Research Article

The next exotic pet to go viral
Is social media causing an increase in the demand of owning bushbabies as pets?

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Abstract

Social media is known to influence consumers' attitudes and to increase demand for wild animals as pets, when depicted online. We investigate the online presence of the nocturnal primates galagos, on TikTok and Instagram, and its influence on followers' attitudes and desire to keep galagos as pets. We monitored activity June – December 2020 and conducted sentiment analysis on 21976 comments. We assessed trends in Google searches and estimated the international trade of live galagos using CITES reports. Post views increased up to 472% within the study period. Posts were mostly from Japan, Thailand, and Russia, with comments in 43 different languages. Of the comments, 95% were positive, e.g., "*cute*" and "*I want one*". Google searches of the term "galago pet" increased over time, as did the number of live galagos exported. Southeast Asia is having a boom in exotic pet trade. Viral videos of other nocturnal primates previously led to increased demand for pets, and we hope our findings provide data to guide policy and conservation interventions.

Introduction

Trade of non-domesticated wildlife as pets has grown substantially in recent years, particularly in Asia (McNeely et al., 2009; Bush et al., 2014; Reuter et al., 2018; Thạch et al., 2018). In many countries, this type of trade is increasingly moving from physical markets onto the Internet (Lavorgna, 2014; Sung and Fong, 2018; Siriwat and Nijman, 2020), and in more recent years this online trade has moved from more traditional sale webpages to social media platforms (Hinsley et al., 2016; Vaglica et al., 2017; IFAW, 2018; Thạch et al., 2018; Siriwat, 2019). The apparent anonymity of online markets encourages both buyers and sellers of illegal products, such as some wild species, to engage in illegal transactions, which likely expands the potential of this trade to impact wildlife (Aldridge, 2019). Not only accommodating trade of wildlife, social media, as well as other popular media, has been demonstrated to influence attitudes of consumers and the attractiveness of the animals shown, resulting in an increase in demand for these animals as pets (Ross et al., 2011; Nijman and Nekaris, 2017; Aldrich, 2018; Siriwat and Nijman, 2018). Sollund (2011) found that showing images of exotic pets across popular media outlets can increase the demand for these species, and there are clear links to increased trade in exotic animals. With 4.14 billion people around the world now being active on social media (Statista, 2021) it has become a huge influence on people's everyday lives. The numbers of social media users are also increasing more rapidly than ever due to the Covid-19 pandemic (Datereportal, 2020).

Primates are often viewed as attractive pets due to their perceived cuteness and entertaining human-like behaviour (Phillips et al., 2014; Marshall and Wich, 2016; Estrada et al., 2017). These characteristics allow people to connect emotionally to posted content depicting primates, which is ultimately one of the main factors leading a post to be shared and receive engagement by large numbers of people (Botha and Reyneke, 2013). Nekaris and colleagues (2013) showed how a video of a slow loris (*Nycticebus* spp.) went viral and increased desire to own one as a pet, with the second most common comment to the analysed YouTube videos being "*I want one*". Svensson and Friant (2014) found that the trade in and threats to African Lorisiforms mirrored that of their Asian counterparts and although they are traded in smaller numbers the full extent of the trade remains unknown. Galagos, also known as bushbabies (comprising of 20 species, viz. *Euoticus*, *Galago*, *Galagoides*, *Otolemur*, *Paragalagos* and *Sciurocheirus*), is another group of African nocturnal strepsirrhines known to be traded within their respective range countries (Svensson et al., 2015, 2021). To investigate if popularity and resulting trade in galagos is following the same or a different pattern to that of the slow lorises and other primates, we here investigate their presence on social media and how this influences social media followers' attitudes and desire to keep galagos as pets, as well as assess the conditions of the galagos depicted on social media platforms. We further aim to provide a baseline of the current legal and illegal global trade of galagos, to assess the effect of their presence on social media platforms.

