COVID-19 and chimpanzees from a field perspective: Mitigation measures, ecological and economical situation after four months in Sebitoli, Kibale National Park, Uganda

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INTRODUCTION

The SARS-CoV-2 outbreak has led to the confinement of about two-thirds of the world's population (Bates *et al*. 2020). The emergence of the virus seems to be related to the increase in the interaction between wild animals and humans. Two main drivers have been proposed to explain it (1) the encroachment of human activities into wild areas and forests, and (2) the (legal and illegal) expanding international market of bushmeat and live wild animals from tropical and sub-tropical areas for food and traditional medicine, sold in unsanitary conditions (Volpato *et al*. 2020). While the biology underlying susceptibility to SARS-CoV-2 infection remains to be fully elucidated, it is now well-established that the virus infects the endothelial cells in targeting the angiotensin-converting enzyme-2 (ACE2) receptor. Apes exhibit the same set of amino-acid residues in ACE2 as humans, making them highly susceptible to SARS-CoV-2 (Melin *et al*. 2020).

With the restriction of national and international traffic to limit the virus transmission, many benefits were expected for wildlife from this "anthropause," as a consequence of reduced habitat disturbance (Rutz *et al*. 2020). However, the reverse also has been noticed in some places, with an increase in poaching and illegal activities (Rutz *et al*. 2020). Besides the dramatic consequences on human health of Coronavirus disease 2019 (COVID-19), this unique case of global reduction of human mobility and activities may be viewed as an opportunity to better estimate both positive and negative effects of human impact in different ecosystems and on different species (Bates *et al*. 2020).

Before the COVID-19 pandemic, Sebitoli chimpanzees living in the north of Kibale National Park (Uganda) experienced a high level of pressure from human activities, such as intensive agriculture, road traffic and related pollution (Cibot *et al*. 2015; Bortolamiol *et al*. 2016; Krief *et al*. 2014; 2017; 2020; Spirhanzlova *et al*. 2019). They also were indirect victims of wire snares set by poachers to catch duikers for bushmeat (Cibot *et al*. 2016). During the COVID-19 pandemic, the Sebitoli Chimpanzee Project (SCP) monitored the direct and indirect consequences of COVID-19 in terms of health, environment and the economy in order to mitigate them. Based on our preliminary results, we propose perspectives for researchers and conservationists on possible tools and measures to protect great apes and their habitats in the contexts of such pandemics.

STUDY SITE

The home range of the Sebitoli chimpanzee community covers 25 km^2 in the far north of the Kibale National Park, Uganda (795 km^2; 0°13′ to 0°41′N and 0°19′ to 30°32′E). Since 2008, SCP has monitored daily this community of about 80 chimpanzees. In 2020, before the pandemic, SCP consisted of 25 Ugandan field assistants working to: collect scientific data, conduct anti-poaching operations, implement education and community-based programmes, and maintain the trail systems, managed by one of us, JPO, coordinator. During the lockdown decided by the Ugandan government and Uganda Wildlife Authority, eight of the assistants were confined in the National Park, i.e. they did not have contact with the population outside of the research station. Food was ordered and delivered at the gate of the station and communication between France (direction of the project) and Ugandan team was maintained daily with social networks and weekly with visioconferences.

METHODS

We adapted the usual protocols to record chimpanzee behaviour and health and to reduce threats of poaching in accordance with Uganda Wildlife Authority guidelines. We set up 14 camera traps at the most commonly-visited locations (feeding trees and crop-fields) and memory cards were collected twice weekly for immediate reading. We designed new datasheets: identity of chimpanzees and when possible, general condition, injuries, respiratory function (sneezing, coughing), locomotion, appetite, faecal consistency, reproductive status of females were scored. We collected data on illegal activities during antipoaching patrols five days per week. Two teams were dedicated to this task during the COVID-19 period, whereas usually only one was active. We counted twice weekly, the number of vehicles travelling in both directions along the road inside the protected area. On 19 May and 27 July, 2020, we collected all plastic bottles and other litter discarded by people from the vehicles along the 4.6 km of roadsides (4 m each side of the tarmac within the national park).

