

## Article

# Monitoring the Trade of Legally Protected Wildlife on Facebook and Instagram Illustrated by the Advertising and Sale of Apes in Indonesia

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**Abstract:** Apes continue to be trafficked to meet the demand for pets or zoos. Indonesia, the most diverse country in terms of ape species, has been implicated in the global trade in gibbons, orangutans and, to a lesser degree, chimpanzees. Recently trade has shifted to online platforms, a trend that may have been amplified by the Covid-19 pandemic and partial lockdowns. We assessed the availability of legally protected apes for sale on Facebook and Instagram over two 16-months periods (2017–2018 and 2020–2021). Despite Facebook and Instagram explicitly banning the sale of endangered animals, and Facebook not allowing the sale of live animals, we found 106 gibbons, 17 orangutans and four chimpanzees for sale on five Facebook pages and 19 Instagram accounts. All orangutans and chimpanzees and 70% of the gibbons were infants or juveniles. We did not record any obvious responses of vendors to the Covid-19 pandemic. Facebook and Instagram accounts were linked (similar names, cross-referencing each other and announcing new accounts on existing ones), names were altered (e.g., “petshop” to “pethsop”) and new vendors emerged for short periods. Facebook and Instagram’s policy of not allowing the sale of live and/or endangered wildlife on their platforms is not effectively implemented in Indonesia.

**Keywords:** chimpanzee; conservation; Covid-19; gorilla; primate diversity; orangutan; social media; wildlife trade



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## 1. Introduction

Wildlife trade is a major threat to global biodiversity conservation and affects a wide range of species, from corals, mollusks and insects to reptiles, birds and mammals [1,2]. Primates are traded both domestically and internationally in substantial numbers to meet the demand for pets, biomedical use and meat or medicine [1]. While a majority of primates in trade are monkeys, our closest relatives, the apes, continue to be traded domestically and internationally as well. The apes, including gibbons, chimpanzees, bonobos, gorillas and orangutans, are a highly diverse group of primates, with 27 species (42 taxa) distributed over large parts of Africa and Asia. Over the last decade, a series of high-profile reports on the trade and trafficking of apes have been published, resulting in broad media coverage. A compilation of data on the trade in great apes (i.e., excluding gibbons) [3] showed not only the extent of the trade and the species involved, but also highlighted the trade’s global nature. The Pan African Sanctuary Alliance noted that chimpanzees *Pan troglodytes* were one of the most iconic victims of the illegal wildlife trade [4], and others also reported on the trafficking of chimpanzees [5–7]. Reports on the illegal trade in chimpanzees, with evidence in the form of faked CITES permits, revealed that at least two chimpanzees had

been trafficked from Guinea to Indonesia [8]. An investigation into the largely domestic trade in Bornean orangutans, *Pongo pygmaeus*, in Indonesian Borneo found no evidence of trading rings and identified weak law enforcement as one of the most significant challenges in addressing this illegal trade [9]. Nijman [10] reported on a large number of seizures but very few successful prosecutions of Bornean and Sumatran orangutans, *P. abelii*, over a 24-year period in Indonesia. Most recently, the ARCUS Foundation gave a comprehensive overview of the trade and trafficking of apes, including the gibbons [11]. They concluded that, by facilitating and promoting the illegal ape trade, social media presented both a challenge—as it offers an additional avenue for sales—and an opportunity, through increased collaboration between conservation organizations and social media companies.

Given the prominence of Indonesia in the trade of gibbons [12–14] and orangutans [9,15–17], both domestically and internationally [3,11,17] and its being implicated in the trafficking of chimpanzees [8], we here focus on the trade in apes in Indonesia. Indonesia harbors the largest diversity of apes of any country, with seven species of gibbon and all three species of orangutan. The main threats to their survival are deforestation, conversion of forest to other land uses, hunting and trade in live individuals. All species have been classified as globally threatened, following the IUCN Red List criteria. In Indonesia, gibbons have been protected since 1925 and orangutans since 1931; it is not permitted to keep them as pets, nor to buy or sell them. Penalties for lawbreakers, if imposed, may include five years of imprisonment and/or a fine of US\$7200. Despite this, gibbons and orangutans have been traded and continue to be traded openly throughout Indonesia [9,11,14,18–22].

