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Conservation implications of primate trade in China over 18 years based on web news reports of confiscations

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Primate species have been increasingly threatened by legal and illegal trade in China, mainly for biomedical research or as pets and traditional medicine, yet most reports on trade from China regard international trade. To assess a proxy for amount of national primate trades, we quantified the number of reports of native primate species featuring in unique web news reports from 2000 to 2017, including accuracy of their identification, location where they were confiscated or rescued, and their condition upon rescue. To measure temporal trends across these categories, the time span was divided into three sections: 2000-2005, 2006-2011 and 2012-2017. A total of 735 individuals of 14 species were reported in 372 news reports, mostly rhesus macaques (n=165, 22.5%, *Macaca mulatta*) and two species of slow lorises (n=487, 66.3%, *Nycticebus* spp.). During the same period, live individuals of rhesus macaques were recorded 206 times (70,949 individuals) in the CITES Trade Database, whereas slow lorises were only recorded four times (9 individuals), indicating that the species originated illegally from China or were illegally imported into China. Due to their rescued locations in residential areas (n=211, 56.7%), most primates appeared to be housed privately as pets. A higher proportion of 'market' rescues during 2006-2011 ($\chi^2=8.485$, $df=2$, $p=0.014$), could be partly attributed to an intensive management on wildlife markets since the outbreak of SARS in 2003. More than half (68.3%, 502 individuals) of the primate individuals were unhealthy, injured or dead when rescued. Thus, identification and welfare training and capacity-building should be provided to husbandry and veterinary professionals, as well as education to the public through awareness initiatives. The increase in presence of some species, especially slow lorises, with a declining population in restricted areas, also suggests the urgent need for public awareness about the illegal nature of keeping these taxa as pets.

1 **Conservation implications of primate trade in China over 18 years based on web news**
2 **reports of confiscations**

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6
7 **Short title:** Primate trade in China

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18 **Abstract**

19 Primate species have been increasingly threatened by legal and illegal trade in China, mainly for
20 biomedical research or as pets and traditional medicine, yet most reports on trade from China
21 regard international trade. To assess a proxy for amount of national primate trades, we quantified
22 the number of reports of native primate species featuring in unique web news reports from 2000
23 to 2017, including accuracy of their identification, location where they were confiscated or
24 rescued, and their condition upon rescue. To measure temporal trends across these categories, the
25 time span was divided into three sections: 2000-2005, 2006-2011 and 2012-2017. A total of 735
26 individuals of 14 species were reported in 372 news reports, mostly rhesus macaques (n=165,
27 22.5%, *Macaca mulatta*) and two species of slow lorises (n=487, 66.3%, *Nycticebus* spp.). During
28 the same period, live individuals of rhesus macaques were recorded 206 times (70,949 individuals)
29 in the CITES Trade Database, whereas slow lorises were only recorded four times (9 individuals),
30 indicating that the species originated illegally from China or were illegally imported into China.
31 Due to their rescued locations in residential areas (n=211, 56.7%), most primates appeared to be
32 housed privately as pets. A higher proportion of ‘market’ rescues during 2006-2011 ($\chi^2=8.485$,
33 $df=2$, $p=0.014$), could be partly attributed to an intensive management on wildlife markets since
34 the outbreak of SARS in 2003. More than half (68.3%, 502 individuals) of the primate individuals
35 were unhealthy, injured or dead when rescued. Thus, identification and welfare training and
36 capacity-building should be provided to husbandry and veterinary professionals, as well as
37 education to the public through awareness initiatives. The increase in presence of some species,
38 especially slow lorises, with a declining population in restricted areas, also suggests the urgent

39 need for public awareness about the illegal nature of keeping these taxa as pets.

40

41 **Introduction**

42 Hundreds of wild animal species are traded both legally and illegally to satisfy the
43 market for exotic pets (Bush, Baker & Macdonald, 2014). Many of these species are native
44 to tropical areas where catching them in the wild is economically more viable than captive
45 breeding (Rosen & Smith, 2010). Although international trade is becoming widely
46 documented (Da Silva et al., 2016; Reuter & Schaefer, 2016; Nijman et al., 2017), many
47 exotic species are captured for the national pet trade, remaining in their countries of origin.
48 The incidence of this trade is much more poorly documented as official recording
49 mechanisms, such as CITES (Convention on International Trade in Endangered Species of
50 Wild Fauna and Flora) Trade Database (UNEP World Conservation. Monitoring Centre,
51 Cambridge, UK), are lacking, and often enforcement is limited. Illegal trade undermines the
52 efforts of developing nations to manage their natural resources (Rosen & Smith, 2010).
53 Unsustainable harvest of wild animals for the pet trade has already led to population decline
54 and collapse of many species (Da Silva et al., 2016; Svensson et al., 2016). In addition,
55 individuals in the illegal market are often handled and transported under appalling conditions,
56 creating an animal welfare concern (Reuter & Schaefer, 2016; Fuller et al., 2017).

