservation Society (WCS) Nigeria. Unpublished report.
- Abitsi, G. (2006). *Inventaires de reconnaissance des grands mammifères et de l'impact des activités anthropiques. Parc National de Waka, Gabon, Décembre, 2005–Juillet, 2006*. Libreville, Gabon: Wildlife Conservation Society (WCS). Unpublished report.
- Aebischer, T., Siguindo, G., Rochat, E., *et al.* (2017). First quantitative survey delineates the distribution of chimpanzees in the Eastern Central African Republic. *Biological Conservation*, **213**, 84–94. DOI: 10.1016/j.biocon.2017.06.031.
- Akers, A.A., Islam, M.A. and Nijman, V. (2013). Habitat characterization of western hoolock gibbons *Hoolock hoolock* by examining home range microhabitat use. *Primates*, **54**(4), 341–8. DOI: 10.1007/s10329-013-0352-8.
- Allam, A., Beukou, G.B., N'Goran, P. and Mahoungou, S. (2017). *Rapport d'inventaire des grands et moyens mammifères dans la forêt de Messok-Dja*. Rapport du Ministère de l'Economie et du développement Durable du Congo et du Bureau Régional du WWF pour l'Afrique, Programme TRIDOM. Unpublished report.
- Allam, A., N'Goran, P., Mahoungou, S. and Ikoa, B. (2016). *Rapport d'inventaire des grands et moyens mammifères dans la forêt de Djoua-Ivindo*. Rapport du Ministère de l'Economie et du développement Durable et du Bureau Régional du WWF pour l'Afrique, Programme TRIDOM. Unpublished report.
- Ambahe, R., Nanfack, A.D., Ambassa, E., *et al.* (2022). *Abundance and distribution of large and medium-sized mammals and of human impact in the Mbam and Djerem landscape*. Limbe, Cameroon: Wildlife Conservation Society (WCS). Internal report.
- Anonymous (1989). *Developpement Rural – Projet Bururi-Rumonge-Vyanda (Burundi)*. Wildlife Conservation Society (WCS)/Rwandan Office for Tourism and National Parks (ORTPN). In *Proceedings from the First International Workshop for the Conservation and Management of Afromontane Forests, Cyangugu, Rwanda*. Unpublished report.
- ANPN (2013). *Wildlife and poaching assessment in northeast Gabon: results of the pilot study. Final report*. Libreville, Gabon: Agence Nationale des Parcs Nationaux (ANPN), Wildlife Conservation Society (WCS) and World Wide Fund for Nature (WWF). Unpublished report.
- Aung, P., Lwin, N., Aung, T.H., *et al.* (2023). Confirmation of skywalker hoolock gibbon (*Hoolock tianxing*) in Myanmar extends known geographic range of an endangered primate. *International Journal of Primatology*, in press.
- Ayang, V. (2020). *AFI Mountain Wildlife Sanctuary annual report: 2020*. Calabar, Nigeria: Wildlife Conservation Society (WCS) Nigeria. Unpublished report.
- Barakabuye, N., Mulindahabi, F., Plumtre, A.J., *et al.* (2007). *Conservation of chimpanzees in the Congo-Nile Divide forests of Rwanda and Burundi*. Kigali, Rwanda: Wildlife Conservation Society (WCS). Unpublished report to United States Fish and Wildlife Service (USFWS) for Project 98210-6-G095/GA 0282, December 2007. Available at: <https://library.wcs.org/doi/ctl/view/mid/33065/pubid/DMX1161200000.aspx>.
- Bartlett, T.Q. (2009). *The Gibbons of Khao Yai: Seasonal Variation in Behavior and Ecology*. Upper Saddle River, NJ: Pearson.
- Bassouama, A., Bongui, A.S., Ibata, S. and Mahamadou, M. (2006). *Rapport d'inventaire faune et bois commercial dans la zone ETIC, sud-ouest du Parc National d'Odzala-Kokoua, 2006*. Brazzaville, Congo: Ministère de l'Economie Forestière et de l'Environnement (MEFE), Parc National d'Odzala-Koukoua (PNOK) and World Wide Fund for Nature (WWF). Unpublished report.
- Benavides, J., Dia, T.P., Rodriguez, V. and Brugière, D. (2016). *Dénombrement 2016 de la population de grands singes du Parc National de Deng Deng*. Parc National de Deng Deng-BRL Ingénierie-Electricity Development Corporation (PNDD-BRLI-EDC). Unpublished report.
- Bermejo, M., Rodriguez-Teijeiro, J.D., Illera, G., *et al.* (2006). Ebola outbreak killed 5000 gorillas. *Science*, **314**(5805), 1564. DOI: 10.1126/science.1133105.
- Bessone, M., Kühl, H.S., Hohmann, G., *et al.* (2020). Drawn out of the shadows: surveying secretive forest species with camera trap distance sampling. *Journal of Applied Ecology*, **57**(5), 963–74. DOI: 10.1111/1365-2664.13602.

- Beudels-Jamar, R., Lafontaine, R.-M., Robert, H., et al. (2015). *Inventaires faunistiques dans la Réserve Naturelle de Tumba-Lediima et dans la zone de Mbanzi/Nsélé (17/03 au 25/04/2014 et 19/08 au 20/09/2014)*. Institut Royal des Sciences Naturelles de Belgique, World Wide Fund for Nature (WWF) and Institut Congolais pour la Conservation de la Nature (ICCN). Unpublished report.
- Beukou, G.B., Sombambo, M., Nzoo, Z., et al. (2019). *Dynamique des Populations des Grands et Moyens Mammifères dans le Segment Cameroun du paysage Tri-National de la Sangha*. Aires Protégées de Dzangha-Sangha, Yaoundé, Cameroon: World Wide Fund for Nature (WWF) Bureau Régional pour l'Afrique.
- Beukou Tchoumbou, G.B., Nzoo Dongmo, Z.L., Sombambo, M., et al. (2021). *Dynamique de la Population des Grands et Moyens Mammifères dans le Parc National de Campoo Ma'an et sa Zone Périphérique*. Yaoundé, Cameroon: World Wide Fund for Nature (WWF)–Cameroon and Ministry of Forests and Wildlife.
- Bezangoye, A. and Maisels, F. (2010). *Great ape and human impact monitoring in the Lopé-Waka Exceptional Priority Area, Gabon. Part 1: Lopé National Park*. Libreville, Gabon: Wildlife Conservation Society (WCS). Unpublished report.
- Blake, S., Strindberg, S. and Princée, F. (2012). *Evaluation of the CARPO/GHOA Biological Monitoring Programme. Reporting on Consultancy Contract No. WWF CARPO/AFGAP/FY12/CC/030 and Project Activity No. 9Fo865.01*. Morges, Switzerland: World Wide Fund for Nature (WWF).
- Bobo, K., Ntumwel, B.C. and Aghomo, F.F.M. (2013). Local perception on wildlife uses and related loss of cultural values around the Nkwende Hills Forest Reserve, south-west Cameroon. *Life Sciences Leaflets*, 5, 1–8.
- Bohm, T. (2020). *Wildlife and Human Impact Survey 2019/2020, Odzala-Kokoua National Park, Republic of Congo*. Brazzaville, Congo: African Parks.
- Bombome, K. (2007). *Évaluation du potentiel faunique mammalien dans l'UFA 10-047a concession forestière 1057 Diversité biologique, densité, activités humaines et distribution spatiale de la faune sauvage*. Yaoundé, Cameroon: Horizon Vert Groupement d'Intérêt Économique (GIE). Unpublished report.
- Boonratana, R., Duckworth, J.W., Phiapalath, P., Reumaux, J.-F. and Sisomphane, C. (2011). The precarious status of the white-handed gibbon *Hylobates lar* in Lao PDR. *Asian Primates Journal*, 2(1), 13–20.
- Bout, N. (2006). *Parc National des Plateaux Batéké suivi écologique des grands mammifères et de la pression humaine. Rapport final*. Libreville, Gabon: Wildlife Conservation Society (WCS) and John Aspinall Foundation. Unpublished report.
- Brcnic, T., Madzoke, B., Ndzai, C., et al. (2018). *Results of the 2016–2017 Large Mammal Survey of the Ndoki-Likouala Landscape*. Brazzaville, Congo: Wildlife Conservation Society (WCS) Congo.
- Brcnic, T.M., Amarasekaran, B. and McKenna, A. (2010). *Sierra Leone National Chimpanzee Census Project August 2010*. Freetown, Sierra Leone: Tacugama Chimpanzee Sanctuary. Available at: http://www.tacugama.com/wp-content/uploads/2017/12/2010_Brcnic_SLNCCP_Final_Report.pdf.
- Brockelman, W.Y., Naing, H., Saw, C., et al. (2009). Census of eastern hoolock gibbons (*Hoolock leuconedys*) in Mahamyaing Wildlife Sanctuary, Sagaing Division, Myanmar. In *The Gibbons: New Perspectives on Small Ape Socioecology and Population Biology*, ed. D. Whittaker and S. Lappan. New York, NY: Springer, pp. 435–51. DOI: 10.1007/978-0-387-88604-6_20.