Table 1. Confinement measures and Standard Operating Procedure (SOP) taken in Uganda

Date	Event and measure
18 March 2020	Public gatherings (religious, cultural meeting, school) suspended.
21 March 2020	The first case of COVID-19 recorded at the Entebbe International Airport.
22 March 2020	Travel from abroad suspended except for drivers of cargo trucks (PCR tests done before entering Uganda). Moto-taxis allowed to carry only food and material. Private cars allowed but to carry no more than three people including, the driver.
25 March 2020	Communication from Uganda Wildlife Authority management to stop primate research, filming and tourism.
27 March 2020	Public and private transport suspended.
30 March 2020	Total lock-down declared. Curfew 19:00–06:30 hr.
31 March 2020	Private car traffic suspended.
26 May 2020	Private cars allowed to operate from 06:30–19:00 hr in 95 of 135 districts.
4 June 2020	Public transport (bus and minibus) allowed to operate, provided they followed SOPs and only in some districts. No public transport in border districts.
21 July 2020	Moto-taxis allowed to carry passengers provided they followed SOPs. During entire period, cargo trucks continued to operate.
30 July 2020	SOP for research activities in UWA estates—Reopening of the Park Area (PA) during COVID-19 pandemic. i) All researchers coming into the PAs or close proximity of wild animals must wear clean clothing and disinfected footwear prior to going to the field for data collection. ii) Every researcher must carry into the field a hand sanitiser. iii) Time spent conducting research activities near primates shall be limited to a maximum of five hours per designated research day. iv) The research team shall comprise a maximum number of three people to ensure safety and health monitoring. v) A distance of not less than 10 metres from the primates shall be maintained at all times. vi) A surgical facemask must be worn by anyone coming within 10 metres of primates.

RESULTS

Protecting Sebitoli chimpanzees and local communities : sensitization by SCP

From 21 April through July 2020, a series of measures were adopted by the government and Uganda Wildlife Authority, modulating the level of human activities in and around Kibale National Park (Table 1). Although SCP, even before the pandemic, had implemented preventive measures against transmission of human respiratory diseases to chimpanzees (e.g. keeping distance between observers and apes, wearing surgical masks, using sanitizer, not spitting in the forest...), to reduce an emergent risk of the new coronavirus transmission, SCP initiated communication related to safety recommendations. The SCP team designed posters using pictograms to highlight the risks and the measures to reduce them (Figure 1). The targeted public was: (1) SCP field assistants at the research station and in the forest when authorized to carry out health monitoring, anti-poaching patrols, and transect maintenance in the National Park; (2) villagers, especially those who neither know how to read nor speak English, thus the simplicity and pictorial nature of the messages.