57 Wildlife trade is a growing concern for primates, a group of long-lived and slow-
58 reproducing species. They are traded for consumption; biomedical research; for zoos, wildlife
59 collections and the entertainment industry (Kavanagh, 1983; Nijman, 2005); as pets; for the

60 sale of body parts (bodies, skins, hair, and skulls) used in traditional medicine; as talismans
61 and trophies; and for magical purposes (Alves, Souto & Barboza, 2010; Nijman et al., 2011).
62 The CITES Trade Database from 2005–2014 reported a global primate trade of some 450,000
63 live individuals plus an additional 11,000 individuals in the form of body parts. More than
64 430,000 individuals (93%) in this trade are Asian species (Estrada et al., 2017), and thus
65 Southeast Asia is considered as a primate trade hotspot (Nijman, 2010; Rosen & Smith 2010).

66 China is the second-most primate diverse country in Asia and nine species are considered
67 endemic (Roos et al., 2014). In recent years, people's demand for wild animal products has
68 grown substantially with the development of a consumer economy, and thus, China has
69 become one of the world's largest consumers of wildlife products (Zhang, Hua & Sun, 2008).
70 Primate trade of 537,480 live individuals was reported in China from 1975 to 2017 based on
71 the CITES Trade Database. Eleven native primate species, including four macaques (*Macaca*
72 spp.), two colobus (*Trachypithecus* spp.), two slow lorises (*Nycticebus* spp.) and three
73 gibbons (*Hylobates* spp., *Hoolock* spp. and *Nomascus* spp.), were reported as having been
74 illegally trafficked in China (Li et al., 2010; Hu et al., 2011; Gao, Ma & Wang, 2012; Yin,
75 Yu & Peng, 2016).

76 China became CITES contracting party in 1981, requiring all internationally traded
77 CITES-listed species to be accompanied by valid permits or certificates. The Law of Wild
78 Animals Protection of the People's Republic of China, 1 March 1989 (LWAP) forbids the
79 hunting, killing, trade, import or export of wild animals classified as rare or endangered unless
80 under special circumstances (Li & Wang, 1999). Primates, except for newly described

81 species, are included in the Red List of China's Vertebrates Designated for Legal Protection
82 (Table 1).

83 Mass media is one of the principal arenas within which issues come to the attention of
84 decision makers, interest groups and the public (Barua, 2010). Media attention promotes
85 conservation of primates, along with the Internet gaining importance in global wildlife trade
86 and changing perceptions towards threatened species (Nekaris & Campbell, 2012; Roberge,
87 2014). Public knowledge concerning wildlife conservation can be quantified by analyzing
88 comments and associated data posted online. Here, we aimed to measure the number of
89 species of traded primates in news reports found by or surrendered to authorities in China,
90 and examine trends over time and differences among regions. Furthermore, we examined
91 public statements in the reports to evaluate how well the public could identify species in
92 comparison with official identification in these same reports; if members of the public knew
93 whether or not species were threatened; and also evaluated health and welfare status of the
94 rescued or confiscated animals. These data are critical to recognize the magnitude and
95 diversity of illegally traded primates in China, and generate suggestions for management
96 strategies and law enforcements.

97 **Methods**

98 To reveal temporal variations in trade of native primate species in China, we used purposive
99 sampling (Newing et al., 2011) to collect rescue or confiscation related news online. We
100 considered rescuing or confiscating to be descriptions of primates surrendered to or confiscated by
101 the authorities, hereafter referred to as rescue events. We conducted the searches in February 2018

102 and limited the period from January 1st 2000 to December 31st 2017, in three popular Chinese Web
103 2.0 search engines: Baidu, 360 and Bing. Baidu, especially, is by far the largest search engine in
104 China, fulfilling a similar function to Google. Based on the Chinese name of each species, we
105 entered manually the simplified Chinese key terms into each search engine (Table 1). We used ‘新
106 闻’(news) category to select news articles and filtered the articles related to rescue events using
107 keywords ‘救护’ (rescue) or ‘查获’ (seize) or ‘没收’ (confiscate). Given the effects of search
108 engine algorithms and previous search history on the results, we expected the potential bias could
109 be reduced by cross validation of the three search engines. We combined all the news reports and
110 excluded repetitive news based on date, site and media source.

111 Each report included various identification of the species included in the rescue event. These
112 identifications were made by the public (public recognition), or an official who carried out the
113 rescuing event, which was considered the official identification (Fig. 1). We categorized the public
114 recognition as unrecognized; primate (but not to species); or species level identification (Table 2).
115 Based on information provided in the news reports, especially photographs, we assessed the
116 taxonomic status to compare with the official identification. Frequency in different categories of
117 public recognition and accuracy of official identification were used as proxies for public
118 knowledge. We followed the primate taxonomy as listed in *The Handbook of the Mammals of the*
119 *World*, Volume 3 (Primates), and original accounts for two taxa not included in that resource
120 (*Macaca leucogenys* - Li, Zhao & Fan, 2015; *Hoolock tianxing* - Fan et al., 2017).

121 We collected information in each news report on date of rescue or confiscation, number of
122 individuals, location of rescue (e.g. field, market, residential area or transporting vehicles),

123 physical condition of rescued individuals (e.g. healthy, unhealthy, injured or dead), and
124 whereabouts of the individuals after being rescued (e.g. zoo, wildlife rescue centre, released into
125 wild, or unreported) (Table 2; Fig. 1). China's primates are naturally distributed in 21 of 34
126 provincial-level administrative units (PLAUs), with four provinces in west and southwest China
127 (Yunnan = 15 species, Guangxi = 8 species, Tibet= 8 species, Guizhou= 6 species), containing the
128 highest diversity (Fig. 2(A)). We also recorded provinces where news was/had been reported to
129 determine distribution of rescuing (Fig. 1).