- Bruce, T., Ndjassi, C., Fowler, A., et al. (2018). *Faunal Inventory of the Dja Faunal Reserve, Cameroon – 2018*. Yaoundé, Cameroon: Ministry of Forests and Wildlife (MINFOF), Zoological Society of London (ZSL)–Cameroon Country Programme, African Wildlife Foundation.
- Bryant, J.V. (2014). *Developing a conservation evidence-base for the critically endangered Hainan gibbon (Nomascus hainanus)*. PhD thesis. London, UK: University College London and Institute of Zoology (Zoological Society of London).
- Buzzard, P.J. and Parker, A.J.A. (2012). Surveys from the Subri River Forest Reserve, Ghana. *African Primates*, 7(2), 175–83. Available at: <http://www.primates-sg.org/african-primates-volume-7-2/>.
- Campbell, G. (2008). *Rapport préliminaire sur les parcs nationaux et les forêts classées inventoriés en Côte d'Ivoire*. Rapport présenté à la direction de l'OIPR et de la SODEFOR. Unpublished report.
- Campbell, G. and Hounbedji, M. (2015). *Conservation status of the West African chimpanzee (Pan troglodytes verus) in Togo and Benin. Final report presented to Conservation International–Primate Action Fund April 2015*. Arlington, VA: Primate Action Fund. Unpublished report. Available at: <http://www.primates-sg.org/unpublished-reports>.

- Carvalho, J.S., Marques, T.A. and Vicente, L. (2013). Population status of *Pan troglodytes verus* in Lagoas de Cufada Natural Park, Guinea-Bissau. *PLoS ONE*, **8**(8), e71527. DOI: 10.1371/journal.pone.0071527.
- Carvalho, J.S., Stewart, F.A., Marques, T.A., *et al.* (2022). Spatio-temporal changes in chimpanzee density and abundance in the Greater Mahale Ecosystem, Tanzania. *Ecological Applications*, **32**(8), e2715. DOI: 10.1002/eap.2715.
- Chan, B.P.L., Mak, C.F., Yang, J.-H. and Huang, X.-Y. (2017). Population, distribution, vocalization and conservation of the Gaoligong hoolock gibbon (*Hoolock tianxing*) in the Tengchong Section of the Gaoligongshan National Nature Reserve, China. *Primate Conservation*, **31**. Available at: http://static1.1.sqspcdn.com/static/f/1200343/27795205/1515432731637/PC31_Chan_et_al_Gaoligong_Hoolock.pdf?token=vr1DVVxEAXCKKFqGsk7nJiXgdQ%3D.
- Chancellor, R.L., Langergraber, K., Ramirez, S., Rundus, A.S. and Vigilant, L. (2012). Genetic sampling of unhabituated chimpanzees (*Pan troglodytes schweinfurthii*) in Gishwati Forest Reserve, an isolated forest fragment in western Rwanda. *International Journal of Primatology*, **33**(2), 479–88. DOI: 10.1007/s10764-012-9591-6.
- Chetry, D., Chetry, R., Ghosh, K. and Singh, A.K. (2010). Status and distribution of the eastern hoolock gibbon (*Hoolock leuconedys*) in Mehao Wildlife Sanctuary, Arunachal Pradesh, India. *Primate Conservation*, **25**(1), 87–94. DOI: 10.1896/052.025.0113.
- Chetry, R. and Chetry, D. (2010). First record of eastern hoolock gibbon in Assam, India. *Primate Conservation*, **25**, 95–7.
- Chetry, R., Chetry, D. and Bhattacharjee, P.C. (2012). Status and conservation of eastern hoolock gibbon *Hoolock leuconedys* in Assam, India. *Journal of Threatened Taxa*, **4**(13), 3183–9. DOI: 10.11609/JOTT.03073.3183-9.
- Cheyne, S.M. (2011). *Ex-Mega Rice Project Gibbon Density and Comparison with Other Sites. Project Report*. Palangka Raya, Indonesia: Orangutan Tropical Peatland Project (OuTROP). Unpublished report.
- Cheyne, S.M., Gilhooly, L.J., Hamard, M.C., *et al.* (2016). Population mapping of gibbons in Kalimantan, Indonesia: correlates of gibbon density and vegetation across the species' range. *Endangered Species Research*, **30**(1), 133–43. DOI: 10.3354/esr00734.
- Chivers, D.J. (1974). *The Siamang in Malaya: A Field Study of a Primate in Tropical Rainforest*. Contributions to Primatology 4. Basel, Switzerland: Karger.
- Choudhury, A. (2006). The distribution and status of hoolock gibbon, *Hoolock hoolock*, in Manipur, Meghalaya, Mizoram, and Nagaland in northeast India. *Primate Conservation*, **2006**(20), 79–87. DOI: 10.1896/0898-6207.20.1.79.
- Choudhury, A. (2013). Description of a new subspecies of hoolock gibbon *Hoolock hoolock* from northeast India. *Newsletter and Journal of the Rhino Foundation for Nature in Northeast India*, **9**, 49–59.
- Choudhury, A.U. (2000). A survey of hoolock gibbon (*Hylobates hoolock*) in Dibru-Saik-Howa National Park, Assam, India. *Primate Report*, **56**, 61–6.
- Coudrat, C.N.Z. and Nanthavong, C. (2014). Gibbon survey and taxonomical status in Nakai-Nam Theun National Protected Area, Laos reveals one of the largest remaining populations of white-cheeked gibbons: implications for their long-term conservation. Presented at: *XXVth International Primatological Society Congress, Hanoi, Viet Nam*.
- Danquah, E., Oppong, S.K., Akom, E. and Sam, M. (2012). Preliminary survey of chimpanzees and threatened monkeys in the Bia-Goaso forest block in southwestern Ghana. *African Primates*, **7**, 163–74.
- Das, J., Bhattacharjee, P.C., Biswas, J. and Chetry, D. (2005). *Western Hoolock Gibbon: Socioecology, Threats and Conservation Action Plan*. Guwahati, India: Department of Zoology, Gauhati University, and Primate Research Centre, Northeast Centre.
- Das, J., Biswas, J., Bhattacharjee, P.C. and Mohnot, S.M. (2006). First distribution records of the eastern hoolock gibbon *Hoolock hoolock leuconedys* from India. *Zoos' Print Journal*, **21**(7), 2316–20. DOI: 10.11609/JOTT.ZPJ.1530.2316-20.
- Davenport, T.R.B., Mpunga, N., Philips, G.P., *et al.* (2010). *The conservation status of the chimpanzee (Pan troglodytes schweinfurthii) in southern Tanganyika*. Tanzania: Wildlife Conservation Society (WCS). Unpublished report.
- De Vere, R.A., Warren, Y., Nicholas, A., Mackenzie, M.E. and Higham, J.P. (2011). Nest site ecology of the Cross River gorilla at the Kagwene Gorilla Sanctuary, Cameroon, with special reference to anthropogenic influence. *American Journal of Primatology*, **73**(3), 253–61. DOI: 10.1002/ajp.20886.

- Deb, P., Rai, P.K. and Bhattacharjee, P.C. (2014). Threats to the western hoolock gibbon *Hoolock hoolock* in and around Longai Reserve Forest, Southern Assam, India. *Science and Technology Journal*, 2(1), 38–43.
- Duc, H.M., Bang, T.V. and Covert, H.H. (2015). *Assessment of conservation status and strengthening conservation of yellow-cheeked crested gibbon and other primates in southeastern slope of the Da Lat Plateau, Vietnam*. Ho Chi Minh City, Viet Nam. Unpublished report.
- Duc, H.M., Bang, T.V. and Covert, H.H. (2017). *Strengthening conservation of the northern yellow-cheeked gibbon *Nomascus annamensis* and the establishment of community-based monitoring group on the eastern slope of the Central Annamites, Vietnam*. Ho Chi Minh City, Viet Nam. Unpublished report.
- Duc, H.M., Bang, T.V., Tinh, M.X. and Thang, N.D. (2014). *Final report on fauna in Quang Truc Commune, Tuy Duc District, Dak Nong Province, with an emphasis on population assessment of yellow-cheeked crested gibbon*. Unpublished technical report for Fauna & Flora International (FFI), Ho Chi Minh City, Viet Nam.
- Duckworth, J.W. (2008). *Preliminary gibbon status review for Lao PDR 2008*. Hanoi, Viet Nam, and Cambridge, UK: Fauna & Flora International (FFI) and Arcus Foundation. Unpublished report. Available at: <https://www.issuelab.org/resources/10668/10668.pdf>.
- Dunn, A., Bergl, R., Byler, D., et al. (2014). *Revised Regional Action Plan for the Conservation of the Cross River Gorilla (*Gorilla gorilla diehli*) 2014–2019*. New York, NY: International Union for Conservation of Nature (IUCN) Species Survival Commission (SSC), Primate Specialist Group (PSG) and Wildlife Conservation Society (WCS). Available at: <https://portals.iucn.org/library/node/44661>.
- Eban, J. (2020). *Wildlife Conservation Society Mbe Mountains annual report: 2020*. Calabar, Nigeria: Wildlife Conservation Society (WCS) Nigeria. Unpublished report.