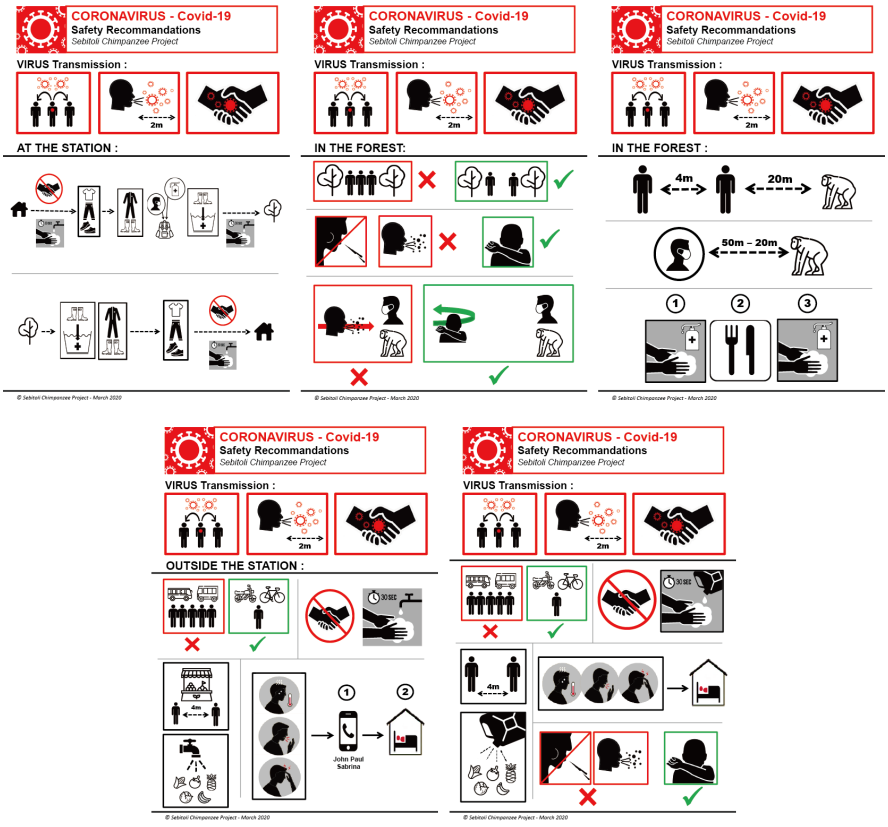

Figure 1. Posters designed to sensitize SCP staff and local farmers to COVID-19

Indirect monitoring of the chimpanzees using camera traps

Over the first eight weeks, 51 chimpanzees were seen

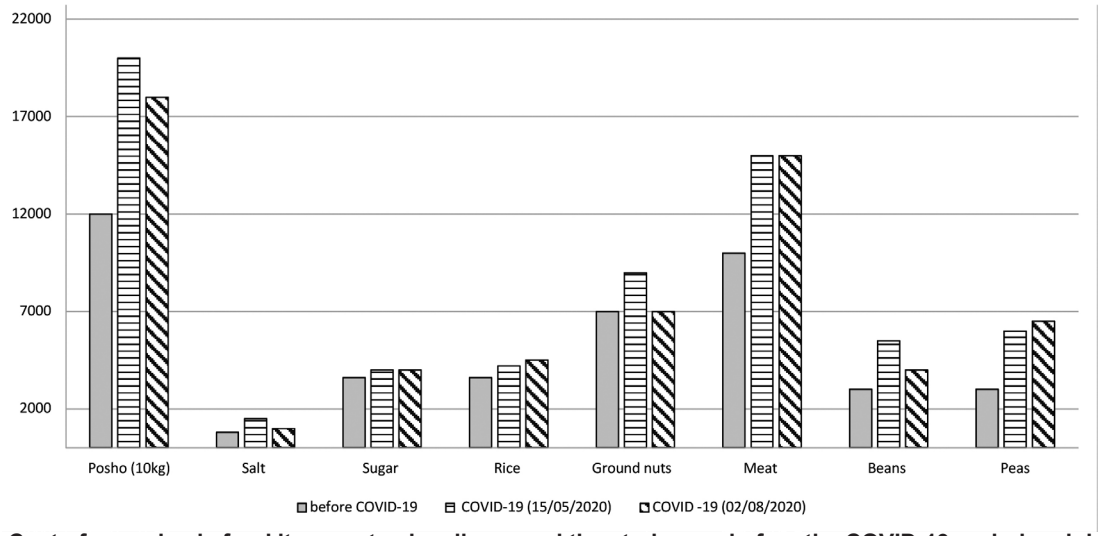

Figure 2. Cost of some basic food items eaten locally around the study area before the COVID-19 period and during the COVID-19 period. Prices are given in Uganda shillings for 1 kg of food except for posho (maize flour, 10 kg).