We chose to focus on two of the social media platforms currently globally popular; TikTok and Instagram. TikTok is a social media app, with 1.1 billion monthly active users globally (Wallaroo, 2021). The app focuses on the creation and sharing of video content under 60

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Table 1 – Description of conditions in photographs and videos posted, and reasons why they indicate lack in welfare of the galagos (modified from Nekaris et al., 2015).

Condition	Description	Indications that basic needs and welfare of galagos are not met
Human contact	The galago(s) was handled or held by a human (incl. touched, stroked, manipulated).	Non domesticated animals are in general unfamiliar with human contact and forced contact can cause discomfort and stress (Morgan and Tromborg, 2007).
Daylight	The galago(s) were observed in daylight or indoor artificial daylight.	Being subjected to daylight conditions without reversing their light cycle and provide adequate night lighting impacts the health of nocturnal primates and neglects their behavioural needs (Fitch-Snyder and Schulze, 2001; Fuller et al., 2016).
Unnatural conditions	The galago(s) were observed eating unnatural food and/or on unnatural substrate.	Although galagos sometimes use the ground for locomotion, they are mainly arboreal and have home ranges of 1.5–50.0 ha (Nekaris et al., 2013). Being housed in small enclosures, and subjected to environments without suitable substrates and hiding places means their basic behavioural needs are not met (Fitch-Snyder and Schulze, 2001). Galagos diets depend on species, but sugar-rich and inappropriate food can have detrimental effect on their health (Fitch-Snyder and Schulze, 2001; Clayton et al., 2016).
Isolation	Additional galagos were not observed in the photograph/video.	Galagos are social animals (Svensson et al., 2018) and as other primates they suffer greatly when deprived of social interaction or stimuli (Honess and Marin, 2006).

seconds in length, which are classified using keywords and hashtags. Instagram works much the same as TikTok, but users of the app can also create and share photographs as well as videos, and this app has over 1.0 billion monthly active users globally (Statista, 2021).

Material and methods

Data collection

We monitored activity under the hashtags `#bushbaby` and `#galago` on both TikTok and Instagram between 26 June and 8 December 2020, although all comments on posts were included and these dated back to 1 January 2019. We chose to only use hashtags in English. Although in the region under study more than 100 different languages are spoken, hashtags tend to be in English. To indicate the posts' popularity, we recorded number of likes, comments and shares each month for the 50 most recent posts (hereafter referred to as Recent Posts) on each platform, and for the 10 (TikTok) or nine (Instagram) of the most popular posts (hereafter referred to as Top Posts) (Lenzi et al., 2020). Top Posts on both TikTok and Instagram are generated by the platforms themselves, based on algorithms that take into account how much engagement the posts generate (comments and likes) as well as how fast this engagement occurs. The number of Top Posts from TikTok and Instagram differ, as this is how they are presented on the two platforms. We recorded from what country the post was posted, based on geotags of each post and/or location given in the accompanying text. We also recorded what galago (to genus level) was pictured and where possible, recorded the condition of the depicted galagos; if in human contact, if in daylight, if in unnatural conditions and/or if in isolation (Tab. 1). Galagos are wild animals and forced human contact may cause discomfort; being nocturnal being subjected to daylight may cause stress and as arboreal primates, galagos need sufficient and proper substrates.

We downloaded, translated, and coded comments for the nine or 10 (depending on platform) Top Posts on TikTok and Instagram, under the hashtags `#galago` and `#bushbaby` on the 12 November 2020 (giving a total of 38 posts). While we all are multilingual, speaking 12 languages, and have a reasonable understanding of several more, we did rely on Google Translate as well as Bing Microsoft Translator for translations. Many of the comments comprised short, simple few-word sentences, or even one or two words, and we are confident that these translations are accurate enough for the purposes of our study.

To investigate the interest in galagos as pets on the Internet in general we used Google Trends. We extracted Google Trends data at the global, rather than country, level, and we searched for the term "galago pet" in English as well as in Thai ("บุชเบบี้"), Japanese ("ショウガラゴ") and Russian ("галаго"). These languages were chosen based on a preliminary search on social media which showed these countries having a prevalent number of galago posts.