- Ekinde, A. and Ashu, M. (2006). *Preliminary survey of apes around the Assaka forest, Akwaya Subdivision, South West Province, Cameroon*. Limbe, Cameroon: Wildlife Conservation Society (WCS). Unpublished report.
- Ekinde, A., Ashu, M. and Sunderland-Groves, J. (2005). *Preliminary ape surveys around the Fungom Forest Reserve and Furu-Awa sub division, North West Province, Cameroon*. Unpublished report to the Wildlife Conservation Society (WCS) and Cross River Gorilla Project.
- Ekobo, A. (2006). *Évaluation des potentialités fauniques du Sanctuaire des gorilles à Mengame*. Yaoundé, Cameroon: World Wide Fund for Nature (WWF). Unpublished report.
- Ekobo, A. (2007). *Étude sur les potentialités fauniques de l'UFA 00-004 Province du Littoral, Cameroon*. Yaoundé, Cameroon: World Wide Fund for Nature (WWF). Unpublished report.
- Ellioti.org (n.d.). *P.T. Elliotti by the Numbers*. Ellioti.org. Available at: <http://www.elliotti.org/p.t.elliotti-by-the-numbers.html>. Accessed January, 2020.
- ELRECO (2020). *Large Mammal Rapid Biodiversity Assessment in the Wonegizi REDD+ Project site. Report to Fauna & Flora International*. Saal an der Donau, Germany: Elephant Research and Conservation (ELRECO). Available at: <https://ekmsliberia.info/wp-content/uploads/2020/06/NORADLargeMammalSurveyWonegizi.pdf>.
- Eno Nku, M. (2003a). *Rapid large mammal assessment of Ejagham Forest Reserve, South West Province, Cameroon*. Limbe, Cameroon: Wildlife Conservation Society (WCS). Unpublished report.
- Eno Nku, M. (2003b). *Rapid large mammal assessment of Nkwende Hills forest concession (UFA 11-001) and Upper Banyang forest concession (UFA 11-002), South West Province, Cameroon*. Limbe, Cameroon: Wildlife Conservation Society (WCS). Unpublished report.
- Eno Nku, M. (2004a). *Large mammal reconnaissance surveys of Lake Barombi Mbo and Southern Bakundu Forest Reserves, SW Province Cameroon*. Limbe, Cameroon: Wildlife Conservation Society (WCS). Unpublished report.
- Eno Nku, M. (2004b). *Large mammal reconnaissance surveys of Mt Etinde Forest Reserve, SW Province, Cameroon*. Limbe, Cameroon: Wildlife Conservation Society (WCS). Unpublished report.
- Eno Nku, M. (2013). *Large mammal surveys of the Mount Cameroon National Park*. Yaoundé, Cameroon: World Wide Fund for Nature (WWF). Unpublished report.
- Etoga, G. (2001). *Étude sur les potentialités fauniques de l'UFA 10-038*. Yaoundé, Cameroon: World Wide Fund for Nature (WWF). Unpublished report.
- Etoga, G. (2002). *Étude sur les potentialités fauniques de l'UFA 10-039. Rapport pour RP Pallisco*. Yaoundé, Cameroon: World Wide Fund for Nature (WWF). Unpublished report.

- Fan, P.-F., Fei, H.-L. and Luo, A.-D. (2014). Ecological extinction of the critically endangered northern white-cheeked gibbon *Nomascus leucogenys* in China. *Oryx*, **48**(1), 52–5. DOI: 10.1017/S0030605312001305.
- Fan, P.-F., He, K., Chen, X., *et al.* (2017). Description of a new species of hoolock gibbon (Primates: Hylobatidae) based on integrative taxonomy. *American Journal of Primatology*, **79**(5), e22631. DOI: 10.1002/ajp.22631.
- Fan, P.-F., Turvey, S.T. and Bryant, J.V. (2020). Hoolock tianxing (*amended version of 2019 assessment*). *The IUCN Red List of Threatened Species 2020: e.T118355648A166597159*. Gland, Switzerland: International Union for Conservation of Nature (IUCN). DOI: 10.2305/IUCN.UK.2020-1.RLTS.T118355648A166597159.en.
- Fan, P.-F., Xiao, W., Huo, S., *et al.* (2011). Distribution and conservation status of the vulnerable eastern hoolock gibbon *Hoolock leuconedys* in China. *Oryx*, **45**(1), 129–34. DOI: 10.1017/S003060531000089X.
- Feeroz, M.M. and Islam, M.A. (1992). *Ecology and Behaviour of Hoolock Gibbons in Bangladesh*. Dhaka, Bangladesh: Multidisciplinary Action Research Centre.
- FFI (2012). *Mammal survey in N Khin Bum, Kachin State*. Yangon, Myanmar: Fauna & Flora International (FFI), Myanmar Programme. Unpublished report.
- Fonkwo, N.S., Angwafo, T.E. and Mbida, M. (2011). Abundance and distribution of large mammals in the Bakossi landscape area, Cameroon. *Journal of Soil Science and Environmental Management*, **2**, 43–8.
- Fotso, R., Eno Nku, M. and Groves, J. (2002). *Distribution and conservation status of gorilla population in the forests around Belabo, Eastern Province, Cameroon*. Limbe, Cameroon: Wildlife Conservation Society (WCS). Report to Cameroon Oil Transportation Company (COTCO).
- Furnell, S., Dowd, D., Tweh, C., *et al.* (2015). *Final report: survey of wildlife and anthropogenic threats in the Grebo-Sapo Corridor, south-eastern Liberia (May–July 2015)*. Prepared by Wild Chimpanzee Foundation (WCF) in collaboration with Forestry Development Authority, Liberia. Available at: https://www.wildchimps.org/file-admin/content_files/pdfs/reports/FINAL_REPORT_GS_Corridor_Survey_2015.pdf.
- Garriga, R. (2019). *Loma Mountains National Park chimpanzee nest survey*. Report to United States Fish and Wildlife Service (USFWS) and Tacugama Chimpanzee Sanctuary. Available at: https://www.tacugama.com/wp-content/uploads/2020/04/2019_Loma-chimpanzee-survey-report_final.pdf.
- Gašperšič, M. and Pruetz, J.D. (2011). Chimpanzees in Bandafassi arrondissement, southeastern Senegal: field surveys as a basis for the sustainable community-based conservation. *Pan Africa News*, **18**(2), 23–5. Available at: http://mahale.main.jp/PAN/18_2/contents.html.
- Gatti, S. (2009). *Status of primate populations in protected areas targeted by the Community Forest Biodiversity Project*. Accra, Ghana: West African Primate Conservation Action (WAPCA) Wildlife Division (WD) and Forestry Commission (FC). Internal report prepared for the Ministry of Lands, Forestry and Mines, Ghana, within the context of the FFEM-funded project CFBP: Community Forest Biodiversity Project, Component 1: Community Forest Biodiversity Project: Status of primate populations in Protected Areas targeted under CFBP. Available at: <http://www.primatesg.org/ghana-unpublished-reports/>.
- GBIF.org (2020). *GBIF Occurrence Download Hoolock hoolock hoolock, May 17 2020*. Copenhagen, the Netherlands: Global Biodiversity Information Facility (GBIF). DOI: 10.15468/dl.f2exd8.
- Geissmann, T., Grindley, M., Ngwe, L., *et al.* (2013). *The Conservation Status of Hoolock Gibbons in Myanmar*. Zürich, Switzerland: Gibbon Conservation Alliance. Available at: http://www.gibbonconservation.org/07_publications/book/2013_hoolock_myanmar.pdf.
- Gilhooly, L.J., Rayadin, Y. and Cheyne, S.M. (2015). A comparison of hylobatid survey methods using triangulation on Müller's gibbon (*Hylobates muelleri*) in Sungai Wain Protection Forest, East Kalimantan, Indonesia. *International Journal of Primatology*, **36**(3), 567–82. DOI: 10.1007/s10764-015-9845-1.
- Ginn, L.P., Robison, J., Redmond, I. and Nekaris, K.A.I. (2013). Strong evidence that the West African chimpanzee is extirpated from Burkina Faso. *Oryx*, **47**(3), 325–6. DOI: 10.1017/S0030605313000434.
- Gittins, S.P. (1979). *The Behaviour and Ecology of the Agile Gibbon (Hylobates agilis)*. Cambridge, UK: Wildlife Research Group, University of Cambridge.
- Granier, N. and Awotwe-Pratt, V. (2007). A rapid survey of primates from the Atewa Range Forest Reserve, Ghana. In *A Rapid Biological Assessment of the Atewa Range Forest Reserve, Eastern Ghana*. RAP Bulletin of Biological Assessment 47, ed. Conservation International. Washington DC: Conservation International, pp. 103–12. DOI: 10.1896/054.047.0118.

- Granier, N., Hambuckers, A., Matsuzawa, T. and Huynen, M.-C. (2014). Density estimates and nesting-site selection in chimpanzees of the Nimba Mountains, Côte d'Ivoire, and Guinea. *American Journal of Primatology*, **76**(11), 999–1010. DOI: 10.1002/ajp.22278.
