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1 **Wildlife trafficking via social media in Brazil**

2
3 **Abstract:** The trafficking of non-human animals is having a profound effect on biodiversity and
4 conservation efforts. This is also the case in Brazil where it is estimated that millions of wild animals
5 are sold each year, particularly for the pet market. The increasing use of social media and private
6 messaging services (i.e., Facebook and WhatsApp) facilitate this illegal activity to a degree that has not
7 yet been explored. This paper shares the findings of a pilot study analysing the patterns and trends
8 from 500 messages containing at least 1,682 individual animals in Brazil via social media and private
9 messaging services. We found the vast majority of the wildlife advertised are Brazilian reptiles and
10 birds. All the trade observed was illegal since it was not happening through certified breeders. This
11 means that it is likely tens of millions of wildlife are being illegally traded each year in Brazil, which has
12 conservation and public health implications in Brazil, but also globally. Efforts to reduce the demand
13 for wildlife in and from Brazil and to support law enforcement agencies and technology companies in
14 combating wildlife trafficking are needed.

15
16 **Key Words:** illegal wildlife trade, social media, Brazil, pet market

17 18 **Introduction**

19 Owning a companion animal or pet is nothing exceptional; 57% of global households already do
20 (Anderson 2020). During times of unrest, companion animal ownership seems to increase (Wallace
21 2020) as seen during the coronavirus pandemic (PFMA no date). Whereas dogs and cats are the most
22 common companion animals, another side of the market is 'exotic' pets (Hall 2019). In Brazil, the
23 human habit of collecting and domesticating wild animals (i.e., parrots, monkeys, turtles, and snakes
24 for pets) from the rainforest has been common for Indigenous Peoples (see Hagenbeck 1910). The
25 Portuguese and other Europeans not only carried out scientific expeditions throughout Brazil (Maurice
26 de Nassau, Von Spix, Von Martius and Von Langsdorff) in order to identify, record, and collect the
27 fauna, but also adopted the practice of keeping these species as pets in Brazil and in Europe
28 (Hagenbeck 1910). The Indigenous Peoples, for their part, understood quickly the European demand
29 for wildlife; thus, began the ongoing trade based on the commercialization of wild animals and derived
30 products (Hagenbeck 1910).

31 The demand for rare and unique companion animals across the world is one of the main
32 components of wildlife trafficking (Wyatt 2021), and this holds true in Brazil (Giovannini 2006). The
33 attractiveness of rainforest species for the 'exotic' companion animal (pet) market is undeniable as it
34 is a biodiversity hotspot. Yet, wildlife trafficking likely removes more than 38 million animals from the
35 wild in Brazil every year, posing a huge threat to regional and global biodiversity (RENTAS 2014). Sixty
36 percent of these animals are sold on the domestic pet market with the remainder illegally exported.
37 The harm to smuggled animals is also serious. Of every 10 animals taken, on average only one arrives
38 at the final intended destination; the others die either during capture or in transport (RENTAS 2014).
39 Further understanding of the pet market is thus needed and important.

40 Wildlife trafficking in Brazil is a highly profitable illegal market. The national Brazilian non-
41 governmental organisation—Rede Nacional de Combate ao Tráfico de Animais Silvestres (RENTAS
42 2014)—reports that Brazilian species such as the Lear's Macaw (*Anodorhynchus leari*) are traded for
43 more than USD 100,000 each. The traffickers' profit is exorbitant, with wild birds being purchased
44 from Indigenous Peoples' communities for USD 1 and resold for up to a thousand. Wildlife trafficking
45 also involves exploitation of Brazil's most vulnerable communities, including Indigenous Peoples and

46 underprivileged youth (RENTAS 2014). In many poor communities, wildlife trafficking is an important
47 source of income for many local communities and wildlife traffickers take advantage of this social
48 vulnerability to expand their team of animal collectors (RENTAS 2014).

49 Furthermore, illegally traded animals do not undergo any health inspections and are more
50 likely to transmit diseases, including unknown ones, to domestic animals and human beings, with the
51 risk of public health consequences. This is particularly poignant given the coronavirus pandemic that
52 continues to cause human death and suffering around the world. COVID-19 is the latest disease to be
53 transmitted from animals to humans, likely through consumption (Kimbrough 2020) as has happened
54 in previous zoonotic outbreaks (i.e., Severe Acute Respiratory Syndrome (SARS), HIV, Ebola - Swift et
55 al. 2007)). Wildlife trade and the related markets have been identified as possible points of
56 transmission and mutation of potential viral pathogens and thus risk factors for zoonotic spill over
57 (Aguirre et al. 2020; IPBES 2020; World Animal Protection 2020). The diversity of species brought to
58 highly populated cities is thought to contribute to the potential for disease emergence (Swift et al.
59 2007) as are the cramped and stressful conditions for wildlife, insufficient diet, and exchange of
60 excrement and viruses (Kimbrough, 2020). The welfare of wildlife in these spaces—particularly the
61 conditions in which they are caught, killed, transported and kept—have direct and fatal consequences
62 for human health and safety (WHO 2017; One Welfare 2019).