The outcomes of the monitoring of apes have been described in several systematic reports over the years. From 1997 to 2001, Shepherd [14] monitored the trade in primates in three animal markets on Sumatra, working with TRAFFIC, the wildlife trade network, and the Leuser Management Unit, a program of the Indonesian Government and the European Union. In 2000, an international team including members of the Indonesian NGO KONUS, supported by the Indonesian Institute of Sciences, conducted a survey of gibbons for sale in animal markets on Java and Bali [12,13]. From 2003 to 2008, TRAFFIC, in close consultation with the Indonesian Ministry of Forestry, commissioned a country-wide assessment of the trade in orangutans and gibbons [15–17,23]. The main findings of these studies were that a wide range of gibbon species were openly traded in the animal markets in Western Indonesia, in addition to a smaller number of orangutans. On Sumatra, generally, only species native to Sumatra were traded, on Borneo only species native to Borneo were traded, and, in Java, species from all over Indonesia were traded. For gibbons, no species that were not native to Indonesia were found in trade. Prices were low relative to average earnings and differed between rural and urban areas with the younger individuals being more expensive (cf. References [16,19]). Recommendations that followed from these studies—many of which were carefully drafted in consultation with the Indonesian Ministry of Forestry—included more stringent enforcement efforts and better implementation of effective penalties, the enactment of public awareness programs to government officials and the general public, and introducing training programs targeting the judiciary. In hindsight, it is clear that they were either never implemented, or when they were—for instance, in the case of training law enforcement officers and judges—they were ineffective (cf. Reference [10]). All in all, these efforts did not result in any tangible actions on the ground.

Just like many other commodities, wildlife is now increasingly traded over the Internet. In 1996, the first Internet café opened in Indonesia. By 2009, almost 10% of the people in Indonesia had used the Internet, and this had increased to nearly 50% in 2019 [24]. Since the 2010s, gibbons have rarely been recorded in the physical animal markets in Indonesia [22] and are now primarily traded online [11]. The Covid-19 pandemic has affected the Indonesian wildlife trade in the physical animal markets, as several were closed for short periods of time, and the partial lockdowns in 2020 restricted people to visit animal markets. There is support for an increase in trade in wildlife in the online

marketplace within Indonesia [25]. In 2017, Facebook announced it would no longer allow the sale of live animals between private individuals. This was an update from an existing policy that prohibited the sale of globally threatened wildlife. The 2019 update clarifies that this includes the prohibition of selling of live animals, livestock and pets. In 2017, Instagram introduced a content advisory warning pop-up when users search for a particular hashtag associated with the illegal wildlife trade, informing users that Instagram prohibits the sale of endangered animals and animal abuse (a warning does not stop users from following through with their search and potential transaction).

Here we report on the online trade in gibbons, orangutans and chimpanzees in Indonesia by comparing data we collected in 2018 with those in 2021. Given that our studies were conducted after 2017, when both Facebook and Instagram widely announced policies preventing the sale of (live) endangered wildlife, we expected to observe no live apes for sale on these two platforms. We tested whether or not the geographic patterns seen in the physical markets in the 2000s also hold for the online trade; we tested whether or not online traders that offered gibbons and/or orangutans for sale in 2018 still did so in 2021—which would suggest a degree of stability on this part of the trade similar to that seen in physical markets—or whether the trade is more capricious or opportunistic with high turnarounds between vendors.

## 2. Materials and Methods

In April 2018, we searched for Facebook and Instagram pages and accounts selling gibbons, orangutans or other apes (Table 1). We restricted the adverts to those that dated back to January 2017 at the earliest. In April 2021, we revisited the pages and accounts from 2018 that had offered apes for sale to search for new adverts, going back to January 2020 at the earliest. When the pages were no longer active, we searched for similarly named pages (as traders often switch pages, using slight variations in the name and/or move between Facebook and Instagram), but we did not search for completely new, not previously recorded pages.

**Table 1.** Comparison of the different mechanisms by which animals can be sold on social media, with the mechanisms used to sell them in physical markets.

Online		Physical Markets	
Facebook groups	Public	Animal market	Central part, fronts of shop
	Closed		Back alley
	Secret		Inside a warehouse
Facebook pages	Public	Pet shop	The shop
Instagram account	Public	Pet shop	The shop
	Private		Back of the shop
WhatsApp group	Closed		Inside a warehouse

For the ethical and legal considerations of online surveys, we followed the reasoning and guidelines as provided by Siriwat and Nijman [26]. When comparing physical market surveys with online surveys, there are some important similarities and differences. Prior to the emergence of the online trade, members of conservation NGOs or researchers interested in the live trade of apes in Indonesia would typically visit open wildlife markets (*pasar burung* or *pasar hewan* in Indonesian) or pet shops. They would observe what was on offer, assess how the trade is organized, identify and count the number of individuals for sale and record prices and husbandry practices. In the 1990s and 2000s, trade in gibbons occurred in the open, but orangutans were often kept in the back of the shop and would be brought into the open for the potential customer to see if requested (cf. Reference [13]). After the 2000s, increasingly, species such as orangutans were more often kept off-site (e.g., in the traders' home or in a warehouse). Surveyors may have interviewed the traders and the

customers to obtain more detailed information and to ask for the origin of the individual ape for sale, its age and the price. In these circumstances, all of those involved (traders and customers) would have a reasonable expectation that they could be observed by others, just like when visiting any other public space.