To investigate the legal international trade of live galagos we downloaded data in December 2020 from the CITES trade database (http://trade.cites.org/) for the period 2010–2019 (data from 2020 were not yet available). The reliability of the records in the CITES database is entirely dependent on the accuracy of which CITES parties report data. It has been documented that there can be large discrepancies between officially reported import and export figures and the actual imports or export figures (Blundell and Mascia, 2005; Nijman and Shepherd, 2010). As import data (reported by the importing country) and export data (reported by the exporting country) did not always match, we cross-checked the data and included the largest overall totals by comparing data from importing and exporting countries. We checked all re-exports (when an individual is exported by one country after it has been imported from another) to prevent double counting. We additionally investigated the illegal international trade by collecting data on seizures of galagos from online news articles and reports.

Data analysis

To test whether the platform, galago genus (*Galago* spp. or *Otolemur* spp.) and the conditions of the animals presented in the posts (if in contact with human, if in daylight, if in isolation and if in unnatural conditions, e.g., dressed up) influenced the type of comments we used cumulative link mixed model (CLMM) of `ordinal` package (Christensen, 2019). Comments were classified upon agreement by two of the authors according to an ordinal scale from negative (e.g., against keeping galagos as pets or finding them scary), to neutral, to positive (e.g. cute), to active positive (e.g., I want one). The post ID was included as a random factor to account for the multiple observational units (multiple comments) per post. We used likelihood-ratio test for the model selection to obtain the best-fitted model (function `anova`), using the combination of predictor variables, from the simplest model (only one predictor variable) to the most complex model (all predictor variables). The top two models were the most complex models, with all variables and the model with the variables "dressed up" and "platform". Both were equally good in representing the data ($\chi^2_{(3)}$=1.95, p=0.58, Δweight=0.135), and both were better than the third-ranked model ($\chi^2_{(1)}$= 5.24, p=0.02, Δwight=0.461). We therefore considered the two best-fitted models, and among them, given its similarity, we presented the model with lowest number of parameters in the results. To explore public perception we used sentiment analysis, i.e., studying opinions, attitudes and emotions conveyed via comments, evaluating positive or negative intentions of comments on the 38 Top Posts on TikTok and Instagram (Kalogeropoulos, 2018; Moloney et al., 2021). We also categorized commenters' attitudes towards the galagos according to the Kellert categories, which define a person's inclination to "attach evaluative meanings and values" to animals (Kellert, 1985). Comments were analysed through the content analysis software Leximancer (version 5.0). This program uses automated machine learning to create a concept map that details the most significant themes and concepts in posts using an algorithm that analyses word frequency and co-occurrences (Wilk et al., 2017). Leximancer uses weighted word frequencies to identify concepts which are grouped together with similar concepts to illustrate broader themes in a heat map where the warmer the colour of the theme, the more salient it is within the data (Fig. 2). The higher the number of concepts within

a theme circle, the more prevalent in the comments, whilst the size of circles are not indicative of importance.

We used a two-tailed Mann-Kendall Trend Test to assess the temporal trend on Google searches and legal trade of Kendall package, which is a non-parametric statistical test appropriated for time series. The statistical analyses were performed in R version 3.6.3 (R Core Team 2020) and were considered significant when $p \leqslant 0.05$.

Results

Posts and Taxon Recorded

On TikTok we saw an increase of 472% in views of `#galago` Recent Posts from June to December 2020 (1.1 million to 6.3 million views), and for `#bushbaby` Recent Posts we saw an increase of 69% in the same period (84.8 million to 143.0 million views). On Instagram, we recorded number of Recent Posts rather than total views of each hashtag, as this was what is available. Recent Posts under `#galago` increased by 20% from June to December (13376 to 16110 posts), and Recent Posts under `#bushbaby` increased by 10% in the same period (59552 to 65589 posts). The hashtag `#bushbaby` contained more posts on both TikTok and Instagram but had a higher proportion of unrelated content (not depicting galagos) compared to posts under `#galago`.