63 In the debates about wildlife trafficking and zoonotic diseases, it appears that consumption is
64 the focus, and the companion animal market has been largely overlooked. Yet many of the species in
65 demand for ‘exotic’ pets also carry the risk of transmitting diseases to humans. For instance, in one
66 small study in Brazil, 55.8% of animals (24 out of 43 total - 41.7% and 58.3% of the carnivores and non-
67 human primates respectively) were found to have at least one zoonotic parasite species (Lima et al.
68 2021). Bezerra-Santos et al. (2021) cite instances of documented cases of transmission of viruses,
69 bacteria, and parasites from ‘exotic’ pets such as small mammals, reptiles, amphibians, fish, and birds
70 to humans. Thus, in Brazil, in addition to the conservation implications, there are real concerns for
71 public health arising from the ‘exotic’ pet trade.

72

73 **The social media fever**

74 As a response to the increasing demand for wildlife and wildlife products around the world, the
75 trafficking of wildlife, like other black markets, appears to be facilitated by the use of social media and
76 related private messaging platforms (Broséus et al. 2016; Lee and Roberts 2020; Martin 2014). Private
77 messaging provides a fast worldwide reach, ensures privacy and is flexible; if one group gets deleted,
78 another can be created with a different name. During the COVID-19 crisis, RENTAS (who monitors
79 websites selling wildlife as well as social media advertisements—see Methods) observed 15,000 online
80 advertisements per day for rainforest wildlife-related trade. This number reflects RENTAS’ maximum
81 capacity for message monitoring, meaning the actual number of daily advertisements for wildlife
82 online is likely far greater. In Brazil, all restricted species of wild animals can *only* be legally purchased
83 at a store through breeders certified by the local environment agency IBAMA (Instituto Brasileiro do
84 Meio Ambiente e dos Recursos Naturais Renováveis no date)(see Brazilian Federal law 5.197 / 67,
85 9.605 / 98). Hence, any sales of wildlife online and through groups on private messaging platforms
86 such as those monitored by RENTAS and as sampled for this article are illegal.

87 This article documents a pilot study exploring the as yet uninvestigated use of private
88 messaging groups to facilitate wildlife trafficking for companion animals in Brazil. By exploring the
89 contents of private messaging groups advertisements for the first time, we aim to raise awareness
90 about the extensive use of social media and messaging platforms for illegal activities that threaten

91 Brazilian ecosystems, economy, society, and public health. We begin by outlining the methods used
92 to conduct this pilot study. We then share our findings as well as analysis. We end with our thoughts
93 for further research and the implications of our study for combating wildlife trafficking.

94 95 **Methods**

96 We recorded and analysed a dataset of 500 social media messages randomly sampled from RENTAS
97 records that were collected between August and November 2020 from private messaging groups on
98 Facebook and WhatsApp marketing 'exotic' pets. Established in 1999, RENTAS is a local Brazilian non-
99 governmental organisation that has been collecting data and intelligence on wildlife trafficking with
100 the goal of trying to decrease it. One way that they have collected such data is to create 200 fake
101 Facebook profiles to access private messaging groups on Facebook and WhatsApp.

102 Once access to the private messaging groups is gained, the relevant contents of the group
103 chat are downloaded in the form of screenshots. In their data collection, RENTAS adhere to the
104 Association of Internet Researchers' parameters and Brazilian law (Internet Civil Rights Act 12.965
105 /2014). No personal information is shared publicly. The screenshots are securely stored, and the
106 intention is to record the data from each screenshot. RENTAS now has a repository of 4 million
107 screenshots from 350 private groups collected over the last 12 months.

108 For this pilot study, RENTAS shared their anonymised database of screenshots with the
109 authors. Ethical approval was obtained via XXX's Department of Social Sciences (#26787) for the
110 recording of the data from a random sample of screenshots into a spreadsheet for analysis. We
111 recorded (where possible) the species traded and their origin, the type of transaction (sell or buy
112 order), the price, and the specific social media and group used for this advertisement into a Microsoft
113 Excel spreadsheet for 500 randomly selected social media messages. The number of individual animals
114 was also recorded and this was assumed to be one if the number for sale was not specified. We also
115 categorised species in the dataset by additional information such as the animal class, scientific name
116 if not provided in the original post, and conservation status using different lists (ICMBio (Instituto
117 Chico Mendes de Conservação da Biodiversidade – the national organisation overseeing Brazilian
118 national protection), IUCN (International Union for the Conservation of Nature) Red List, Convention
119 on International Trade in Endangered Species of Wild Fauna and Flora (CITES)) to provide insights into
120 level of protection and possible conservation implications.