In practice, a large part of the online trade in apes in Indonesia is very similar to that of the trade in an open, public space. It is in the best interest of the online vendors to ensure that as many potential customers as possible have the opportunity to see and buy what is on offer. The online trade in gibbons, orangutans and chimpanzees as pets, as documented here, occurs in the open. Many of the Facebook groups where apes are offered for sale are classified as “open” or “public” and have their privacy settings set at a level where it is not necessary to join a group in order to see posts and comments. In fact, many of the Facebook pages and Instagram accounts can be viewed by conducting a simple Google search. For those Facebook groups and Instagram accounts that are “closed” or “private”, it is often still very easy to observe or join their network. Once joined, posts and comments can be seen by all those that are part of that group. By comparison, “secret” Facebook groups and WhatsApp chat groups can only be joined by invitation from an existing member, requiring someone already to have connections into the network in order to join. It has been noted that “... the online social spaces are indeed loci of public display rather than private revelation: online profiles are structured with the view that ‘everyone’ can see them, even if the explicitly intended audience is more limited. These social norms are inconsistent with the claim that social media are private spaces; instead, it appears that participants view and treat online social networks as public venues” [27]. Thus, perhaps even more so than when entering a public space, such as a town square or an animal market, anyone posting or commenting on Facebook or Instagram can have a reasonable expectation to have their posts read and their photos or videos viewed.

We used a manual approach in our online trade survey to record, filter, classify and assess legal and illegal trade [28]. We did not interact with any participants or access any personal profile pages and only collected information that was publicly displayed. Data were anonymized after cross-checking for duplicates, and no information after the monitoring session can be attributed to one person (cf. References [29,30]). Duplicates were identified by matching images, text and the account uploads. We also took into account the length of time between post uploads. For example, two infant gibbons posted with the same text on the same day are likely to be duplicates; two infant gibbons posted 3 months apart, however, were treated as separate detections. We took a conservative approach to removing duplicates, erring towards reducing duplicates rather than increasing detection. Photographs that were uploaded onto the Facebook pages or Instagram accounts were collected on the day of data collection and stored on an encrypted drive (cf. Reference [28]). When we refer to examples of how the trade is conducted, we use pseudonyms of accounts’ and vendors’ names.

Given that the aim of our study was to monitor the wares of online traders, we did not report any of them to either Facebook or Instagram. However, midway in the first monitoring period, in October/November 2017, authors V.N. and J.H.S. contributed to a BBC News story on trade in Javan gibbons, *Hylobates moloch*, and we shared information from one Instagram account with the journalist [31]. Unbeknownst to us, the BBC contacted Instagram, and the account was taken down. The shared site was part of online trader type C (see Results), and the linked sites, on Instagram and Facebook, remained active, and gibbons and orangutans continued to be offered for sale. In all, this unplanned intervention has had a limited effect on the aims of our study.

From the posted photographs and videos, we identified the species and assessed age categories as infants, juveniles, sub-adults and adults (the latter two age categories were pooled, as it was challenging to assess this properly on the basis of photographs or videos alone). Many gibbons and all orangutans in trade were infants or juveniles, making it difficult to differentiate between species who do not gain clearly distinguishable phenotypic differences before adulthood. We therefore considered Mueller’s gibbon *H. muelleri* as one

species to avoid misclassification. Four young gibbons were identified as either Mueller's or Bornean agile gibbon (*H. albibarbis*), and two others as either Bornean agile gibbon or agile gibbon (*H. agilis*). For analysis, we split them equally between these species. The Tapanuli orangutan (*P. tapanuliensis*) was formally described in November 2017 [32], but given that we were aware of its existence at the start of our study in January 2017, we recognized both Sumatran *P. abelii* and Tapanuli orangutans (but none were recorded). When no photos or videos were posted, we excluded the entry, as it was not possible to check the veracity of the report. Instagram posts occasionally referred to additional information being posted on a Facebook page, but in this instance, we only included the Instagram post.

Asking prices were corrected for inflation to April 2021 and converted to US dollars. Those adverts where we could assess the first date of posting were tested for any temporal (seasonal) pattern in the advertising of orangutans or gibbons (all species pooled). We expected that, once corrected for survey effort (e.g., the month of January was monitored in 2017, 2018, 2020 and 2021, whereas the month of June was only included in 2018 and 2020), the number of individuals offered for sale would be equal for all months. We used  $\chi^2$ -tests of homogeneity, with expected values generated based on survey effort.