On TikTok the 10 Top Posts, under both hashtags, all depicted galagos as pets (Fig. 1A). When looking at the 50 Recent Posts (both hashtags) on TikTok an average of 96% contained galago pets. The main taxon was lesser galagos (*Galago* spp., 97%) and the remaining individuals were greater galagos (*Otolemur* spp.). Posts were exclusively from Japan, Thailand, and Russia (if from other countries these posts were reposted from one of these three countries). On Instagram the 9 Top Posts under `#bushbaby` depicted galagos as pets in 96% of the posts, whilst under `#galago` it was always pet galagos as content (Fig. 1B). When looking at the 50 Recent Posts an average of 49% showed galago pets under `#bushbaby` and 81% under `#galago`. There were only *Galago* spp. observed in the Instagram posts, and posts were mainly from Japan (57%), Thailand (21%) and Russia (21%).

From the 38 Top Posts, we found that all posts showed at least three negative conditions, but 71% of the posts showed all four negative conditions. All Top Posts depicted galagos in daylight and unnatural environments. In the majority of Top Posts, they were also observed in contact with a human (65%) and not in company of a conspecific (95%), and in some the galagos were dressed up in clothes (13%).

Looking at all posts, we recorded seven TikTok accounts specifically dedicated to a "galago pet star", with between 34 (Russian account) to 1.4 million (Japanese account) followers. All of these "galago pet stars" with their own TikTok accounts were *Galago* spp. We recorded 47 Instagram accounts specifically dedicated to a "galago pet star" with between 73 (Thai account) to 369000 (Japanese account) followers. Out of these "galago pet stars" with their own Instagram accounts 25 were from Japan, 21 from Thailand and one from Russia. Forty-six of these galago pet stars were *Galago* spp. and one was an *Otolemur*
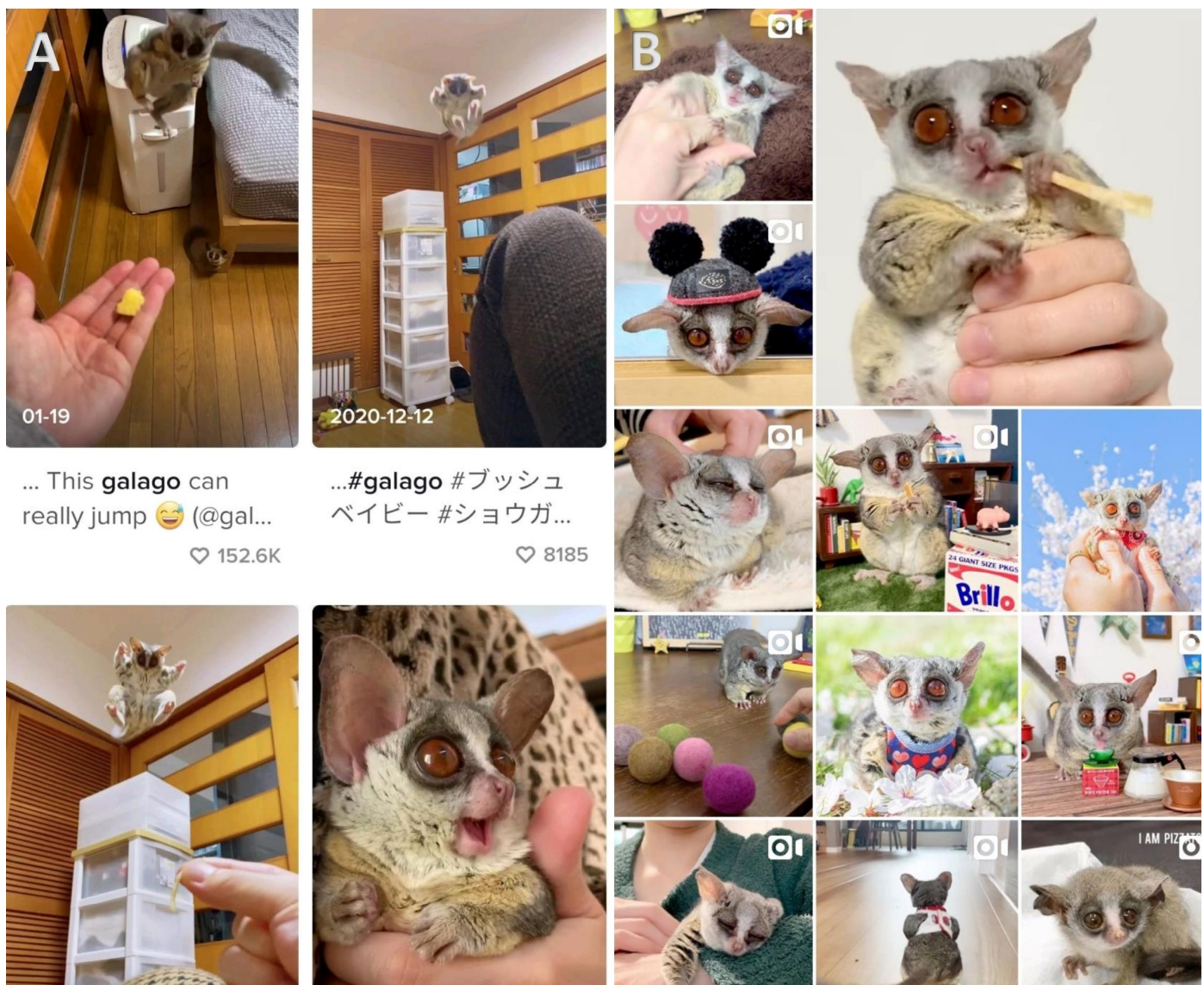