- Granjon, A.-C., Robbins, M.M., Arinaitwe, J., et al. (2020). Estimating abundance and growth rates in a wild mountain gorilla population. *Animal Conservation*, **23**(4), 455–65. DOI: 10.1111/acv.12559.
- Gray, T.N.E., Phan, C. and Long, B. (2010). Modelling species distribution at multiple spatial scales: gibbon habitat preferences in a fragmented landscape. *Animal Conservation*, **13**(3), 324–32. DOI: 10.1111/j.1469-1795.2010.00351.x.
- Greengrass, E.J. (2006). *A survey of chimpanzees in south-west Nigeria*. Lekki, Nigeria: Nigerian Conservation Foundation and Wildlife Conservation Society (WCS). Unpublished report.
- Greengrass, E.J. (2009). Chimpanzees are close to extinction in southwest Nigeria. *Primate Conservation*, **24**(1), 77–83.
- Greengrass, E.J. and Maisels, F. (2007). *Conservation of the Nigeria-Cameroon chimpanzee P. t. vellerosus (and other mammals) in and around the Banyang-Mbo Wildlife Sanctuary, South-West Province, Cameroon*. Limbe, Cameroon: Wildlife Conservation Society (WCS). Unpublished report.
- Groves, C.P. (1972). Systematics and phylogeny of gibbons. In *Gibbon and Siamang*, Vol. 1, ed. D. M. Rumbaugh. Basel, Switzerland, and New York, NY: Karger, pp. 1–89.
- Grueter, C.C., Jiang, X., Konrad, R., et al. (2009). Are *Hylobates lar* extirpated from China? *International Journal of Primatology*, **30**(4), 553–67. DOI: 10.1007/s10764-009-9360-3.
- Hakizimana, D. and Huynen, M.C. (2013). Chimpanzee (*Pan troglodytes schweinfurthii*) population density and abundance in Kibira National Park, Burundi. *Pan Africa News*, **20**(2), 16–19.
- Hansen, M.C., Potapov, P.V., Moore, R., et al. (2013). High-resolution global maps of 21st-century forest cover change. *Science*, **342**(6160), 850–3. DOI: 10.1126/science.1244693. Data available on-line from: <http://earthenginepartners.appspot.com/science-2013-global-forest>.
- Harrison, M.E., Cheyne, S.M., Husson, S.J., et al. (2012). *Preliminary Assessment of the Biodiversity and Conservation Value of the Bawan Forest, Central Kalimantan, Indonesia*. Project Report. Palangka Raya, Indonesia: Orangutan Tropical Peatland Project (OuTROP). Available at: http://www.borneonaturefoundation.org/en/resources/publications/forest-ecology-publications/attachment/outrop_2012-biodiversity_assessment_of_bawan_forest_2/.
- Harrison, M.E., Hendri, Dragiewicz, M.L., et al. (2010). *Biodiversity of the Mungku Baru Ulin Forest, Central Kalimantan, Indonesia*. Palangka Raya, Indonesia: Orangutan Tropical Peatland Project (OuTROP). Report produced by OuTROP for International Animal Rescue (IAR), Palangka Raya, Indonesia. Available at: http://www.borneonaturefoundation.org/wp-content/uploads/2016/01/harrison_10_mungku_baru_biodiversity-exc_app_iii.pdf.
- Hasan, M.K. and Feeroz, M.M. (2011). Space sharing by hoolock gibbons (*Hoolock hoolock*) in Lawachara National Park, Bangladesh. In *Proceedings of the International Conference on Biodiversity – Present State, Problems and Prospects of its Conservation, Chittagong, Bangladesh, January 8–10, 2011*, ed. E. Røskaft and D. J. Chivers. Chittagong, Bangladesh: University of Chittagong, pp. 44–8.
- Haurez, B., Petre, C.-A., Vermeulen, C., Tagg, N. and Doucet, J.-L. (2014). Western lowland gorilla density and nesting behavior in a Gabonese forest logged for 25 years: implications for gorilla conservation. *Biodiversity and Conservation*, **23**(11), 2669–87. DOI: 10.1007/s10531-014-0743-1.
- Herbinger, I. (2007). *Chimpanzee survey in Azagny National Park*. Abidjan, Ivory Coast: Wild Chimpanzee Foundation (WCF). Unpublished report.
- Herbinger, I. and Tounkara, E.O. (2002). *A rapid survey of primates in the Simandou Range, Pic de Fon, Guinea*. Abidjan, Ivory Coast: Wild Chimpanzee Foundation (WCF). Unpublished report.
- Hickey, J.R., Uzabaho, E., Akantorana, M., et al. (2019). *Bwindi-Sarambwe 2018 surveys: monitoring mountain gorillas, other select mammals, and human activities*. Unpublished report to Uganda Wildlife Authority. Kampala, Uganda: GVTC, IGCP & Partners. Available at: <http://ir.must.ac.ug/handle/123456789/762>.
- Hoàn, T.Đ., Dũng, L.V. and Trường, N.V. (2016). *Báo cáo Tổng điều tra liên khu Vườn Cao vút (Nomascus nasutus) tại Khu Bảo tồn loài và sinh cảnh Vườn Cao vút huyện Trùng Khánh, tỉnh Cao Bằng, Việt Nam và Khu bảo tồn Bằng Lũng, Trịnh Tây, Quảng Tây, Trung Quốc* [in Vietnamese]. Hanoi, Viet Nam: Fauna & Flora International (FFI).

- Hockings, K.J. and Sousa, C. (2013). Human–chimpanzee sympatry and interactions in Cantanhez National Park, Guinea-Bissau: current research and future directions. *Primate Conservation*, **26**(1), 57–65. DOI: 10.1896/052.026.0104.
- Höing, A., Quinten, M.C., Indrawati, Y.M., Cheyne, S.M. and Waltert, M. (2013). Line transect and triangulation surveys provide reliable estimates of the density of Kloss' gibbons (*Hylobates klossii*) on Siberut Island, Indonesia. *International Journal of Primatology*, **34**(1), 148–56. DOI: 10.1007/s10764-012-9655-7.
- Idowu, M., Nkonyu, L., Ntui, J. and Bassey, E. (2021). *Wildlife Conservation Society Cross River National Park (Okwango Division). Annual Report: January–December 2021*. Calabar, Nigeria: Wildlife Conservation Society (WCS) Nigeria Program.
- Ikati, B., Intamba, O., Wilondja, B., et al. (2019). *Inventaire des grands mammifères et impact humain réalisé dans le Corridor du Parc National de la Salonga, 2017–2018*. Kinshasa, DRC: Wildlife Conservation Society (WCS). Unpublished report.
- Ikemeh, R.A. (2013). Population survey of Nigeria–Cameroon chimpanzees (*Pan troglodytes ellioti*) in southwestern Nigerian priority sites: Idanre forest cluster and Ise Forest Reserve. *African Primates*, **8**, 39–50.
- Ikfuingei, R. and Kuchambi, E. (2013). *The Takamanda National Park: large mammal survey, May–July 2013*. Limbe, Cameroon: Wildlife Conservation Society (WCS). Unpublished report.
- Imong, I., Mengnjo, C. and Okeke, F. (2009). *Gorilla census of Boshi Extension and Okwa Hills, Cross River National Park, Nigeria, December, 2009*. Calabar, Nigeria: Cross River National Park and Wildlife Conservation Society (WCS). Unpublished report to Cross River National Park and WCS.
- Inkamba Nkulu, C., Samba, O.J., Massala, D., et al. (2018). *Sondage Écologique des Grands Mammifères et Impacts des Activités Humaines dans le Futur Parc National Ogooué Leketi*. Brazzaville, Congo: Wildlife Conservation Society (WCS).
- Inogwabini, B.-I., Abokome, M., Kamenge, T., Mbende, L. and Mboka, L. (2012). Preliminary bonobo and chimpanzee nesting by habitat type in the northern Lac Tumba Landscape, Democratic Republic of Congo. *African Journal of Ecology*, **50**(3), 285–98. DOI: 10.1111/j.1365-2028.2012.01323.x.
- Inogwabini, B.-I., Matungila, B., Mbende, L., Abokome, M. and wa Tshimanga, T. (2007). Great apes in the Lake Tumba landscape, Democratic Republic of Congo: newly described populations. *Oryx*, **41**(4), 532–8. DOI: 10.1017/S0030605307414120.
- Iskandar, E. (2007). *Habitat dan Populasi Owa Jawa (Hylobates moloch Audebert, 1797) di Taman Nasional Gunung Halimun-Salak Jawa Barat*. PhD thesis. Bogor, Indonesia: Institut Pertanian Bogor.
- Islam, M., Choudhury, P. and Bhattacharjee, P.C. (2013). Survey and census of hoolock gibbon (*Hoolock hoolock*) in the Inner-Line Reserve Forest and the adjoining areas of Cachar District, Assam, India. *Folia Primatologica*, **84**(3–5), 170–9. DOI: 10.1159/000351695.