We compared numbers of individuals for each species (conditional on at least one detection) offered on Facebook and Instagram and between 2018 and 2021 with a paired *t*-test; prices were compared with a *t*-test, and the proportions of young gibbons offered for sale relative to the number of adults in 2018 and 2020 were compared with a G-test (with Yates' correction). Data were log-transformed as to approach a normal distribution more closely. All tests were two-tailed, and significance was accepted when  $p < 0.05$ .

All adverts were written in (a combination of) Bahasa Indonesia, regional languages (Basa Sunda, Betawi and Basa Jawa) or slang (including some Indonesia-wide adopted English words). All translations were completed prior to analysis by the authors, who are fluent speakers of these languages.

### 3. Results

#### 3.1. Accounts and General Description of the Online Trade in Apes

In 2017/2018, we found five Facebook pages and 19 Instagram accounts offering a diverse range of gibbons for sale. Five of the Instagram accounts offered orangutans for sale, and one additionally offered chimpanzees. In 2021, two of the Facebook pages were still active (offering wildlife for sale), but none offered gibbons or orangutans in the period January 2020 to April 2021. Six of the Instagram accounts were still active. Of these, one still offered gibbons, one offered orangutans and one offered both gibbons and orangutans. The three Instagram accounts that no longer offered gibbons or orangutans for sale still offered other protected wildlife for sale. The vendors can be categorized broadly into four types (Figure 1):

- A. Accounts that remain active over the entire duration under the same or a very similar name.
- B. Accounts that are regularly renamed but that stay within the same platform with no temporal gaps in their presence.
- C. Accounts that are short-lived (typically 6 months to 1.5 years) but linked to similarly named accounts on a different platform, and that then re-emerge after a period of time under a slightly different name.
- D. Short-lived accounts that do not appear to be linked to any other account (or if they are, where we were not able to detect these).

Each of these account types can be linked to a physical pet shop or trading facility.

Asking prices, when given, were in Indonesian rupiah, with vendors giving options for pick-up or drop-off within their respective provinces/islands, but not abroad. These factors suggest the online trade in gibbons in Indonesia is largely, if not exclusively, for the domestic market. Once the online purchase has been made in Indonesia, it is of course possible that the apes are trafficked out of the country. In 2021, but not in 2018, sellers



Table 2. Cont.

MONTH	J	F	M	A	M	J	J	A	S	O	D
Sunda clouded leopard <i>Neofelis diardi</i> *			2						1	1	1
Marbled cat <i>Pardofelis marmorata</i> *									1		
Binturong <i>Arctictis binturong</i> *			2		1				1		1
Malayan civet <i>Viverra zangalunga</i>			2								
Banded linsang <i>Prionodon linsang</i> *			2								
Javan mongoose <i>Herpestes javanicus</i>				1							
Malayan sun bear <i>Helarctos malayanus</i> *	1		1				1				1
<b>Fennec fox <i>Vulpes zerda</i></b>			2								
Javan porcupine <i>Hystrix javanica</i>								1			
Black flying squirrel <i>Aeromys tephromelas</i>			1				2				1
Tarsiers <i>Tarsier</i> spp. *					4				4		
Proboscis monkey <i>Nasalis larvatus</i> *	2						4		4	4	1
Ebony langur <i>Trachypithecus auratus</i> *								2			
Agile gibbon <i>Hylobates agilis</i> *	2										1
Bornean agile gibbon <i>H. albibarbis</i> *							1				
Javan gibbon <i>H. moloch</i> *								2			1
Siamang <i>Symphalangus syndactylus</i> *	1										1
Bornean orangutan <i>Pongo pygmaeus</i> *	1							2		1	
BIRDS											
Cassowary <i>Casuarius</i> spp. *			2				8		5		2
Wandering whistling duck <i>Dendrocygna arcuata</i>										2	
Crested partridge <i>Rollulus rouloul</i>							12		7		
Green peafowl <i>Pavo muticus</i> *			6	8						2	7
Sumatran peacock-pheasant <i>Polyplectron chalcurum</i> *				2							
Victoria crowned-pigeon <i>Goura victoria</i>				2			2	5			
Rose-crowned fruit-dove <i>Ptilinopus regina</i>									7		
Stilt <i>Himantopus</i> spp. *				20						6	
Javan hawk-eagle <i>Nisaetus bartelsi</i> *					1						
Bonelli's eagle <i>Aquila fasciata</i> *							1				
Eurasian hoopoe <i>Upupa epops</i>				4							
Rhinoceros hornbill <i>Buceros rhinoceros</i> *					1		2				
Wreathed hornbill <i>Rhyticeros undulatus</i> *											
Sulawesi wrinkled hornbill <i>Rhabdotorrhinus exarhatus</i> *			2								
Palm cockatoo <i>Probosciger aterrimus</i> *	2	1	11	2		2			1	1	1
Yellow-crested cockatoo <i>Cacatua sulphurea</i> *		2	3	4	2		3			1	1
Moluccan cockatoo <i>C. moluccensis</i> *	1	1	4	2	1		1		1	1	
Sulphur-crested cockatoo <i>C. galerita</i> *											3
White cockatoo <i>C. alba</i> *	2	19	2	4	2	1					6

Table 2. Cont.