130 For an overview of international trade, we examined data from the CITES Trade Database,
131 which provided all records of import, export and re-export of CITES-listed species. The data were
132 downloaded in May 2018 and 'year range' were limited from 2000 to 2016 with 2016 being the
133 last year for which data were available. We searched live (LIV) animals in Order Primates traded
134 with all sources and purposes, and focused on 27 indigenous primate species in China (Table 1).
135 The data implicating China as importer and exporter were combined to obtain number of
136 individuals traded per year for each species.

137 We divided the time span from 2000 to 2017 into three sections: 2000-2005, 2006-2011 and
138 2012-2017, and used Kruskal-Wallis non-parametric test to examine variations over periods in
139 rescuing frequency. To measure temporal trends of public knowledge about primate conservation,
140 Kruskal-Wallis test was also used to compare the proportion of each description category in three
141 time sections towards those species which were reported in more than six years. We calculated the
142 Shannon-Wiener Index ($H = -\sum_i^S p_i \ln p_i$) and Pielou Index ($E = H/\ln S$) for each year to
143 evaluate diversity and evenness of primates reported, where S = total number of species recorded

144 in a given year, p_i = the proportion of individuals belonging to i th species. Spearman's Rank
145 Correlation Coefficient was used to analyze annual variations of diversity and evenness. All the
146 tests were two-tailed and a threshold for significance was $p < 0.05$.

147 **Results**

148 **Temporal variations of primate rescuing frequency in China**

149 We filtered 372 valid news reports based on the topics of rescuing and confiscation, including
150 735 individuals of 14 primate species (Table 1; Fig. 3). The Bengal slow loris (*Nycticebus*
151 *bengalensis*) was the most reported species with 329 (44.8%) individuals, followed by the rhesus
152 macaque (*Macaca mulatta*, 165 individuals, 22.5%) and the pygmy slow loris (*N. pygmaeus*, 158,
153 21.5%), while 13 of 27 primate species distributed in China were never reported (Fig. 3). We
154 recorded rescue events of Bengal and pygmy slow lorises every year during the 2000-2017 period.
155 Rhesus macaque rescue events were reported in 10 years (2005, 2007, 2010-2017) and the Tibetan
156 macaque (*M. thibetana*) in recent seven years (2011-2017). The rescue news related to other
157 species, however, was individually reported in no more than six years. The diversity index
158 increased significantly over time (Spearman's rank Correlation Coefficient, $\rho=0.862$, $p<0.001$,
159 $N=18$), as well as evenness ($\rho=0.488$, $p=0.040$, $N=18$). Primate rescue frequency tended to
160 increase during the last six years from 2012 to 2017 (Fig. 4(A)) while number of news reports
161 specifically on slow lorises fluctuated between years (Fig. 4(B)).

162 Comparatively, an average of 4219 ± 1618 live individuals of native primate species per year,
163 including ten species in total, were recorded in CITES Trade Database from 2000 to 2016 (Fig.
164 4(C)). The rhesus macaque contributed most of these internationally traded individuals (70,949,

165 98.6%, 206 records), followed by the stump-tailed macaque (*M. arctoides*, 726, 1.0%, 3 records).
166 Nine individuals (4 records) of slow lorises and none of Tibetan macaques and were reported in
167 CITES Trade Database over the studied period.

168 **Location and provincial distribution of rescuing news reports**

169 Among 372 rescue events recorded, 211 (56.7%) reports were located in residential areas,
170 followed by 70 (18.8%) in wild areas, 54 (14.5%) during transporting and 37 (9.9%) in the market.
171 The proportion of market rescues was significantly higher in 2006-2011 than the other time
172 sections but fewer individuals were rescued from markets in 2000-2005 based on the reports
173 ($\chi^2=8.485$, $df=2$, $p=0.014$), especially for Bengal slow lorises ($\chi^2=11.832$, $df=2$, $p=0.003$) and
174 rhesus macaques ($\chi^2=9.544$, $df=2$, $p=0.008$).

175 Primate rescuing news covered more than 190 counties in 29 PLAUs throughout China (Fig.
176 2(B)), with a considerable proportion of rescuing events (130, 36.9%) taking place in Yunnan
177 province, followed by Guangdong (33, 9.4%) and Guangxi (26, 7.4%). The rescuing news related
178 to slow lorises occurred in 26 PLAUs (Fig. 2(C)), while rhesus macaques rescues was reported in
179 21 PLAUs, and other species were not individually reported in more than seven PLAUs. It is
180 noteworthy that data from Taiwan (4), Hong Kong (1) and Macau (0) were limited due to
181 unpopular use of simplified Chinese.

182

183 **Physical conditions and whereabouts of individuals rescued**

184 We found that more than half (68.3%, 502 individuals) of the primate individuals were
185 unhealthy, injured or dead when rescued. Of 105 individuals whose injuries were specified, most

186 (40, 38.1%) were suffering from leg wounds. The proportion of healthy individuals rescued was
187 significantly lower in 2006-2011 than the other two time periods ($\chi^2=6.140$, $df=2$, $p=0.046$).