- Islam, M.A., Feeroz, M.M., Muzaffar, S.B. and Mofizul, M. (2006). *Conservation of the Hoolock Gibbons (Hoolock hoolock) of Bangladesh: Population Estimates, Habitat Suitability and Management Options*. Washington DC: United States Fish and Wildlife Service Report.
- IUCN and ICCN (2012). *Bonobo (Pan paniscus): Conservation Strategy 2012–2022*. Gland, Switzerland: International Union for Conservation of Nature (IUCN) Species Survival Commission (SSC), Primate Specialist Group (PSG) and Institut Congolais pour la Conservation de la Nature (ICCN). Available at: <https://portals.iucn.org/library/efiles/documents/2012-083.pdf>.
- Iyenguet, F.C., Malanda, G.F., Madzoke, B. and Twagirashyaka, F. (2008). *Recensement et distribution des grands mammifères et activités humaines dans la zone Impfondo*. Brazzaville, Congo: Wildlife Conservation Society (WCS). Unpublished report.
- Iyer, N., Kahlenberg, S.M., Williamson, E.A., et al. (2023). Viability analysis for population reinforcement of Grauer's gorillas at Mount Tshiaberimu, Democratic Republic of the Congo. *The Journal of Wildlife Management*, **87**(4), e22384. DOI: 10.1002/jwmg.22384.
- Jenkins, P.D. (1990). *Catalogue of Primates in the British Museum (Natural History) and Elsewhere in the British Isles. V. The Apes, Superfamily Hominoidea*. London, UK: British Museum (Natural History).
- Kabir, M.T., Ahsan, M.F., Cheyne, S.M., et al. (2021). Population assessment of the endangered western hoolock gibbon *Hoolock hoolock* Harlan, 1834 at Sheikh Jamal Inani National Park, Bangladesh, and conservation

- significance of this site for threatened wildlife species. *Journal of Threatened Taxa*, **13**(7), 18687–94. DOI: 10.11609/jott.7207.13.7.18687-18694.
- Kakati, K., Raghavan, R., Chellam, R., Qureshi, Q. and Chivers, D.J. (2009). Status of western hoolock gibbon (*Hoolock hoolock*) populations in fragmented forests of Eastern Assam. *Primate Conservation*, **24**(1), 127–37. DOI: 10.1896/052.024.0111.
- Kingdon Ward, F. (1949). *Burma's Icy Mountains*. London, UK: Jonathan Cape.
- Kirkby, A., Plumptre, A., Spira, C., et al. (2019). *Estimates of ape abundance in the Kahuzi-Biega National Park and Oku Community Reserve*. Kinshasa, DRC: Wildlife Conservation Society (WCS) and Institut Congolais pour la Conservation de la Nature (ICCN). Unpublished report to Arcus Foundation, Gesellschaft für Agrarprojekte (GFA), United States Agency for International Development (USAID) and United States Fish and Wildlife Service (USFWS).
- Lapuente, J., Ouattara, A., Köster, P.C. and Linsenmair, K.E. (2020). Status and distribution of Comoé chimpanzees: combined use of transects and camera traps to quantify a low-density population in savanna-forest mosaic. *Primates*, **61**(5), 647–59. DOI: 10.1007/s10329-020-00816-3.
- Latour, S. (2005). *Inventaire de faune autour des lacs du delta de l'Ogooué*. Libreville, Gabon: Wildlife Conservation Society (WCS). Unpublished report.
- Latour, S. (2006). *Recensement des éléphants et de grands singes dans la région du Parc National de Pongara (Gabon)*. Libreville, Gabon: Wildlife Conservation Society (WCS). Unpublished report.
- Le-Duc Yeno, S. and N'Goran, K.P. (2016). *Rapport de l'inventaire des grands et moyens mammifères dans la forêt de Djoua-Zadié*. Libreville, Gabon: World Wide Fund for Nature (WWF). Unpublished report.
- Lee, D.C., Powell, V.J. and Lindsell, J.A. (2015). The conservation value of degraded forests for agile gibbons *Hylobates agilis*. *American Journal of Primatology*, **77**(1), 76–85. DOI: 10.1002/ajp.22312.
- Levo, P.K., Tsakala, P., Lushimba, A., Akpona, H.A. and Maputla, N.W. (2015). *Lomako Yokokala Faunal Reserve biological survey*. Kinshasa, DRC: African Wildlife Foundation (AWF). Unpublished report.
- Li, G.-S., Yang, X.-M., Zhang, H.-Y. and Li, W. (2011). Population and distribution of western black crested gibbon (*Nomascus concolor*) at Ailao Mountain, Xiping, Yunnan. *Zoological Research*, **32**(6), 675–83. DOI: 10.3724/sp.J.1141.2011.06675.
- Li, Y.C. and Lu, Y. (2010). Population and distribution of western black crested gibbon in Mt Ailao. *Forest Conservation*, **1**, 11–13.
- Liengola, I., Vosper, A., Maisels, F., Bonyenge, A. and Nkumu, P. (2009). *Conserving bonobos in the last unexplored forest of the Democratic Republic of Congo: the Tshuapa-Lomami-Lualaba Landscape*. Kinshasa, DRC: Wildlife Conservation Society (WCS). Unpublished final report to the Beneficia Foundation. Available at: <https://freetheapes.files.wordpress.com/2014/12/conserving-bonobos.pdf>.
- Luo, Z. (2011). Survey on populations and distribution of western black crested gibbons (*Nomascus concolor jingdongensis*) from Wuliang Shan National Nature Reserve. *Sichuan Journal of Zoology*, **30**, 283–7.
- Lushimba, A., Kasalevo, P. and Fowler, A. (2012). *Estimation de la densité, de l'abondance et de la distribution relative des grands mammifères et l'impact des humains dans La Réserve d'Iyondji: établissement d'une ligne de base pour le biomonitoring*. Kinshasa, DRC: African Wildlife Foundation (AWF). Unpublished report.
- Lwin, N., Sukumal, N. and Savini, T. (2021). Modelling the conservation status of the threatened hoolock gibbon (genus *Hoolock*) over its range. *Global Ecology and Conservation*, **29**, e01726. DOI: 10.1016/j.gecco.2021.e01726.
- Lynam, A.J. (2003). *A National Tiger Action Plan for the Union of Myanmar*. Rangoon, Myanmar: Myanmar Forest Department, Ministry of Forestry, and Wildlife Conservation Society (WCS), International Program.
- Madidi, J., Maisels, F., Kahindo, F., et al. (2019). *Inventaires des grands mammifères et de l'impact humaine, Réserve de Faune à Okapis, 2018. Rapport technique no: 01/BION/RFO/2019*. Kinshasa, DRC: Wildlife Conservation Society (WCS) DRC. Unpublished report.
- Magnuson, L., Adu-Nsiah, M. and Kpelle, D. (2003). Ghana. In *West African Chimpanzees: Status Survey and Conservation Action Plan*, ed. R. Kormos, C. Boesch, M. Bakarr and T. Butynski. Gland, Switzerland, and Cambridge, UK: World Conservation Union (IUCN) Species Survival Commission (SSC) Primate Specialist Group, pp. 111–16. Available at: <https://portals.iucn.org/library/sites/library/files/documents/2003-059.pdf>.

- Mahop, J.P. (2007). *Densité, abondance et distribution spatio-temporelle des grands et moyens mammifères diurnes dans la ZICGCS 9*. Yaoundé, Cameroon: World Wide Fund for Nature (WWF) and Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH (German Technical Cooperation). Unpublished report.
- Maisels, F., Abitsi, G. and Bezangoye, A. (2008). *Great ape and human impact monitoring in the Lopé-Waka Exceptional Priority Area, Gabon. Part 2: the Lopé-Waka corridor*. Libreville, Gabon: Wildlife Conservation Society (WCS). Unpublished report.
- Maisels, F. and Ella Akou, M. (2013). *Mwagna National Park: report on WWF survey 2012*. Libreville, Gabon: Agence Nationale des Parcs Nationaux (ANPN), Wildlife Conservation Society (WCS) and World Wide Fund for Nature (WWF). Unpublished report.
- Maisels, F., Madidi, J., Kahindo, F., et al. (2019). *Wildlife and human impact survey of the Mai Tatu forest landscape, Democratic Republic of Congo*. Kinshasa, DRC: Wildlife Conservation Society (WCS) and Institut Congolais pour la Conservation de la Nature (ICCN). Unpublished report.
- Maisels, F., Strindberg, S., Ambahe, R., et al. (2013). *Deng Deng National Park and UFA 10-065, Republic of Cameroon. Wildlife and human impact survey 2012*. Yaoundé, Cameroon: Wildlife Conservation Society (WCS). Unpublished report.
- Maisels, F., Strindberg, S., Rayden, T., et al. (2015). *Wildlife and human impact survey of the Ngombé Ntoukou-Pikounda forest landscape, Republic of Congo, Feb–Oct, 2014*. Brazzaville, Congo: Wildlife Conservation Society (WCS). Unpublished report. Available at: https://interholco.com/images/pdfs/Maisels-et-al-2015-Wildlife-and-human-impact-survey-of-Ngombe-Ntokou-Pikounda-EN-v2_FINAL.pdf.