MONTH	J	F	M	A	M	J	J	A	S	O	D
<b>Blue-eyed cockatoo <i>C. ophthalmica</i></b>					1						
Vulturine parrot <i>Psittrichas fulgidus</i> *	2		6	2			4	2		1	
Moluccan king parrot <i>Alisterus amboinensis</i> *			1	1							
Eclectus parrot <i>Eclectus roratus</i> *	1	2	2	12			4			1	13
Blue-backed parrot <i>Tanygnathus sumatranus</i>				4							
Large fig-parrot <i>Psittaculirostris desmarestii</i>				1							
Black lory <i>Chalcopsitta atra</i>			1	1							
Red-and-blue lory <i>Eos histrio</i>									1		
<b>African gray parrot <i>Psittacus erithacus</i></b>	1						4				
<b>Red-fronted parrot <i>Poicephalus gularis</i></b>	2										
Flame bowerbird <i>Sericulus ardens</i> *						1		3			
Lesser bird-of-paradise <i>Paradisaea minor</i> *	1		1				1				
Red bird-of-paradise <i>P. rubra</i> *								1			2
Riflebird <i>Ptiloris</i> spp.	2										2
Wilson's bird-of-paradise <i>Cicinnurus respublica</i> *	1										2
King-of-Saxony bird-of-paradise <i>Pteridophora alberti</i> *		2									
12-wired bird-of-paradise <i>Seleucidis melanoleucus</i> *				2							2
REPTILES											
False gharial <i>Tomistoma schlegelii</i> *									4		

### 3.2. Species, Numbers, Origin and Prices

In total, we found 34 gibbons for sale on Facebook and 72 on Instagram, seven orangutans on Facebook and ten on Instagram, and four chimpanzees on Facebook (Table 3). A total of 98 (2018) and eight (2021) gibbons were offered for sale, the difference being significant (paired *t*-test,  $t = 4.625$ ,  $p = 0.0057$ ). All orangutans were Bornean. The most common species was the Javan gibbon (38 individuals), followed by the siamang (35 individuals), the Bornean orangutan (17 individuals) and agile gibbon (12 individuals). In 2018, at the species level, no more individuals were offered for sale on Instagram than on Facebook (paired *t*-test,  $t = 1.672$ ,  $p = 0.155$ ). Other than the four chimpanzees, the only species of ape we found offered for sale were ones that occur within Indonesia, although some species, including agile and lar gibbons and the siamang also occur in mainland Southeast Asia, and Mueller's and Bornean orangutans also occur in the Malaysian and Bruneian parts of Borneo. We did not find Sumatran or Tapanuli orangutans for sale online, nor Kloss' gibbons (*H. klossi*).

All orangutans and chimpanzees were infants or juveniles, as were seventy percent (74/106) of the gibbons. For gibbons, this proportion did not differ between years (G-test with Yates' correction,  $G = 3.375$ ,  $p = 0.069$ ). Mostly single individuals were offered for sale, but in at least five cases, vendors had more than one gibbon for sale at the same time (we were only able to assess this when two or more individuals appeared in the same picture or when two ads were posted in quick succession). None of the two gibbons that were in the same picture appeared to be mother and offspring.



**Table 3.** Gibbons (*Hylobates* and *Symphalangus*), orangutans (*Pongo*) and chimpanzees offered for sale in January 2017–April 2018 on five Facebook pages and 19 Instagram accounts and the numbers for sale on these same (or linked) pages in January 2020–April 2021.

Species (Origin) 2017–2018/2020–2021	Sub-Adult/Adult	Juvenile	Infant
Chimpanzee <i>Pan troglodytes</i> (Africa)	0/0	4/0	0/0
Bornean orangutan <i>P. pygmaeus</i> (Borneo)	0/0	2/3	8/4
Sumatran orangutan <i>P. abelii</i> (Sumatra)	0/0	0/0	0/0
Tapanuli orangutan <i>P. tapanuliensis</i> (Sumatra)	0/0	0/0	0/0
Mueller’s gibbon <i>H. muelleri</i> (Borneo)	3/0	4/1	2/0
Bornean agile gibbon <i>H. albibarbis</i> (Borneo)	2/0	5/0	2/0
Javan gibbon <i>H. moloch</i> (Java)	13/0	14/1	9/1
Kloss’ gibbon <i>H. klossi</i> (Mentawai Islands)	0/0	0/0	0/0
Agile gibbon <i>H. agilis</i> (Sumatra)	3/0	6/1	2/0
Lar gibbon <i>H. lar</i> (Sumatra)	0/0	1/0	0/1
Siamang <i>S. syndactylus</i> (Sumatra)	11/0	7/1	14/2