Figure 1 – Top posts when searching for `#galago` on A) TikTok and B) Instagram.

spp. On Instagram there were also three accounts dedicated to selling clothes for galago pets. We found three Instagram accounts selling galagos as pets, one in Thailand, one in Japan and one in Indonesia. We did in our initial searches of social media pages find Facebook pages selling galagos as pets as well; one in Togo, one in Japan, two in Indonesia and seven in Thailand, but these are not included in this analysis.

Comment analysis

We recorded a total of 21976 comments posted on the 38 Top Posts on both platforms, including both `#galago` and `#bushbaby`. Posts were mainly from Japan (75% of the accounts on TikTok and 55.6% of accounts on Instagram), and none of the posts overlapped. Comments were translated to English from 43 different languages, with Japanese being the most commonly used language (42.9%, n=8134), followed by English (13.4%, n=2543), Korean (12.7%, n=2399), Russian (11.8%, n=2228) and Thai (4.6%, n=873).

For our sentiment analysis, 4121 (18.8%) of the comments were classed as irrelevant (e.g., "follow my account and I follow yours") or neutral (i.e., just commenting on the situation in the post). Out of the remaining comments 95% were positive (i.e., commenting positively about galagos as pets, or tagging others to see the posts). The most popular sentiment terms identified were "cute", "what is that?", "I want one" and "movie reference". "Cute" was the most frequently used term, comprising 34.2% of all sentiment terms recorded, compared to "what is that?" constituting 8.2% and "I want one" 8.1% of all 18 sentiment codes identified within the comments (Fig. 2). References to movies constituted 7.9% and mainly referred to King Julien in the movie Madagascar, or Pokémon. In the negative comments (4.6%) three themes could be distinguished; comments about the origin of Covid-19, that they find the animal creepy, or comments that these animals are not supposed to be kept as pets, and then mainly referring to them being poisonous (here confused with the slow lorises who are indeed venomous). Excluding comments deemed irrelevant, six of the nine Kellert categories were observed in the comments, them being: Humanistic (72.9%), Aesthetic (7.9%), Naturalistic (8.2%) Scientistic (6.4%), Moralistic (2.7%) and Negativistic (1.9%).