121 122 **Findings and Analysis**

123 Our dataset of 500 messages advertised an estimated minimum of 1,687 individual animals. Of these,
124 1,682 animals were 'for sale' with the remaining five messages from people looking to buy wildlife.
125 We equate each individual animal to one advertisement. There were 105 different groups advertising
126 and a total of 260 distinct species listed for sale across the ads. Below, we first discuss the overall
127 trends in regard to species being advertised. Then, we summarize information obtained related to
128 price, geographic distribution of the species origin, and the conservation status of the species
129 advertised.

130 131 **Overall Species Trends in Advertisements**

132 The vast majority of ads were for reptiles (44%) and birds (40%). This was followed by mammals (8%),
133 arachnids (7%) and amphibians (2%) (see Table 1). Certain species more popular in the pet trade
134 appear more than other species. In 13 ads, the information about the species was unidentifiable. One
135 hundred and fourteen species only appeared once in one advertisement. One hundred and six species

136 appeared in two to nine ads (accounting for 418 ads) and only 23 species appeared in ten to 19 ads
137 (for a total of 308 ads). The remaining 834 ads contained only 14 species, accounting for approximately
138 49% of all ads. The list of these species are in Table 2.

139

140 **Price**

141 Data available for prices were limited. The total value of all individuals was 780,207 Brazilian real or
142 USD 148,239. However, there were 673 instances (~40% of the total number of individuals) which had
143 no price information for the animal for sale. From the information that was available, we suggest that
144 there is a clear unevenness in the value of each species category, with mammals and birds each
145 accounting for approximately USD 95,330 (or 64% of the total USD value) and reptiles accounting for
146 USD 51,726 (35% of USD value). Mammals had the highest value per advertisement on average (USD
147 792) followed by birds (USD 166 per ad) and reptiles (USD 130 per ad). The average higher price for
148 mammals may be a reflection of lower population numbers overall, fewer mammals being available
149 for sale, or the greater perceived value. We do not know whether the price is missing because price is
150 common knowledge among these private groups' members or whether negotiating is expected and
151 thus the price is purposefully omitted in the messages.

152

153 **Geographical Distribution**

154 Most of the species advertised (81%) originated in Brazil. That this pilot contains data from only 500
155 of 4 million messages indicates that there are profound implications for conservation and biodiversity
156 loss stemming from the demand for Brazilian species as companion animals. Species originating in the
157 United States accounted for 6.25% of individuals, followed by just under 4% of species from Africa.
158 Only two individuals were species from Europe (Russia and Spain/Portugal).

159

160 **Conservation Status**

161 We also analysed the messages according to different lists of conservation status, namely the CITES
162 Appendices, the IUCN Red List categories, and the Conservation Categories from Brazil's Ministry of
163 the Environment (ICMBio). Approximately, one third of ads were for species, for which some level of
164 trade under CITES is allowed (Appendix II). Almost 4% of ads, however, are for species in Appendix I
165 (which in essence means no international trade is allowed). Ads for CITES Appendix I listed species
166 were split evenly between birds, mammals, and reptiles. However, the distribution changes for
167 Appendix II listed species with reptiles accounting for almost 70% and birds and mammals accounting
168 for approximately 15% each (see Table 3).

169 We also analysed the ads by IUCN Red List categories. Few ads, only 30, were for species in
170 the Critically Endangered and Endangered categories. However, approximately 3% of identifiable ads
171 were for species designated as Near Threatened (5.30% are near threatened as defined by ICMBio),
172 meaning their trade, in addition to other factors, could make them at risk for qualifying for a more
173 threatened category in the future. The vast majority of ads (56%) were designated as being in the
174 Least Concern category (see Table 4). Similarly, for the advertisements by ICMBio category, a majority
175 of the species were Least Concern (Table 5). Critically Endangered, Endangered, Near Threatened, and
176 Vulnerable species were less than 9% combined. Unevaluated species (those who have not been
177 scientifically assessed) and unidentified species accounted for over 30% of the total.

178

179 **Discussion and Conclusion**

180 The 1,682 advertisements provide insights on the exotic and illegal pet trade in Brazil. Reptiles and
181 birds appear to be a majority of the volume of traded species in Brazil's online illegal wildlife trade,
182 whereas mammals likely earn sellers more money per animal. A vast majority of the trade is in Brazilian
183 species, and it does not appear that many of the species are endangered under the three conservation
184 status lists we consulted. However, there is a significant number of advertisements where the status
185 of the species cannot be determined, so there may be more trade of endangered species than our
186 figures indicate. Moreover, when scaled up to 4 million ads and over time, the trade could underpin
187 large losses to specific species populations if unchecked, thereby threatening their conservation
188 status.