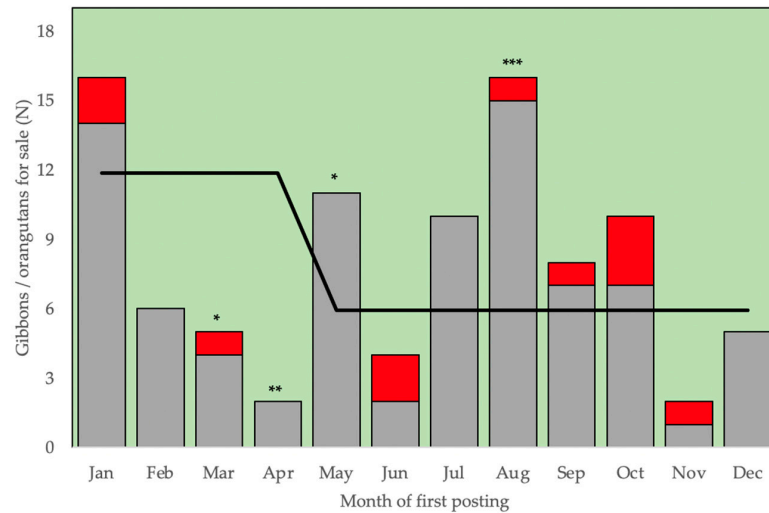
Prices were rarely advertised, but these could be requested by contacting the vendor via WhatsApp (also owned by Facebook) or other direct messaging services. We found three asking prices for gibbons averaging US\$84.36 ± 17.77. Both on Instagram and Facebook, new arrivals were announced typically with dates of arrival included in the photograph, and traders would show or list what they had in stock; occasionally, “proof of posting” and “proof of arrival at the customer” were provided (e.g., an animal properly packed in a box ready for transport and then, upon arrival, the opening of the box to demonstrate it had arrived in good order). Descriptions on the specifics of the animal for sale (“tame”, “3 months old”, “ready to eat on its own”, etc.) left no doubt that it was for sale without having to include the words “for sale”/“dijual” or an asking price.

In 2021, we found that seven of the Facebook pages and six Instagram accounts, whilst not having posted any new ads for gibbons or orangutans, had left one or more of their older posts publicly visible. This may have been to indicate to potential buyers that gibbons are still for sale but only through direct messaging. In addition, Facebook pages can be changed to groups with “closed” or “secret” privacy settings, or the owners may create individual accounts for their businesses. This function enables them to continue trading without bringing attention to their page and would have prevented us from recording their posts.

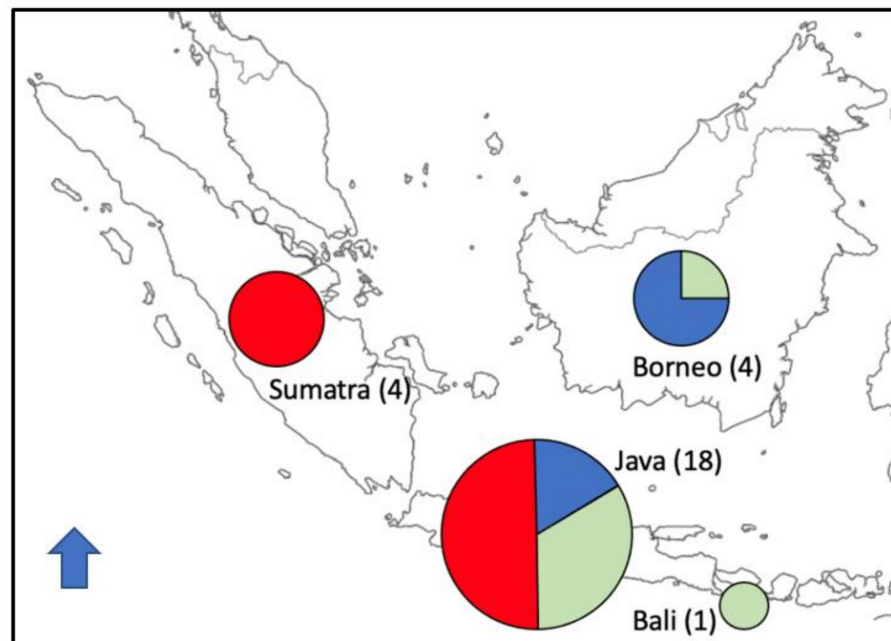
### 3.3. Temporal and Spatial Patterns of the Online Trade