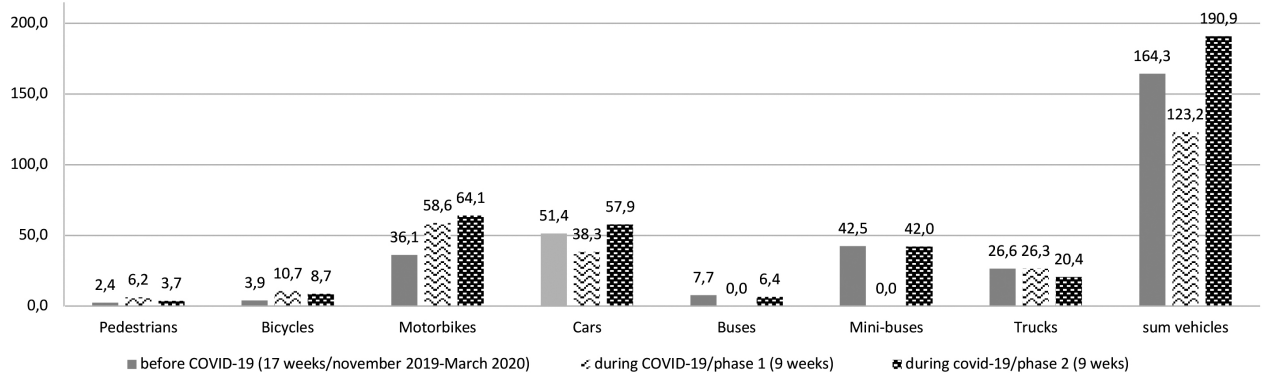

Figure 3. Traffic (mean number of pedestrians and vehicles/hour) on the tarmac road from Fort Portal to Kampala before and during the COVID-19 period.

a total of 612 times. None was diagnosed as showing severe symptoms (sneezing, coughing, apathy), which can indicate COVID-19. Injuries were observed (see below, poaching section).

Economic situation during the four months of COVID-19 confinement

We made very basic estimates of the economic consequences for local communities, using as a proxy of the cost of living, the price of common foods. Over eight weeks after the traffic was suspended (15 May, 2020), all food-item prices had increased (Figure 2).

Ecological situation during the four months of COVID-19 confinement

Public transport (by bus, minibus) was almost absent between 25 March and 4 June, i.e. over more than two months (Figure 3).

Despite this substantial reduction of traffic,

- A subadult female chimpanzee, CP (Chapati) estimated age of 14 year, was knocked dead by a vehicle on the tarmac road on 8 May, 2020 (Figure 4). Since 2012, three Sebitoli chimpanzees were killed on this portion of road (Krief *et al*. 2020).

Figure 4. Chapati, subadult female fatality from a car accident on 8 May 2020 on the tarmac road crossing the Sebitoli chimpanzee home range in Kibale National Park.

- On 27 July, 2020 : 2626 bottles (52 kg) and 26 kg of other plastic waste were collected with the assistance of the Uganda Wildlife Authority. Seventy-eight kg of such litter had accumulated in only 10 weeks (19 May to 27 July, 2020) since the last collection during the confinement. Twice as many bottles were collected during the COVID-19 period (1170/month) compared to a mean number of 601 bottles/month in the four months, at the end of 2019 (Table 2; Figure 5).

Table 2. Plastic collection along the Fort Portal-Kampala road, in the section crossing Kibale National Park and the home-range of Sebitoli chimpanzees.

Date of plastic collection	Number of plastic bottles	Weight of plastic (kg)	Number of bottles per month since last collection
July 2019	3090	92	
December 2019	2406	96	601/month
May 2020	1884	70.5	376/month
July 2020	2926	78	1170/month
Total for year	10306	336.5	

Figure 5. Litter collection by Sebitoli Chimpanzee Project assistants 19 May 2020 on the tarmac road crossing the Sebitoli chimpanzee home range in Kibale National Park.

Table 3. Illegal activities recorded during patrols of Sebitoli Chimpanzee Project in chimpanzee home-range from 25 March – 31 July in 2019 and in 2020 (since confinement was declared in Uganda).

Type of illegal activities	Number of evidences recorded during patrols from 20 March – 31 July	
	2019	2020 (COVID-19)
Debarked trees	1	22
Firewood collection sites	20	28
Piper guineense harvesting	2	13
Tree cutting	27	41
Snares	58	64
Total	116	210

Figure 6. Subadult male LK severely injured his left hand by a snare. Image captured by camera-trap on 14 July 2020.