188 The percentage of healthy individuals varied significantly over time in Bengal slow lorises
189 ($\chi^2=6.579$, $df=2$, $p=0.037$) and Tibetan macaques ($\chi^2=9.563$, $df=2$, $p=0.008$), as well as the
190 percentage of injured individuals in pygmy slow lorises ($\chi^2=8.503$, $df=2$, $p=0.014$), rhesus
191 macaques ($\chi^2=8.812$, $df=2$, $p=0.012$) and Tibetan macaques ($\chi^2=9.563$, $df=2$, $p=0.008$). The
192 whereabouts of the individuals after being rescued were often unreported (116, 31.2%), followed
193 by 'wildlife rescue centre' (91, 24.5%), field (86, 23.1%), and zoo (79, 21.2%).

194 **Species recognition**

195 The individuals in nearly half of rescuing events (158, 42.5%) were recognized as primates
196 by the public, and the individuals in 112 events (30.1%) were recognized as a specific species
197 (Table 3). The public could not recognize the animals or referred to primates in 102 events
198 (27.4%). The public recognitions of the Bengal slow loris was consistent with the pygmy slow
199 loris over the three time periods. The proportion of rescuing events in which the individuals could
200 be recognized to a species level by the public varied over time for the rhesus macaque ($\chi^2=6.733$,
201 $df=2$, $p=0.035$) and the recognition percentage of individuals identified as 'primates' varied
202 significantly for the Tibetan macaque ($\chi^2=9.389$, $df=2$, $p=0.009$).

203 The official recognition was reported to species level in all of the news reports, but species in
204 14.5% (32/220) of news including photos were incorrectly identified (Table 3). The pygmy slow
205 loris, which was usually recognised as the Bengal slow loris, contributed most (26/32, 81.3%) to
206 these wrong identifications. All the other incorrect identifications (6) were related to species of

207 Genus *Macaca* (Table 3), especially for rhesus macaques (3) and Tibetan macaques (2).

208

209 **Discussion**

210 **Public knowledge towards illegal primate trade in China**

211 For certain native primate species in China, few individuals were traded internationally based
212 on the CITES Trade Database, whilst rescuing or confiscating news reports revealed that they were
213 frequently traded in domestic areas. In addition, the lower frequency of rescuing or confiscating
214 and a focus on web news mean that the number of individuals traded might be underreported.
215 Thus, it could be argued that a large amount of illegal trade at national level, especially for Bengal
216 and pygmy slow lorises, appeared to be underrepresented by official data. Rhesus macaques
217 composed a large proportion of rescuing reports, which was consistent with the fact that it is the
218 most abundant primate species in China, and widely traded or housed for biomedical purpose
219 (Bontrop, 2001; Fan & Song, 2003). Given the extensive captive breeding throughout China (Fan
220 & Song, 2003), a large number of animals of rhesus and Tibetan macaques rescued may be
221 originally from captive populations. Without any breeding centre in China, not to mention
222 internationally, probably all slow lorises were wild-captured and trafficked illicitly.

223 More than half of the primates in the rescuing news were located in residential areas,
224 indicating that they had probably escaped from households where they were kept as pets.
225 Furthermore, in 65% of reports only a single individual was rescued or confiscated, underlining
226 that the animals were the end-point of trade chain, and had presumably been trafficked several
227 times before being housed (Duarte-Quiroga & Estrada, 2003). The Chinese government has

228 markedly strengthened management of wildlife markets since outbreak of SARS in 2003, which
229 was considered to originate from small wild animals (Zhong, 2004), likely explaining the
230 significant increase of primates rescued from markets during 2006-2011. Illegal trade related to
231 wildlife markets has declined during recent years, and large specialized traditional open markets
232 tend to be replaced by underground trade networks, in particular, the booming online trade on
233 social media (Xiao, Guan & Xu, 2017). Eight online transactions of slow lorises, were detected
234 and penalized based on web news from 2011 to 2017, but only two reports before 2010s.

235 **Spatial variation in rescuing frequency associated with wildlife trade**

236 Frequency of rescuing news on primate species varied remarkably between PLAUs, which
237 indicates a significantly heterogeneous illegal trade distribution across China. A bulk of rescuing
238 events took place in southwestern PLAUs, including Yunnan, Guangxi, Guizhou, Tibet and
239 Sichuan. This is consistent with the highest primate diversity in this area, where more than 92%
240 of the total species in China are distributed and 78% are endemic. In addition, these areas are
241 situated near Southeast Asia, which is a hotspot for global biodiversity (Myers et al., 2000; Sodhi
242 et al., 2010) and wildlife trade (Nijman, 2010). Yunnan and Guangxi, in particular, share long
243 borders with Vietnam, Myanmar and Laos, and are considered as one of the major entrances for
244 wildlife trafficking from neighboring nations (Li & Li, 1998; Shepherd & Nijman, 2007; Zhang,
245 Hua & Sun, 2008).