There was no clear temporal or seasonal pattern apparent in the timing of advertising gibbons and orangutans on Facebook and Instagram (Figure 2). Overall, the timing of posts was not homogeneously distributed over the 12 months of the year ( $\chi^2 = 47.57$ ,  $df = 11$ ,  $p < 0.0001$ ). For specific months, in both March and April we observed fewer animals for sale than what could be expected ( $\chi^2 = 3.98$ ,  $df = 1$ ,  $p = 0.046$  and  $\chi^2 = 8.21$ ,  $df = 1$ ,  $p = 0.004$ , respectively), and for May and August we observed significantly more individuals for sale ( $\chi^2 = 5.93$ ,  $df = 1$ ,  $p = 0.015$  and  $\chi^2 = 17.05$ ,  $df = 1$ ,  $p = 0.0001$ , respectively).

All but nine traders were based on Java. The four traders on Sumatra offered Sumatran species (siamang, *Symphalangus syndactylus*; lar gibbon *H. lar*; and agile gibbons), and two traders on Borneo only offered Bornean species (Bornean orangutan, Bornean agile and Mueller’s), whereas the traders in Java and one in Borneo offered species from Java, Sumatra and Borneo (and indeed wildlife from other, more eastern, parts of Indonesia). The trader in Bali (where apes do not occur in the wild) offered a Javan gibbon, sourced from neighboring Java (Figure 3).



**Figure 2.** Temporal pattern of gibbons (gray bars) and orangutans (red bars) for sale on Facebook and Instagram in Indonesia in January 2017–April 2018 and January 2020–April 2021. Values are added together by month. The line is the expected number based on monthly survey efforts. Asterisks indicate levels of significance based on  $\chi^2$  tests: \*- $p < 0.05$ ; \*\*- $p < 0.01$ ; \*\*\*- $p < 0.001$ .



**Figure 3.** Geographic patterns of apes for sale on Facebook and Instagram in Indonesia, depicting the island where the trader is based and the island where the gibbon or orangutan is found, showing that traders on Sumatra only sell Sumatran species (illustrated in red) and Bornean traders sell mainly Bornean species (illustrated in blue), but traders on Java (species illustrated in green) offer species from all three islands for sale.

#### 4. Discussion

We show that, comparing the two 16-month sample periods (2017–2018 and 2020–2021), there was considerable online trade in gibbons and orangutans, as well as some chimpanzees, in Indonesia. Our main aim was not to find details on the number of apes for sale (although we did find a substantial number), but rather to track the accounts and pages that do offer them for sale over time. Only a small number of vendors that offered apes for sale in the first period were still active on the same platform in the second period,

illustrating that either accounts had been closed down or that vendors changed their online platforms on a regular basis (Figure 1). We have limited insight into the prevalence of gibbons or orangutans being traded in closed social media groups (Facebook, Instagram and WhatsApp) and password-protected online forums, but we expect this to be non-negligible.

There are no commercial captive breeding facilities of gibbons or orangutans in Indonesia, nor are we aware of any dedicated hobbyist who breeds these species. As such, we are confident that all of the gibbons or orangutans we observed for sale were derived directly from the wild. We have no information on whether the four chimpanzees were born in captivity in Indonesia or elsewhere, or whether they were obtained from the wild and illegally smuggled into Indonesia (data from the CITES trade database suggest that no chimpanzees have been legally imported into Indonesia over the last decade).

Compared to 18 (inflation corrected) asking prices in the physical markets in Java and Bali in the early 2000s [16], online prices for gibbons have declined but not significantly so (US\$162 ± 82 vs US\$84 ± 18; *t*-test on log-transformed data, *t* = 1.997, *p* = 0.060). To put these current asking prices into perspective, the government-recommended minimum wage for 2021 for the city of Jakarta is US\$303; for Yogyakarta, it is US\$121; and for Balikpapan, it is US\$210, thus making pet gibbons affordable for a large section of Indonesian society. The asking price for gibbons in the online trade in Malaysia and Indonesia, reported by Rainer et al. [11] (p120), i.e., between US\$150 and 540, is considerably higher than that found here. The discrepancy is due to asking prices in Malaysia being higher than those in Indonesia and with most of the earlier quotes [11] indeed originating from Malaysia. We found no asking prices for orangutans in the Indonesian online market. While we could not check the veracity of the report that a Bornean orangutan could sell for US\$3400 in Java [11], compared to contemporary asking prices for the smaller apes in the online marketplace in Java, this appears to have been a very high asking price.

We observed a similar geographic pattern in the trade in gibbons and orangutans online as what we had observed in the physical markets [12–14,16,20–22]; i.e., on Sumatra, only Sumatran species are traded, whereas, on Java, all species of gibbons are offered for sale. The one online trader based in Borneo, in addition to Bornean orangutans and gibbons, also offered a small number of Sumatran and Javan species. This suggests that, within Indonesia, Java has remained a center for gibbon and orangutan trade (cf. Reference [16]). Likewise, as in the physical markets, the online trade in these apes in Indonesia is largely to meet the domestic demand to keep these apes as pets.