The total number of snares recovered was similar during a four-month period (25 March to 31 July) in 2019 and 2020. Patrols found a mean number of 0.70 snare/day during the COVID-19 period (64 in 91 working days) against 0.85/day in 2019 during the same period (58 in 68 working days). However, other illegal activities related to flora increased by a factor of 2.5 in 2020, especially those that generate income, such as *Piper guineense* (13 cases *vs* 2) and tree cutting for getting bark from medicinal trees (such as *Prunus africana*) (22 *vs* 1) (Table 3). Also, several observations indicated an increase of illegal activities, including poaching:

One of the camera traps was stolen on 7 May, 2020, and the presence of dogs attacking chimpanzees in the forest was also observed in camera-traps and reported to the Uganda Wildlife Authority (two dogs observed in four occasions).

We also observed three cases of severe injuries to chimpanzees caused by poaching over the COVID-19 period, while no case had been observed in 2019:

Subadult male GR (17 April, 2020) had a large wound (at least 4 cm) on his left thigh, attributed to a spear;

Infant female, dependant of FR (27 May, 2020) had a severe injury on her right foot from a snare;

Subadult male LK (14 July, 2020) had a severe injury on his left hand from a snare (Figure 6).

DISCUSSION

In the Sebitoli area, a strict sanitary protocol was applied for the field team confined in the protected area. The direct effects of COVID-19 on the chimpanzees' health, as monitored by camera traps, did not reveal respiratory symptoms. Camera traps enabled us to discover severe injuries caused by poaching (wires and spear) on Sebitoli chimpanzees. While the number of snares recovered by the anti-poaching patrols did not increase compared to the same period in 2019, damages to the habitat have more than doubled likely due of loss of revenues in local communities. Despite the fact that public transport was banned, no detectable positive consequences were noted along the road inside the park, with a female chimpanzee being knocked dead and the number of plastic bottles along the road having more than doubled compared to the period before the lockdown. Unfortunately, the relaxation of the pressure expected on wildlife did not occur and the indirect effects of COVID-19 on wild chimpanzees and their habitat in Sebitoli area seems more negative than positive, in general. This case study in a small part of a protected area emphasized: (1) the relevance of camera-traps' use to reduce proximity with apes in such circumstances, and (2) the importance of strengthening efforts to contain illegal activities. We suggest that sharing local experiences with other study-sites, harmonizing protocols, and increasing indirect monitoring of apes' habitat (e.g. drone, camera trap) are necessary to be ready to react to future emerging disease outbreaks.

The potential cascading impacts of COVID-19 from

international travel restriction, reduced tourism, local food insecurity, poverty increase, and funding reduction due to global economic shrinkage show the importance of supporting local agencies and civil society. This point is proposed to IUCN World Congress 2021 in the motion 115 – "Strengthening great ape conservation across countries, in and outside of protected areas, involving local actors" and shall be also considered to diversify revenue-operating actions from wildlife areas (Lindsey *et al*. 2020).

ACKNOWLEDGMENTS

We thank the Uganda Wildlife Authority and Uganda National Council for Science and Technology for authorizing our research in the Kibale National Park. We are very grateful to all field assistants of the Sebitoli Chimpanzee Project who were confined at Sebitoli Station during Covid-19 lockdown, namely, Emmanuel Balinda, Deogratius Kiomuhangi, Joseph Alinaitwe, Ibrahim Nyakana, Wilson Muzahura, Edward Kalyegira, and Sulaiti Tusabe. We offer profound thanks to Daniela Zainabu Birungi, Robert Asimwe, and Robert Nyakahuma for their assistance for the plastic waste collection and to Clovice Alikonyera, Charles Twesige, and Philip Musinguzi for the road patrols. We are grateful to the Fondation Nicolas Hulot pour la Nature et pour l'Homme, the Fondation Prince Albert II, and the Fonds Français pour l'Environnement Mondial for financial support. We deeply thank Kazuhiko Hosaka, Noriko Itoh and William C. McGrew for their valuable comments to improve this manuscript.

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Received: 13 August 2020
Accepted: 26 October 2020