246 Guangdong province is one of the main destinations for smuggling and the largest wildlife
247 markets (Zhang, Hua & Sun, 2008; Chow, Cheung & Yip, 2014), making it another possible
248 hotspot of primate trade. Along with Guangdong, Beijing, Shandong and Zhejiang are among the

249 most developed PLAUs in China and contributed a lot to the illegal wildlife trade (Li & Lu, 2014;
250 Yu et al., 2017). Zhang and Yin (2014) found that consumers with higher income background were
251 having higher wildlife consumption rate, suggesting that financial strength increases people's
252 propensity to consume wild animals. To support this point, few primate rescues were reported in
253 northwestern PLAUs, the less developed regions in China. The lower primate trade rate observed
254 in northwest and northeast may also result from a long distance from source areas. With the
255 expansion of online trade in recent years, the trafficking sites have become increasingly extensive
256 and scattered, and the distance between sources and the point of retail tend to be greater (Zhang,
257 Hua & Sun, 2008).

258 **Challenges of welfare and captive management in primate rescuing**

259 Primate individuals were mostly sent to zoos, rescue centres or released into the wild after
260 being rescued. For a considerable number of animals (116, 31.2%), we were unable to extrapolate
261 their final destinations from the news reports. Given the scattered sites, it was not surprising that
262 all the individuals were rescued by local forestry staff, who might encounter difficulties during
263 rescuing, such as species identification. Lack of discrimination in the trade, especially in
264 morphology, combined with unresolved taxonomic issues, impedes assessing each taxon's
265 potential vulnerability to trade (Vonk & Wüester, 2006; Nekaris & Jaffe, 2007; Nekaris & Nijman,
266 2007). Genetic, vocalisation and behavioural analyses are essential for rescue and release
267 programmes, yet may be beyond the capabilities for some facilities (Mootnick, 2006). As a
268 consequence, the pygmy slow loris was usually confused with the Bengal slow loris, and the two
269 species were thus housed and released indiscriminately. Limited understanding of slow lorises

270 taxonomy throughout their distribution ranges confounded attempts to reintroduce these animals,
271 or hold and breed them in captive facilities (Nekaris & Starr, 2015).

272 Primates have specific physiological, physical, social and nutritional requirements, and it is
273 unlikely that the welfare of pet animals can be adequately addressed in normal households
274 (Soulsbury et al., 2009). Captive primates, including those in zoos and rescue centres, have been
275 commonly observed to suffer from incorrect diet, wounds or disease, unnatural environment, and
276 fear or distress (Duarte-Quiroga & Estrada, 2003; Hevesi, 2005; Nekaris et al., 2010). Specialist
277 needs of primate species also mean that they might experience elevated mortality and perish
278 quickly in captivity (Fitch-Snyder, Schulze & Larsson, 2000). More than one third of individuals
279 of slow lorises, died within the first six months in rescue centres in southern Yunnan (Ni, person.
280 com.). Hence, for many rescue institutions, immediate re-release is often considered as preferable
281 (Nekaris & Jaffe, 2007). The problem of rehabilitating captive animals without regard to genetic
282 and ecological assessments, geographic distribution, and monitoring has become another difficult
283 issue that remains to be resolved (Duarte-Quiroga & Estrada, 2003; Nekaris & Starr, 2015). The
284 individuals in all the 41 news reports related to release were reintroduced into wild directly during
285 18-year periods, by the local authorities without preparation and training involved, indicating that
286 hard release has been rampant in primate rescuing throughout China. This might lead to high
287 mortality of animals released (Moore & Nekaris, 2014) or endanger wild populations and other
288 animals with disease transmission (Wallis & Lee, 1999), thus, becoming a useless conservation
289 plan.

290 **Implications for primate conservation in China**

291 Accurate measures of wildlife trade are essential to devising sound conservation decisions,
292 yet collection and quality control of such data are challenging (Thomas et al., 2006). The database
293 generated by CITES offers an unparalleled opportunity to analyse international trade in species of
294 conservation concern (Foster, Wiswedel & Vincent, 2016). However, the present official statistics
295 have limited capabilities in representing species illegally harvested and traded (Phelps & Webb,
296 2015), especially for those trafficked at national or regional level. Therefore, taking these data at
297 face value can sometimes distort the perceived risk of wildlife exploitation and lead to
298 misallocation of resources and ineffective conservation efforts (Thomas et al., 2006; Robinson &
299 Sinovas, 2018). As a case study, the discrepancy between few CITES trade records and massive
300 rescuing news reports of slow lorises in China emphasize a need of more reliable and
301 comprehensive understanding of some species, and calls for a harmonized mechanism in
302 estimating national and regional wildlife trade.

303 The success of wildlife conservation largely depends on public perspective, as well as
304 assessment of causes that influence their outlook (Wilson & Tisdell, 2007; Lindemann-Matthies
305 & Bose, 2008). Media reports indicate that public knowledge towards primates in China varied
306 between species. Macaques, along with leaf monkeys and snub-nosed monkeys, represented the
307 typical image of ‘monkeys’ (i.e. primates), in a broad sense, and were well known for the general
308 public in China. The famous Monkey King, Sun Wukong, for instance, was considered to be
309 originated from these species (Qin, 2010). Similarly, though mysterious in deep forests, gibbons
310 historically occurred in many poems and paintings and were rich in symbolic meanings
311 (Geissmann, 2008; Zhang, 2015), whereas slow lorises played a minimal role in Chinese culture.