In the past, largely based on physical market surveys and country-wide assessments, it was assumed that the trade in gibbons and orangutans is at least in part linked to deforestation (e.g., References [9,17]) or hunting (e.g., Reference [33]). Harvest and trade in apes can be affected by the biology of the species (e.g., a species may be easier to catch during the breeding season or when they are dispersing), other responsibilities or work commitments of the poachers (e.g., agricultural labor, harvest, etc., which may have a seasonal component) or demand from buyers (e.g., for certain festivals or holidays). Being situated on or near the equator, there does not appear to be a strong seasonal component to the breeding of gibbons or orangutans, and births are observed during most months of the year [34,35]. These data suggest that there is no seasonality in conspicuousness or catchability, and, as such, any temporal patterns in the availability of the species in the online should be linked to the supply and demand chain. While on average certain months had higher or lower numbers of gibbons and/or orangutans for sale, we did not observe a clear seasonal component to the online trade, and hence this suggests that supply and demand are fairly even year-round. Indonesia is the country with the largest Muslim population. It is worth noting that, in 2017/2018, Ramadan, the ninth month of the Islamic calendar, observed by Muslims as a month of fasting, prayer and reflection, fell in the months of May and June, and in 2020/2021, it fell in the months of April and May. None of this coincided with an increase or decrease in the advertising of apes online.

It is unclear to what extent the Covid-19 pandemic and the associated lockdowns and travel restrictions have impacted the online trade in apes in Indonesia. Morcatty et al. [25] reported that they did not observe a decrease in wildlife offered for sale on Indonesian online platforms in the first few months of the pandemic, but they did find that vendors changed the way they advertised their wildlife (including offering wild primates as lockdown friends and offering Covid-19 discounts). We did not record a similar pattern with regard to the online trade in gibbons or orangutans.

Regulations and legislation governing social media lag behind online developments in the illegal wildlife trade [36–39]. The “no live animals” or “no protected animals” sale policies that Facebook and Instagram have implemented are clearly not working for gibbons or orangutans, or the wide range of other protected wildlife in Indonesia. It appears that, by advertising in Bahasa Indonesia (or more regional languages), by not openly including asking prices or by slightly altering the names of their page (changing “petshop” to “pethsop” or adding numbers), many of the vendors can continue trading in live, globally threatened and legally protected wildlife.

While there have been several reports in the Indonesian media, and to a lesser degree in the scientific literature of successful prosecutions of wildlife traders, including online traders (e.g., References [40–42]), given the large number of Facebook accounts, Instagram pages and other social media platforms that offer protected species for sale it appears that law enforcement concerning protected species is generally lacking in both effort and efficiency. The chances of having protected animals confiscated, or buyers or sellers facing legal charges, are extremely remote. Fines and jail terms handed out are comparatively lenient, and even those that do face prosecution rarely, if ever, receive the maximum penalty [9,10,41,43,44]. There are challenges in reporting illegal activities such as offering protected live animals for sale to Facebook and Instagram and efforts need to be made to improve this. While we restricted ourselves to a small group of legally protected primates in order to evaluate, the complete picture of a wider range of species and additional cases need to be evaluated (see Table 2). From a management perspective, special attention needs to be paid to those cases where prosecution was indeed successful, and its possible underlying reasons (e.g., pressure from government offices, local NGOs, media or otherwise) need to be unraveled [44]. By analyzing “successful” with “unsuccessful” court cases, more can be learned about how to curb the trade effectively, thus preventing imperiled wildlife from being taken from the wild.

## 5. Conclusions

Indonesia, as the most diverse country in terms of ape richness, holds a global responsibility for the conservation of gibbons and orangutans. The same scale and extent of the trade in apes that in the past would have taken place in open animal markets now plays itself out over the Internet. Despite Facebook and Instagram explicitly banning the sale of endangered animals, and Facebook not allowing the sale of live animals, we found large numbers of apes for sale. None of the online traders specialized in apes but instead offered a diverse range of other primates and wildlife for sale. The second part of our study took place during the Covid-19 pandemic and during partial lockdowns in Indonesia, but we did not notice any obvious responses of vendors to the pandemic. Facebook and Instagram accounts were frequently linked to one another, and potential customers were able to obtain additional data (including asking prices) via WhatsApp or other instant-messaging services. We conclude that Facebook’s and Instagram’s policies of not allowing the sale of live and/or endangered wildlife on their platforms is not effectively implemented in Indonesia, and there is an urgent need to better enforce wildlife-protection legislation in Indonesia.

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