Comments tended to be more negative or neutral if the primate on the posts was dressed up (*p*=0.05) when compared to non-dressed up primates. Further, comments tended to be more positive in posts on Instagram compared to comments on posts on TikTok (*p*=0.03) (Fig. 3, Tab. 2). Human contact, isolation and galago genus did not have a significant influence on the type of comments.

Trends in Google searches

We noted a significant increase in Google searches of the English term "galago pet" over time (Mann-Kendall Trend Test, tau=0.471, s=790, var(s)=24090, z=5.08, Sen's slope=0.64, *p*<0.001), same with the Thai term (tau=0.593, s=952, var(s)=23281, z=6.23, Sen's slope=0.75, *p*<0.001), and Japanese term (tau=0.642, s=1,117, var(s)=24,493, z=7.13, Sen's slope=0.42, *p*<0.001), and Russian (tau=0.431, s=754, var(s)=24528, z=4.81, Sen's slope=0.41, *p*<0.001) (Fig. 4).

International trade

There has been a significant increase in the number of live individuals exported over time (Mann-Kendall Trend Test, tau=0.72, s=26, var(s)=92, z=2.61, Sen's slope=45.18, *p*=0.01). For the whole 10-year period a total of 1493 individual galagos have been reported to be traded internationally in the CITES trade database, mainly from

Figure 2 – Heat map showing weighted word frequencies which identify the most common concepts (indicated as grey dots and black text). Concepts are grouped together, creating the most prominent themes (indicated as coloured circles): Cute (red), followed by lol (orange) and animal (yellow). The warmer the colours (i.e., the closer to redtones) the more salient the theme is within the data. The size of the circle does not indicate importance.

Figure 3 – (a) Linear coefficient estimates (±95% confidence intervals) showing the magnitude and direction of effects on the relationship between the type of comments (negative-positive) and the platform and if the primate was dressed up on the Top Posts. Red dots represent significantly positive effects and blue solid dots represent significantly negative effects. Predicted probability of each category of comment for the two significant predictors (b) platform and (c) dressed up.

Table 2 – Details of the selected model using Cumulative Link Mixed Models to assess the influence of the platform and the condition of the primates from the Top Posts on the type of comments recorded. (* $p \leqslant 0.05$).

Response variable	Predictor variable	Reference class	Estimate	Std. Error	z value	p value
Type of comment	Platform	Instagram	0.167	0.077	2.2	0.03[*]
(negative < neutral < positive < active positive)	Dressed up	Yes	−0.28	0.160	−1.7	0.05[*]

range countries (South Africa, DRC, Benin and Togo), with 30% of all the trade going to Thailand, and the last three years almost exclusively to Thailand. The purpose of the trade is 95% commercial (T) or for zoo (Z), and the last 2 years it is almost exclusively for commercial purposes. Since 2010 51% of the galagos have been wild caught, and the last couple of years that number increased by 73%. The galago species traded are lesser galagos (*Galago moholi* and *G. senegalensis*, 68%), dwarf galagos (*Galagoides demidoff*, 26%) and greater galagos (*Otolemur crassicaudatus* and *O. garnettii*).

There have been a few seizures at customs, mainly in Asia, of illegally traded galagos. In 2006 customs officials at Zaventem Airport, Brussels, Belgium seized 21 *Galago senegalensis* that were on route to Czech Republic from Conakry, Guinea (TRAFFIC, 2006). In 2009 five *Galago* spp. were seized at the Chhatrapati Shivaji Maharaj International Airport, Mumbai, India, when someone attempted to smuggle them in bags tied to their legs, arriving from Bangkok, Thailand (Kaushik, 2009). In 2019 Tokyo Customs seized 10 galagos being smuggled in from Thailand by air (Japan Customs, 2020), and Kitade and Naruse (2020) report on eight *Galago* spp. being seized in Japanese customs, coming from Thailand.