312 Few relevant publications, combined with limited distribution areas in the southwest, has resulted
313 in them being the least known primates within the country. Chinese people usually judge animals
314 by ethical standards and emphasize the creature's usefulness to humans, but ignore the physical
315 characteristics of the animals (Zhang, 2015), leading to a series of misunderstanding on slow
316 lorises. One of slow lorises' perceived uses to treat epilepsy—called 'mad sheep disease' by local
317 communities—in traditional Chinese medicine, as a result, was mostly attributed to confusing
318 Chinese common names with similar pronunciation (feng) among '疯' (mad)-, '风' (wind)- and
319 '蜂' (bee)-猴 (monkey).

320 Given the clandestine illegal trade of primates based on web news reports, it can be concluded
321 that monitoring systems of wildlife trade within China are insufficient, and there is an urgent need
322 for initiatives to make regulatory mechanisms more effective (Zhang, Hua & Sun, 2008; Nijman,
323 2010). A common problem in the enforcement of legislation to protect animals from illegal trade
324 is the inability to identify species due to inadequate funding, education and staffing.
325 Recommendations to address these areas should include identification-training initiatives and
326 capacity-building work (Li & Wang, 1999). In addition, it is highly recommended that an approach
327 concerning awareness initiatives and education programs should be developed towards the public
328 to make them more conscious about the illegal wildlife trade, with the final intention of
329 discouraging the consumers to buy wildlife products.

330 By 2008, 40 primate-breeding centres in China contained over 40,000 individuals, mostly
331 rhesus macaques, and the number has been steadily increasing in recent years (Jiang et al., 2015;
332 Cyranoski, 2016). It is necessary to strengthen captive management and improve animal welfare,

333 which was still inconsistent and rudimentary, since the concept has been introduced into mainland
334 China only in the last few decades (Lu, Bayne & Wang, 2013). The authorities should accelerate
335 the legislative process and provide animal welfare education to the public, as well as training to
336 husbandry and veterinary professionals.

337 The demand for pet primates, together with habitat loss and fragmentation, exerts a significant
338 pressure on wild populations. In particular, slow lorises are perceived as suitable pets by both
339 buyers and sellers due to their ‘cute and cuddly’ appeal, and have been one of the most popular
340 primate taxa in wildlife markets (Nekaris, 2014). The widespread illegal trade in China seems to
341 be incompatible to their restricted distributions, high threat category, and poor public knowledge.
342 Taking into account their small and declining wild population, it is urgent to take actions for
343 conservation of this neglected and threatened primate taxon.

344 **Conclusion**

345 We have presented a novel data on primate trade within China based on web news reports
346 regarding rescuing or confiscating. The results indicate that some native primate species,
347 particularly Bengal and pygmy slow lorises, are threatened by domestic illegal trade, which
348 appears to be ‘unrecognized’ in official channels, and lack of public knowledge impedes efforts to
349 conserve these species effectively. In spite of potential bias in search results caused by search
350 engine algorithms and manual filtering, and lack of the firsthand data from authorities, zoos or
351 wildlife rescue centres, we expect this study could facilitate the initial steps to raise public
352 awareness on primate trade in China, especially for slow lorises.

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Table 1 (on next page)

Number of rescuing events and rescued individuals of native primates in China during three periods based on web news search

1

Species	Chinese name	Key items for searching	Conservation status ^b			No. of rescuing events (individuals)		
			IUCN	CITES	NPWA	2000-2005	2006-2011	2012-2017
<i>Nycticebus bengalensis</i>	蜂猴	‘懒猴’ or ‘蜂猴’	VU	I	I	19(30)	68(139)	91(160)
<i>N. pygmaeus</i>	倭蜂猴	‘懒猴’ or ‘蜂猴’	VU	I	I	11(46)	29(51)	40(61)
<i>M. mulatta</i>	猕猴	‘猕猴’	LC	II	II	1(1)	6(20)	50(144)
<i>M. cyclops</i>	台湾猕猴	‘猕猴’	LC	II	I	0	0	5(7)
<i>M. leucogenys</i>	白颊猕猴	‘猕猴’	VU	-	-	0	0	0
<i>Macaca leonina</i>	北豚尾猴	‘豚尾猴’ or ‘平顶猴’	VU	II	I	0	0	2(6)
<i>M. munzala</i>	达旺猴	‘达旺猴’	EN	II	-	0	0	0
<i>M. assamensis</i>	熊猴	‘熊猴’	NT	II	I	0	1(1)	7(7)
<i>M. thibetana</i>	藏酋猴	‘藏酋猴’ or ‘藏猕猴’	NT	II	II	0	1(1)	13(15)
<i>M. arctoides</i>	短尾猴	‘短尾猴’ or ‘红面猴’	VU	II	I	0	2(2)	10(11)
<i>Rhinopithecus roxellana</i>	川金丝猴	‘金丝猴’ or ‘仰鼻猴’	EN	II	I	1(1)	2(2)	4(6)
<i>R. bieti</i>	滇金丝猴	‘金丝猴’ or ‘仰鼻猴’	EN	II	I	1(1)	0	1(1)
<i>R. brelichi</i>	黔金丝猴	‘金丝猴’ or ‘仰鼻猴’	EN	II	I	0	0	0
<i>R. strykeri</i>	缅甸金丝猴	‘金丝猴’ or ‘仰鼻猴’	CR	-	-	0	0	0
<i>Semnopithecus schistaceus</i>	长尾叶猴	‘长尾叶猴’	LC	I	I	0	0	1(2)
<i>Trachypithecus shortridgei</i>	萧氏叶猴	‘叶猴’	EN	I	I	0	0	0
<i>T. pileatus</i>	带帽叶猴	‘叶猴’	VU	I	I	0	0	0
<i>T. phayrei</i> ^a	菲氏叶猴	‘叶猴’	EN	II	I	0	0	0
<i>T. crepusculus</i> ^a	印支灰叶猴	‘叶猴’	EN	II	I	0	0	0
<i>T. poliocephalus</i>	白头叶猴	‘叶猴’	CR	II	I	0	0	0
<i>T. francoisi</i>	黑叶猴	‘叶猴’	EN	II	I	1(1)	2(2)	1(14)
<i>Hoolock tianxing</i>	高黎贡白眉长臂猿	‘长臂猿’	CR	-	-	0	0	1(1)
<i>Hylobates lar</i>	白掌长臂猿	‘长臂猿’	EW	I	I	0	0	1(2)
<i>Nomascus leucogenys</i>	北白颊长臂猿	‘长臂猿’	EW	I	I	0	0	0