- Makaya, Q.P. (2010). *Monitoring écologique des grands mammifères terrestres et l'impact anthropique dans le Parc National de Mayumba, Gabon: rapport final*. Libreville, Gabon: Wildlife Conservation Society (WCS). Unpublished report.
- Malanda, G., Iyenguet, F. and Madzoke, B. (2010). *Inventaire et distribution des grands mammifères et activités humaines dans la zone Tanga*. Brazzaville, Congo: Wildlife Conservation Society (WCS). Unpublished report.
- Marshall, A.J., Beaudrot, L. and Wittmer, H.U. (2014). Responses of primates and other frugivorous vertebrates to plant resource variability over space and time at Gunung Palung National Park. *International Journal of Primatology*, **35**(6), 1178–201. DOI: 10.1007/s10764-014-9774-4.
- McCarthy, M.S., Lester, J.D., Howe, E.J., et al. (2015). Genetic censusing identifies an unexpectedly sizeable population of an endangered large mammal in a fragmented forest landscape. *BMC Ecology*, **15**(1), 21. DOI: 10.1186/s12898-015-0052-x.
- Morgan, B., Adeleke, A., Bassey, T., et al. (2011). *Regional Action Plan for the Conservation of the Nigeria-Cameroon Chimpanzee (Pan troglodytes ellioti)*. New York, NY: International Union for Conservation of Nature (IUCN) Species Survival Commission (SSC), Primate Specialist Group (PSG) and Zoological Society of San Diego, CA. Available at: <https://portals.iucn.org/library/sites/library/files/documents/2011-123-En.pdf>.
- Morris, R.C. (1936). The Vernay-Hopwood Upper Chindwin Expedition. *Journal of the Bombay Natural History Society*, **38** (4), 647–71. Available at: <https://fishingcatsca.files.wordpress.com/2020/10/morris-1936.pdf>.
- Motsaba, P. and Aba'a, R. (2011). *Inventaire préliminaire de grands mammifères et des activités anthropiques à la Réserve Présidentielle de Wonga-Wongué*. Libreville, Gabon: Wildlife Conservation Society (WCS)/Projet GEF PARCS Composante 2. Unpublished report.
- Motsaba, P. and Maisels, F. (2010). *Recensement de grands mammifères et des impacts humains dans les concessions forestières situées dans la périphérie sud et sud-ouest du Parc National d'Ivindo*. Libreville, Gabon: Wildlife Conservation Society (WCS). Unpublished report.
- Motsaba, P., Tezi, J.P., Aba'a, R. and Maisels, F. (2009). *Recensement des grands mammifères et des impacts humains au Parc National d'Ivindo. Cycle de monitoring II*. Libreville, Gabon: Parcs Gabon and Wildlife Conservation Society (WCS). Unpublished report.
- Murai, M., Ruffler, H., Berlemont, A., et al. (2013). Priority areas for large mammal conservation in Equatorial Guinea. *PLoS ONE*, **8**(9), e75024. DOI: 10.1371/journal.pone.0075024.
- Myers, D., Thway, N.M. and Lin, A. (2019). *Hoolock gibbon survey in Pauksa Mountain forest complex in Myanmar*. Yangon, Myanmar: Fauna & Flora International (FFI), Myanmar Programme. Unpublished report.

- N'Goran, K.P. (2007). *Quelques résultats de la première phase du biomonitoring au Parc National de la Marahoué (Mai 2006–Décembre 2006)*. Abidjan, Ivory Coast: Wild Chimpanzee Foundation (WCF) and l'Office Ivoirien des Parcs et Réserves. Unpublished report.
- N'Goran, K.P., Allam, A.M., Le Duc Yeno, S., et al. (2019). *Rapport de l'Inventaire des Grands et Moyens Mammifères dans l'UFA Tala-Tala, Nord Congo*. Brazzaville, Congo: Ministry of Forest Economy and Sustainable Development (MEFDD), World Wide Fund for Nature (WWF) Cameroon Country Program Office (CCPO), Espace TRIDOM Interzone Congo (ETIC).
- N'Goran, K.P., Beukou Choumbou, G.B., Allam, M.A., et al. (2020). *Inventaire Faunique Préliminaire dans le Parc National de Ntokou-Pikounda, l'UFE Pikounda Nord et Concession d'Atama Palmeraie. Évaluation de la Présence des Grands et Moyens Mammifères et des Pressions Anthropiques*. Sembe, République du Congo: World Wide Fund for Nature (WWF), Ministère de l'Economie Forestière (MEFDD).
- N'Goran, K.P., Ndomba, D.L. and Beukou, G.B. (2016). *Rapport de l'inventaire des grands et moyens mammifères dans le segment RCA du paysage trinational de la Sangha*. Bayanga, Central African Republic: Bureau Régional du WWF pour l'Afrique. Unpublished report.
- Nater, A., Mattle-Greminger, M.P., Nurcahyo, A., et al. (2017). Morphometric, behavioral, and genomic evidence for a new orangutan species. *Current Biology*, **27**(22), 3487–98.e10. DOI: 10.1016/j.cub.2017.09.047.
- Ni, Q. and Ma, S. (2006). Population and distribution of the black crested gibbons in southern and southeastern Yunnan. *Zoological Research*, **27**, 34–40.
- Nijman, V. (2004). Conservation of the Javan gibbon *Hylobates moloch*: population estimates, local extinctions and conservation priorities. *Raffles Bulletin of Zoology*, **51**(1), 271–80.
- Nijman, V. and Menken, S.B. (2005). Assessment of census techniques for estimating density and biomass of gibbons (Primates: Hylobatidae). *Raffles Bulletin of Zoology*, **53**(1), 169–79.
- Nixon, S., Plumptre, A., Pinteá, L., et al. (2012). *The forgotten gorilla: historical perspectives and future challenges for conserving Grauer's gorilla (abstract)*. Presented at: XXIV Congress of the International Primatological Society (IPS), Cancún, Mexico.
- Nkono, J. (2020). *Evaluation of the Dynamics of Large and Medium Mammal Populations in the Forest Part of the Core Zone of the Bili-Uele Protected Areas Complex*. International Climate Council Network (ICCN), African Wildlife Foundation (AWF).
- Normand, E., Singo, B. and Boesch, C. (2010). *Rapport de suivi écologique dans les forêts classées de Goin-Débé et de Cavally (2007–2010)*. Abidjan, Ivory Coast: Wild Chimpanzee Foundation (WCF). Unpublished report. Available at: http://www.wildchimps.org/fileadmin/content_files/pdfs/reports/2010_Rapport_biomonitoring_Cavally_et_Goin-Debe.pdf.
- Nzoo, Z.L., N'Goran, K.P., Ekodeck, H., et al. (2016a). *Les populations de grands et moyens mammifères dans le segment Lobéké du Paysage Tri-National de la Sangha*. Yaoundé, Cameroon: World Wide Fund for Nature (WWF) and Ministry of Forests and Wildlife (MINFOF). Unpublished report.
- Nzoo, Z.L., N'Goran, K.P., Etoga, G., et al. (2016b). *Les populations de grands et moyens mammifères dans le segment Cameroun du paysage TRIDOM (Forêt de Ngoyla Mintom, PN Boumba Bek, PN Nki et leurs zones périphériques)*. Ministry of Forests and Wildlife (MINFOF) and World Wide Fund for Nature (WWF). Unpublished report.
- O'Brien, T.G., Kinnaird, M.F., Nurcahyo, A., Iqbal, M. and Rusmanto, M. (2004). Abundance and distribution of sympatric gibbons in a threatened Sumatran rain forest. *International Journal of Primatology*, **25**(2), 267–84. DOI: 10.1023/B:IJOP.0000019152.83883.1c.
- O'Brien, T.G., Kinnaird, M.F., Nurcahyo, A., Prasetyaningrum, M. and Iqbal, M. (2003). Fire, demography and the persistence of siamang (*Symphalangus syndactylus*: Hylobatidae) in a Sumatran rainforest. *Animal Conservation*, **6**(2), 115–21. DOI: 10.1017/s1367943003003159.
- Oates, J. (2006). *Primate conservation in the forests of western Ghana: recommendations for a conservation strategy*. Accra, Ghana: Wildlife Division, Forestry Commission. Unpublished report.
- Ogunjemite, B.G. (2011). Chimpanzee (*Pan troglodytes*) populations in southwestern Nigeria. *Journal of Sustainable Development in Africa*, **13**(2), 60–73. Available at: http://www.jsd-africa.com/Jsda/V13No2_Spring2011_B/article13_02.htm.
- Ogunjemite, B.G., Afolayan, T.A., Agbelusi, E.A. and Onadeko, S.A. (2006). Status survey of chimpanzee in the forest zone of southwestern Nigeria. *Acta Zoologica Sinica*, **52**, 1009–14.

- Olaniyi, O.E., Ogunjemite, B.G. and Dansu, E.J. (2014). Relationship between anthropogenic activities and occurrence of the chimpanzees (*Pan troglodytes*) in Oluwa Forest Reserve, Nigeria. *Ethiopian Journal of Environmental Studies and Management*, **7**, 402–10. DOI: 10.4314/ejesm.v7i4.7.