Discussion

There is undoubtedly a big presence of galagos as pets on TikTok and Instagram, with the majority of accounts and posts originating from Asia (mainly Japan), and the posts are also generating the most attention in Asia. This is not surprising with Japan and Southeast Asia having a recent boom in exotic pet trade (Hesse, 2000; McNeely et al., 2009; Bush et al., 2014; Reuter et al., 2018; Thạch et al., 2018; Kitade and Naruse, 2020), and Japan being considered one of the countries with most owners of exotic pets worldwide (Panter et al., 2019; McMillan et al., 2021). The same pattern was seen in other exotic pet species that are considered cute, such as slow lorises (*Nycticebus* spp., Nekaris et al., 2013) and Asian small-clawed otters (*Aonyx cinereus*, Siriwat and Nijman, 2018). The Japanese cultural concept of "kawaii" (the quality of cuteness, Muehlenbein, 2017) makes it easy to understand why these primates are increasing in popularity in Japan and other Asian countries. In addition to that, galagos present strong paedomorphic characterises, and paedomorphic facial expressions in animals has been associated to higher attractiveness to humans for pet ownership (Waller et al., 2013). We have previously seen videos of nocturnal primates going viral on social media and increasing the desire to own them as pets, when the tickled slow loris went viral on YouTube (Nekaris et al., 2013). Later, a video of a ring-tailed lemur (*Lemur catta*) went viral on Twitter, and the same trend could be seen in the comment sections, where an increasing number of people interacting with the video wanted a lemur as a pet (Clarke et al., 2019). Asian countries have a strong social media presence, with for example Thailand ranking among the top 10 nations in the world for social media use (Leesa-nguansuk and Fredrickson, 2017).

Even if we do not observe a particular video going viral, the whole phenomenon of galago pet stars, on especially TikTok, seems to be following the same pattern of virality. Although the galago species depicted are not currently threatened, this online popularity may cause an increase in demand and should be monitored. Worryingly, the large number of comments "I want one" and the social character of the platforms assessed may generate a herd effect, encouraging more people to desire to own galagos as a pet, as seen in previous studies on herd effect in online markets (e.g., Chen and Wang, 2010). Previous studies have found that showing wild animals in the context of a human environment can increase people's desire to own them as pets, as it normalises them as apparently suitable pets (Vail, 2018). Nijman and Nekaris (2017) showed how this has been the case for less abundant wildlife species that are now declining in the wild, such as with owls in Indonesia. We here report on the current situation on only two chosen social media pages and report that interest in these nocturnal primates is apparently
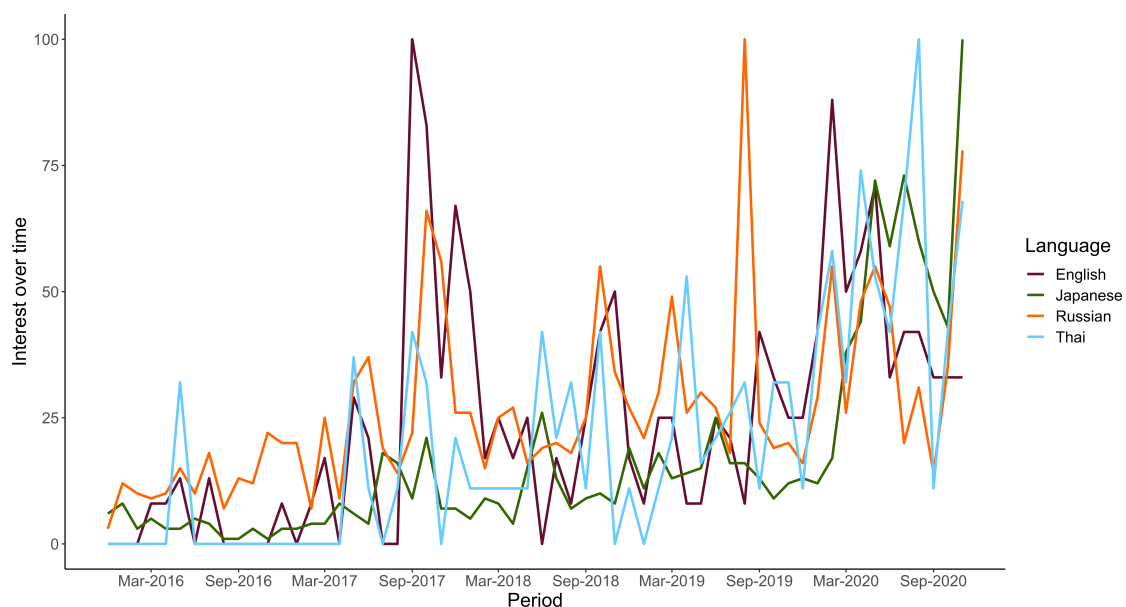