<i>N. nasutus</i>	东黑冠长臂猿	‘长臂猿’	CR	I	I	0	0	0
<i>N. concolor</i>	西黑冠长臂猿	‘长臂猿’	CR	I	I	0	0	0
<i>N. hainanus</i>	海南长臂猿	‘长臂猿’	CR	I	I	0	0	0

- 2 a The two species shared the same data since they were separated recently. b Conservation status, IUCN red list category: CR, Critically Endangered, EN, Engangered, VU, Vulnerable, NT, Near Threatened, LC, Least Concern, EW, Extinct in the Wild; CITES Appendix I and II; NPWAs, National Protected Wild Animals Category I and II.

Table 2 (on next page)

Categories into which we placed contents, example descriptions in the news reports for each type

1

Type	Category	Descriptions in the reports
Physical conditions	Healthy	“Lively”, “ healthy”, “ normal physical”, “ have a good mental condition”, “ No injuries and normal eating”
	Unhealthy	“Hair loss”, “dermatopathya” , “unmoved, shivering, or full of fear” , “weak” , “ undernourished”
	Injured	Visible wounds on the body
	Dead	Died during rescuing; corpse
Public recognition	Species	Mention its Chinese name
	Primate	“Like a monkey”
	Unrecognized	“Animal”“can’t recognize”
Whereabouts	Zoo	Be sent to a zoo or park
	Wildlife Rescue Center	Be sent to a wildlife rescue center
	Wild	Release to a nature reserve, forest area or suitable habitat area
	Unreported	No related statements
Location	Field	On the tree or ground near the forest
	Residential area	In the building or on the road of residential area
	Transporting	In the process of transportation, such as vehicles
	Market	Bird and flower market, agricultural markets, or pet shops

2

3

Table 3 (on next page)

Frequency in different categories of public recognition (n=372) and accuracy of official recognition based on taxonomic assessments of photographs provided by the news reports (n=220)

1

Species	Public recognition			Official recognition	
	Species	Primates	Unrecognized	Correct	Incorrect
<i>Nycticebus bengalensis</i>	68	42	68	85	0
<i>Nycticebus pygmaeus</i>	30	20	30	26	26
<i>Macaca leonina</i>		2		1	1
<i>Macaca mulatta</i>	9	46	2	41	3
<i>Macaca assamensis</i>	1	7		6	0
<i>Macaca cyclopis</i>		5		4	0
<i>Macaca thibetana</i>		12	2	6	2
<i>Macaca arctoides</i>		12		9	0
<i>Rhinopithecus roxellana</i>	1	6		4	0
<i>Rhinopithecus bieti</i>	1	1		1	0
<i>Semnopithecus schistaceus</i>		1		0	0
<i>Trachypithecus francoisi</i>		4		3	0
<i>Hylobates lar</i>	1			1	0
<i>Hoolock tianxing</i>	1			1	0

Figure 1

A typical example of data collection from a Chinese online news report of a rescue event (http://yn.xinhuanet.com/2016hot/20160623/3225860_m.html)

D: Description in the news report; T: Type of the news description; C: Category of the description type. We identified the rescued animal in this news report as the pygmy slow loris based on the photograph, and thus the official recognition (the Bengal slow loris) was considered to be incorrect. The copyright of this news report belongs to Yunnanxinxiabao