189 Regardless of conservation status, the trade recorded is illegal under Brazilian law. As
190 mentioned, only certified breeders are permitted to advertise and sell wildlife in Brazil. Despite this
191 legal limitation, the scale of Brazilian trade seems to be enormous. Each message contains on average
192 3.3 ads for wildlife. Extrapolated to the entire RENTAS' dataset of 4 million messages this means
193 13,200,000 ads and there are more out there from other groups not being monitored. This is just ads;
194 this is not the number of individual animals, which is undoubtedly more. This is from only a 12-month
195 period of monitoring by RENTAS. A vast majority of the wildlife are Brazilian, so the scale has direct
196 implications for conservation and the sustainability of species populations in Brazil. Furthermore, it is
197 not possible to inspect uncertified breeders to check they are maintaining welfare and hygiene
198 standards. This could mean increased risk of zoonotic viruses, bacteria, and parasites from the illegal
199 trade of companion animals within Brazil and beyond its borders.

200 Beyond the need to analyse the full extent of online illegal wildlife trade in Brazil, further
201 research needs to be done to track where these wildlife are going to, but it appears that there is a
202 substantial domestic market in Brazil (which means CITES is irrelevant as CITES does not regulate
203 national level trade and does not always reflect the national list of protected species). Thus, demand
204 reduction campaigns in Brazil are likely necessary. This means further research is needed into who is
205 selling and buying wildlife to be pets, who are organising these private messaging groups, how the
206 online interaction links to physical interactions (i.e., how wildlife are delivered), and the level of
207 knowledge of people involved in the online wildlife pet market in Brazil of its illegality. Given the recent
208 and well-founded concern about zoonotic disease spread from the companion animal trade, further
209 research might also seek to understand the level of risk posed by commonly traded species in Brazil
210 and identify measures to reduce the risk of zoonotic spill over to human populations. That there is a
211 substantial illegal trade taking place via private messaging groups raises unique challenges for
212 conservation and for law enforcement. Although efforts are being made by technology companies to
213 address illegal trade online (see the Coalition to End Wildlife Trafficking Online, for instance),
214 encrypted private messaging poses particular hurdles. Further research is needed to support law
215 enforcement in their approach to online illegal trade in wildlife in Brazil and all over the world for both
216 species conservation and public health purposes.

217

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284

285 **Figures and Tables**

286

287 Table 1 - Breakdown of advertisements by Species' Taxonomic Class

Species' Taxonomic Class	# of ads	% of ads
Amphibian	29	1.72%
Arachnid	115	6.82%
Bird	670	39.72%
Mammal	133	7.88%
Reptile	740	43.86%
Grand Total	1687	100.00%

288

289 Table 2 - Species who account for most of the advertisements

Species in Latin	Species Common Name	# of ads	% of ads
Boa constrictor	boa constrictor	123	7.29%
Chelonoidis sp.	turtle	110	6.52%
Iguana iguana	green iguana	102	6.05%

Pantherophis guttatus	corn snake	93	5.51%
Ara ararauna	blue and yellow macaw	89	5.28%
Saltator similis	green winged saltator	59	3.50%
Sapajus sp.	capuchin	50	2.96%
Sporophila caerulescens	double collared seedeater	49	2.90%
Callithrix sp.	marmoset	31	1.84%
Sicalis flaveola	saffron finch	30	1.78%
Amazona aestiva	turquoise-fronted parrot	28	1.66%
Python sp.	python	28	1.66%
Tupinambis sp.	tegu (lizard)	21	1.24%
Tyto furcata	barn owl	21	1.24%

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291
292
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Table 3 - The distribution of advertisements across taxonomic class within each CITES Appendix

	# of ads	% of ads
Appendix I	54	3.20%
bird	16	29.63%
mammal	16	29.63%
reptile	22	40.74%
Appendix II	605	35.86%

amphibian	4	0.66%
arachnid	26	4.30%
bird	72	11.90%
mammal	76	12.56%
reptile	427	70.58%
Appendix III	15	0.89%
bird	3	20.00%
mammal	3	20.00%
reptile	9	60.00%
Total	674	

294

295 Table 4 - Advertisements by IUCN Red List category

IUCN Category	# of ads	% of ads
Critically Endangered	19	1.13%
Endangered	11	0.65%
Near Threatened	45	2.67%
Vulnerable	79	4.68%
Least Concern	941	55.78%
Not Evaluated	337	19.98%
Unidentifiable (NP)	255	15.12%

296

297 Table 5 - Advertisements by ICMBio category

ICMBio	# of ads	% of ads
Critically Endangered	16	0.95%
Endangered	7	0.41%
Near Threatened	64	3.79%
Vulnerable	54	3.20%
Least Concern	996	59.04%
Not Evaluated	362	21.46%
Data Deficient	10	0.59%
Unidentifiable (NP)	178	10.55%