Figure 4 – Google searches for the term "galago" from December 2015 to November 2020. Information downloaded from the open-access Google Trends database. The y-axis, "interest over time" is a metric derived by Google which is relative to the highest point on the chart (i.e., a value of 100 indicates peak popularity of the search term for the time period considered). In English the exact search term was "galago pet" to specify, in Thai "บุชเบบี้", in Japanese "ショウガラゴ" and in Russian "галаго" (all meaning galago).

increasing. It is essential that action be taken against sellers and buyers engaging in the illegal online trade in these species, and that online platforms be encouraged to remove all posts that encourage or advertise the trade in these species. Furthermore, efforts should be made to discourage this trend and persuade potential buyers to not participate in the trade in these species. How activity on TikTok and Instagram can change users' behaviour has been studied in different topics. For instance, public sharing of prosocial behaviour was responsible for more participation in activism both online and offline (Lane and Dal Cin, 2018).

Further we have demonstrated that this phenomenon of galagos as social media pet stars has a huge implication on the welfare of these animals, with all of them being depicted in unsuitable situations. These nocturnal primates were almost exclusively photographed or filmed in daylight or in unsuitable lighting (Fuller et al., 2016), in human contact, being dressed in clothes, and/or showing signs of obesity and consuming unsuitable food (Cabana et al., 2019). This mirrors findings by Nekaris and colleagues 2015 where they assessed the welfare of slow lorises in YouTube videos. What is worrying, and similarly seen in our study, is that Nekaris et al. (2015) found that social media users were more likely to react positively to images where primates are seen in welfare reducing situations. We found that people commenting on galago posts seemed to tolerate and even appreciate and enjoy post of animals in negative conditions, such as the galagos being kept solitary, with only human contact. Although still having a large number of positive comments, it was clear that posts with galagos in clothes generated fewer positive comments in comparison to not-clothed individuals, which may be as primates dressed-up in clothes shows the extreme sign of domestication and it is yet not completely tolerated. Our finding that Instagram users tend to leave more positive comments on posts (e.g., "cute", "I want one") compared to TikTok users might be due to the fact that TikTok has been found to be used purely for entertainment (Masciantonio et al., 2021), as opposed to Instagram which is used more to seek out social connections with other users with similar interests (Lee et al., 2015).

The legal and international trade we report on is not in very large numbers, and the species in question are all listed as Least Concern on the IUCN Red List (IUCN, 2021). However, trade specifically for pets is only mentioned as a threat in the IUCN Red List assessment for one of these species, *Otolemur garnetti*. Trade in *Galago moholi* and *G. senegalensis* is mentioned in the assessments, but not pet trade — the trade appears to be largely for bush meat. As demand for other similar species traded on the Internet has increased greatly over recent years and is in some cases a significant threat, it is important the Red List assessments include trade as a use and potential threat, and that further monitoring is carried out to determine changing trends in these species and to provide data to guide policy and conservation interventions and to support enforcement efforts, to ensure these species too do not become victims of the wildlife trade.

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