- Pachau, S.V., Qureshi, Q., Habib, B. and Nijman, V. (2013). Habitat use and documentation of a historic decline of western hoolock gibbon (*Hoolock hoolock*) in Dampa Tiger Reserve, Mizoram, India. *Primate Conservation*, **27**, 85–90. DOI: 10.1896/052.027.0108.
- Palombit, R.A. (1995). Longitudinal patterns of reproduction in wild female siamang (*Hylobates syndactylus*) and white-handed gibbons (*Hylobates lar*). *International Journal of Primatology*, **16**(5), 739–60. DOI: 10.1007/bf02735718.
- Phoonjampa, R. and Brockelman, W. (2008). Survey of pileated gibbon *Hylobates pileatus* in Thailand: populations threatened by hunting and habitat degradation. *Oryx*, **42**(4), 600–6. DOI: 10.1017/S0030605308000306.
- Phoonjampa, R., Koenig, A., Brockelman, W.Y., et al. (2011). Pileated gibbon density in relation to habitat characteristics and post-logging forest recovery. *Biotropica*, **43**(5), 619–27. DOI: 10.1111/j.1744-7429.2010.00743.x.
- Piel, A.K., Cohen, N., Kamenya, S., et al. (2015). Population status of chimpanzees in the Masito-Ugalla ecosystem, Tanzania. *American Journal of Primatology*, **77**(10), 1027–35. DOI: 10.1002/ajp.22438.
- Piel, A.K., Stewart, F.A., Pintea, L., et al. (2013). The Malagarasi River does not form an absolute barrier to chimpanzee movement in western Tanzania. *PLoS ONE*, **8**(3), e58965. DOI: 10.1371/journal.pone.0058965.
- Pintea, L., Latour, S., Hanni, D.C., et al. (2012). *Biological surveys and geospatial analysis to support great ape conservation in Dimonika Biosphere and Tchimpounga Natural Reserves, Republic of Congo (abstract)*. Presented at: XXIV Congress of the International Primatological Society (IPS), Cancún, Mexico.
- Plumptre, A.J., Cox, D. and Mugume, S. (2003). *The Status of Chimpanzees in Uganda*. Albertine Rift Technical Report Series No. 2. Kampala, Uganda: Wildlife Conservation Society (WCS) and Jane Goodall Institute (JGI). Available at: https://programs.wcs.org/portals/49/media/file/AR_Tech_Rpt_2_Uganda_Chimps.PDF.
- Plumptre, A.J., Kirkby, A., Spira, C., et al. (2021). Changes in Grauer's gorilla (*Gorilla beringei graueri*) and other primate populations in the Kahuzi-Biega National Park and Oku Community Reserve, the heart of Grauer's gorilla global range. *American Journal of Primatology*, **83**(7), e23288. DOI: 10.1002/ajp.23288.
- Plumptre, A.J., Kujirakwinja, D. and Matunguru, J. (2008). *Survey of Chimpanzees in the Virunga Park and an Assessment of a Potential Corridor to Mt Hoyo. Final report for United States Fish and Wildlife Service (USFWS) Project 98210-7-G231-GA-0400. February 2008*. Kampala, Uganda: Wildlife Conservation Society (WCS) and Institut Congolais pour la Conservation de la Nature (ICCN). Available at: <https://programs.wcs.org/Resources/Publications/Publications-Search-II/ctl/view/mid/13340/pubid/DMX115750000.aspx>.
- Plumptre, A.J., Kujirakwinja, D., Matunguru, J., et al. (2008). *Biodiversity Surveys in the Misotshi-Kabogo and Marungu Regions of Eastern Democratic Republic of Congo with a Focus on Chimpanzees*. Albertine Rift Technical Reports No. 5. Report to United States Fish and Wildlife Service (USFWS) for Project 98210-6-G035. March 2007. Kampala, Uganda: Wildlife Conservation Society (WCS). Available at: <https://global.wcs.org/Resources/Publications/Publications-Search-II/ctl/view/mid/13340/pubid/DMX115700000.aspx>.
- Plumptre, A.J., Nixon, S., Critchlow, R., et al. (2015). *Status of Grauer's Gorilla and Chimpanzees in Eastern Democratic Republic of Congo: Historical and Current Distribution and Abundance*. New York, NY: Wildlife Conservation Society (WCS), Fauna & Flora International (FFI) and Institut Congolais pour la Conservation de la Nature (ICCN). Available at: <https://programs.wcs.org/data/doi/ctl/view/mid/33065/pubid/DMX3094100000.aspx>.
- Plumptre, A.J., Rose, R., Nangendo, G., et al. (2010). *Eastern Chimpanzee (Pan troglodytes schweinfurthii): Status Survey and Conservation Action Plan 2010–2020*. Gland, Switzerland: International Union for Conservation of Nature (IUCN). Available at: <https://portals.iucn.org/library/sites/library/files/documents/2010-023.pdf>.
- Pruetz, J.D. and Bertolani, P. (2007). Savanna chimpanzees, *Pan troglodytes verus*, hunt with tools. *Current Biology*, **17**(5), 412–17. DOI: 10.1016/j.cub.2006.12.042.
- Pruetz, J.D., Marchant, L.F., Arno, J. and McGrew, W.C. (2002). Survey of savanna chimpanzees (*Pan troglodytes verus*) in southeastern Sénégal. *American Journal of Primatology*, **58**(1), 35–43. DOI: 10.1002/ajp.10035.
- Rawson, B.M., Insua-Cao, P., Nguyen, M.H., et al. (2011). *The Conservation Status of Gibbons in Vietnam*. Hanoi, Viet Nam: Fauna & Flora International (FFI) and Conservation International. Available at: <http://www.gibbons.de/main/books/2011gibbons-vietnam.pdf>.

- Ray, P.C., Kumar, A., Devi, A., *et al.* (2015). Habitat characteristics and their effects on the density of groups of western hoolock gibbon (*Hoolock hoolock*) in Namdapha National Park, Arunachal Pradesh, India. *International Journal of Primatology*, **36**(3), 445–59. DOI: 10.1007/s10764-015-9834-4.
- Reichard, U. and Sommer, V. (1997). Group encounters in wild gibbons (*Hylobates lar*): agonism, affiliation, and the concept of infanticide. *Behaviour*, **134**(15–16), 1135–74. DOI: 10.1163/156853997X00106.
- Reinartz, G.E. and Guislain, P. (2010). *Assessment of bonobo distribution and development of bio-monitoring capacity in the MLW CARPE landscape, DR Congo*. Milwaukee, WI: Zoological Society of Milwaukee. Unpublished report.
- Reinartz, G.E., Guislain, P., Ngomo, M., Koko Wanza, J. and Whitman, B. (2017). *Abundance and distribution of bonobos and forest elephants in the Watsi Kengo and Mondjoku Sectors of the Salonga National Park, DRC*. Zoological Society of Milwaukee (ZSM) internal report to United States Agency for International Development (USAID).
- Riley, K.V. and Shortridge, G.C. (1913). Bombay Natural History Society's mammal survey of India, Burma and Ceylon: report no. 14. with field notes by the collector. *Journal of the Bombay Natural History Society*, **22**, 710–25.
- Samson, D.R. and Hunt, K.D. (2012). A thermodynamic comparison of arboreal and terrestrial sleeping sites for dry-habitat chimpanzees (*Pan troglodytes schweinfurthii*) at the Toro-Semliki Wildlife Reserve, Uganda. *American Journal of Primatology*, **74**(9), 811–18. DOI: 10.1002/ajp.22031.
- Sanderson, J., Barrie, A., Coleman, J.E., *et al.* (2005). A rapid survey of mammals from the Haute Dodo and Cavally Forests, Côte d'Ivoire. In *A Rapid Biological Assessment of Two Classified Forests in South-Western Côte d'Ivoire*. RAP Bulletin of Biological Assessment 34, ed. L. E. Alonso, F. Lauginie and G. Rondeau. Washington DC: Conservation International, pp. 118–24.
- Sanz, C., Morgan, D., Strindberg, S. and Onononga, J.R. (2007). Distinguishing between the nests of sympatric chimpanzees and gorillas. *Journal of Applied Ecology*, **44**(2), 263–72. DOI: 10.1111/j.1365-2664.2007.01278.x.
- Serckx, A. (2014). *Eco-ethology of a population of bonobos (Pan paniscus) living in the western forest-savannah mosaics of the Democratic Republic of Congo*. PhD thesis. Liège, Belgium: Département des Sciences et Gestion de l'Environnement, Université de Liège.
- Setiawan, A., Nugroho, T.S., Wibisono, Y., Ikawati, V. and Sugardjito, J. (2012). Population density and distribution of Javan gibbon (*Hylobates moloch*) in Central Java, Indonesia. *Biodiversitas*, **13**, 23–32.
- Soiret, S.P.K., Kouakou, C.Y., Koffi, B.J.C., *et al.* (2019). The diversity and conservation of mammals in the Dodo Coastal Forest in southwestern Côte d'Ivoire, western Africa: a preliminary study. *Journal of Threatened Taxa*, **11**(6), 13654–66. DOI: 10.11609/jott.4641.11.6.13654-13666.
- Strindberg, S., Maisels, F., Williamson, E.A., *et al.* (2018). Guns, germs, and trees determine density and distribution of gorillas and chimpanzees in western Equatorial Africa. *Science Advances*, **4**(4), eaar2964. DOI: 10.1126/sciadv.aar2964.
- Sultan, K., Mansjoer, S. and Bismark, M. (2009). Populasi dan distribusi ungu (*Hylobates agilis*) di Taman Nasional Batang Gadis, Sumatera Utara. *Jurnal Primatologi Indonesia*, **6**(1), 25–31.
- Sun, G.Z., Ni, Q.Y., Huang, B., *et al.* (2012). Population, distribution and conservation status of western black crested gibbon. *Forest Conservation*, **1**, 38–43.
- Tenaza, R.R. and Hamilton III, W.J. (1971). Preliminary observations of the Mentawai Islands gibbon, *Hylobates klossii*. *Folia Primatologica*, **15**, 201–11.
- Thin, V.N., Rawson, B., Hallam, C., *et al.* (2010). Phylogeny and distribution of crested gibbons (genus *Nomascus*) based on mitochondrial cytochrome b gene sequence data. *American Journal of Primatology*, **72**(12), 1047–54. DOI: 10.1002/ajp.20861.
- Tiédoúé, M.R., Kone, S.S., Diarrassouba, A. and Tondossama, A. (2019). *Etat de Conservation du Parc National de Taï: Résultats du Suivi Écologique, Phase 13*. Soubré, Côte d'Ivoire: Office Ivoirien des Parcs et Réserves/Direction de Zone Sud-ouest.
- Tilson, R.L. (1979). Behaviour of hoolock gibbon (*Hylobates hoolock*) during different seasons in Assam, India. *Journal of the Bombay Natural History Society*, **76**, 1–16.
- Timmins, R.J. and Duckworth, J.W. (2013). *A survey of gibbons and other wildlife in the Bokeo section of Nam Kan National Protected Area, Lao PDR*. Cambridge, UK. Unpublished report.

- Traeholt, C., Bunthoeun, R., Rawson, B., *et al.* (2005). *Status review of pileated gibbon, Hylobates pileatus, and yellow-cheeked crested gibbon, Nomascus gabriellae, in Cambodia*. Phnom Penh, Cambodia: Fauna & Flora International (FFI) Cambodia Programme Office. Unpublished report.
- Tweh, C., Kouakou, C., Chira, R., *et al.* (2018). Nest counts reveal a stable chimpanzee population in Sapo National Park, Liberia. *Primate Conservation*, **32**(1), 1–12.
- Tweh, C.G., Lormie, M.M., Kouakou, C.Y., *et al.* (2015). Conservation status of chimpanzees *Pan troglodytes* verus and other large mammals in Liberia: a nationwide survey. *Oryx*, **49**(4), 710–18. DOI: 10.1017/S0030605313001191.
- Utami-Atmoko, S., Traylor-Holzer, K., Rifqi, M.A., *et al.*, ed. (2017). *Final Report: Orangutan Population and Habitat Viability Assessment*. Apple Valley, MN: International Union for Conservation of Nature (IUCN) Species Survival Commission (SSC) Conservation Breeding Specialist Group. Available at: <https://www.cbsg.org/sites/cbsg.org/files/documents/2016%20Orangutan%20PHVA.pdf>.
- van Dijk, K., Cibot, M. and McLennan, M.R. (2021). Chimpanzees (*Pan troglodytes*) adapt their nesting behavior after large-scale forest clearance and community decline. *American Journal of Primatology*, **83**(10), e23323. DOI: 10.1002/ajp.23323.
- Vanleeuwe, H. (2014). *Ecological surveys 2005, 2008, 2010 and 2013 at Conkouati-Douli National Park, Republic of Congo. Projet d'Appui à la Gestion (PAG) du Parc National Conkouati-Douli (PNCD)*. Brazzaville, Congo: Wildlife Conservation Society (WCS). Unpublished report.
- Vanthomme, H. and Nzamba, B.S. (2018). *Rapport technique PROLAB: Abondance et Distribution des Éléphants, Grands Singes, Autres Mammifères, Perroquets Gris, et Signes de Chasse dans le Corridor Industriel du Complexe d'Aires Protégées de Gamba*. Smithsonian, Conservation Biology Institute, World Wide Fund for Wildlife.
- Voigt, M., Wich, S.A., Ancrenaz, M., *et al.* (2018). Global demand for natural resources eliminated more than 100,000 Bornean orangutans. *Current Biology*, **28**(5), 761–9. DOI: 10.1016/j.cub.2018.01.053.
- Warren, Y. and Bila, S.E. (2008). *Mbulu survey*. Limbe, Cameroon: Wildlife Conservation Society (WCS). Unpublished report.
- Warren, Y. and Ekinde, A. (2008). *Large mammal recce survey of the Mone Forest Reserve*. Limbe, Cameroon: Wildlife Conservation Society (WCS). Unpublished report.
- Warren, Y., Stott, A., Ekinde, A.E., Khumbah, P. and Nicholas, A. (2008). *Cross River gorilla inter-population nuclei distribution survey*. Limbe, Cameroon: Wildlife Conservation Society (WCS). Unpublished report.
- WCF (2012). *Etat de la faune et des menaces dans les aires protégées terrestres et principales zones de forte biodiversité de République de Guinée*. Conakry, Guinea: Wild Chimpanzee Foundation (WCF). Unpublished report. Available at: <https://rris.biopama.org/sites/default/files/2019-03/2012WCFBiodivGn.pdf>.
- WCF (2014a). *Biomonitoring in the Guinea Alumina Corporation concession, Prefecture of Boke*. Conakry, Guinea: Wild Chimpanzee Foundation (WCF). Unpublished report.
- WCF (2014b). *Study of a key area for the preservation of chimpanzee in West Africa: preliminary inventory along the Bafing River, Republic of Guinea*. Conakry, Guinea: Wild Chimpanzee Foundation (WCF). Unpublished report.
- WCF (2015). *Complementary primates study – CBG Extension Project Part 2 – rapid assessment*. Leipzig, Germany: Wild Chimpanzee Foundation (WCF). Unpublished WCF report. Available at: http://www.wildchimps.org/fileadmin/content_files/pdfs/reports/2015_WCF_Complementary_primates_study_CBG_extension_Part_2_12-11-2015.pdf.
- WCF (2018). Congrats to Liberia! Two new national parks were launched the 26 April 2018 in Monrovia! *WCF News*, April, 2018. Available at: <https://www.wildchimps.org/about-us/news.html>.
- WCS (2015). *Hoolock gibbon survey in Htamanthi wildlife sanctuary*. Yangon, Myanmar: Wildlife Conservation Society (WCS), Myanmar Programme. Unpublished report.
- Wich, S.A., Fredriksson, G., Usher, G., Kühl, H.S. and Nowak, M.G. (2019). The Tapanuli orangutan: status, threats, and steps for improved conservation. *Conservation Science and Practice*, **1**(6), e33. DOI: 10.1111/csp2.33.
- Wich, S.A., Singleton, I., Nowak, M.G., *et al.* (2016). Land-cover changes predict steep declines for the Sumatran orangutan (*Pongo abelii*). *Science Advances*, **2**(3), e1500789. DOI: 10.1126/sciadv.1500789.
- Widyastuti, S., Perwitasari-Farajallah, D., Iskandar, E., *et al.* (2023). Population of the Javan gibbon (*Hylobates moloch*) in the Dieng Mountains, Indonesia: an updated estimation from a new approach. *Biodiversity Data Journal*, **11**, e100805. DOI: 10.3897/BDJ.11.e100805.

- Williamson, E.A., Bayogo, R., Guimiyessi, G., *et al.* (2004). *Survey of elephants, Bangassou, Central African Republic: conservation status and human impacts May–June, 2004*. New York, NY: Wildlife Conservation Society (WCS)/Convention on International Trade in Endangered Species (CITES), Monitoring the Illegal Killing of Elephants (MIKE). Unpublished report.
- WWF (2003). *Large mammals survey in the Mt Nlonako, Makombe and Ebo proposed protected areas*. Yaoundé, Cameroon: World Wide Fund for Nature (WWF). Unpublished report.
- WWF (2018). The saving of the Luki Biosphere Reserve with WWF support. *WWF News*, April 9, 2018. Available at: https://wwf.panda.org/wwf_news/?325990/The-saving-of-the-Luki-Biosphere-Reserve-with-WWF-support.
- Yanuar, A. (2009). The population distribution and abundance of siamangs (*Symphalangus syndactylus*) and agile gibbons (*Hylobates agilis*) in West Central Sumatra, Indonesia. In *The Gibbons: New Perspectives on Small Ape Socioecology and Population Biology*, ed. D. Whittaker and S. Lappan. New York, NY: Springer, pp. 453–65. DOI: 10.1007/978-0-387-88604-6_21.