惊！湿地公园捡到的小家伙竟是一只蜂猴

2016-06-23 10:15:54 来源 云南信息报

D: 23rd June, 2016
T: Date of the news report
D: YNXXB
T: Media source

摘要
寻甸湿地公园发现一只可爱的小动物，市民觉得萌想带回家养，却发现小家伙野性难驯。

D: Xundian
T: Distribution of rescue events
C: Yunnan Province

D: like a monkey
T: Public recognition
C: Primates

D: wetland park
T: Location
C: Residential area

D: looks frightened
T: Physical condition
C: Subhealthy

D: Yunnan wildlife rescue centre
T: Whereabout
C: Rescue centre

D: the Bengal slow loris
T: Official recognition



寻甸湿地公园发现一只可爱的小动物，市民觉得萌想带回家养，却发现小家伙野性难驯，对着市民又抓又咬，市民无奈只得求助森林公安局民警，原来可爱的小家伙是国家一级保护动物蜂猴。

6月17日，在寻甸县官井路，市民王先生路过湿地公园时，发现树下有一只疑似猴子的动物，长得十分可爱。王先生捡到这只小动物后准备带回家饲养，但是小家伙好像受到了惊吓，对人又抓又咬，可把王先生吓得不轻，只得请寻甸县森林公安局民警进行救助。

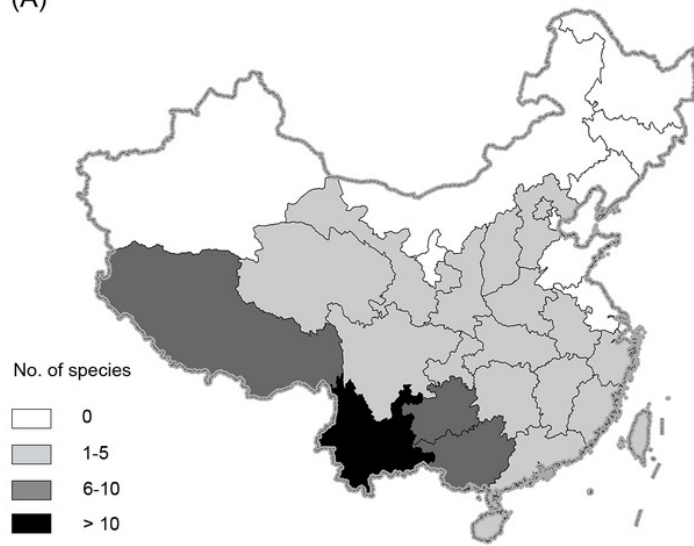
民警接到报警后立即前往该地点查看，经初步确认疑似猴子的动物为国家一级保护动物蜂猴。民警已于昨日将小家伙送往云南省野生动物拯救中心。

记者 魏文青

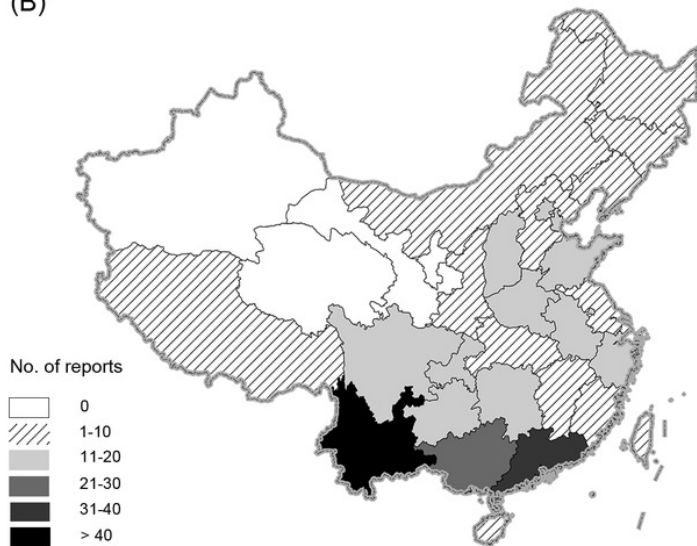
Figure 2

Distribution of native primate species (A), and rescuing reports of primates (B) and slow lorises (C) across provinces in China

(A)



(B)



(C)

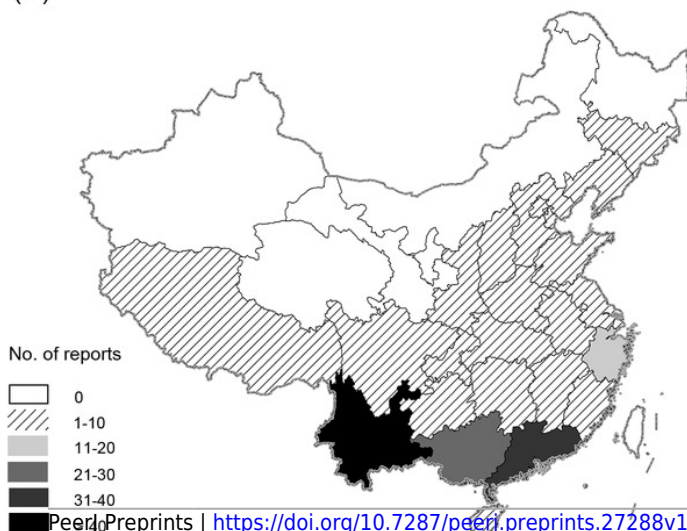


Figure 3(on next page)

Percentage of the total number of individuals per each indigenous primate species reported in CITES Trade Database during 2000-2016 and Chinese web news during 2000-2017 in China

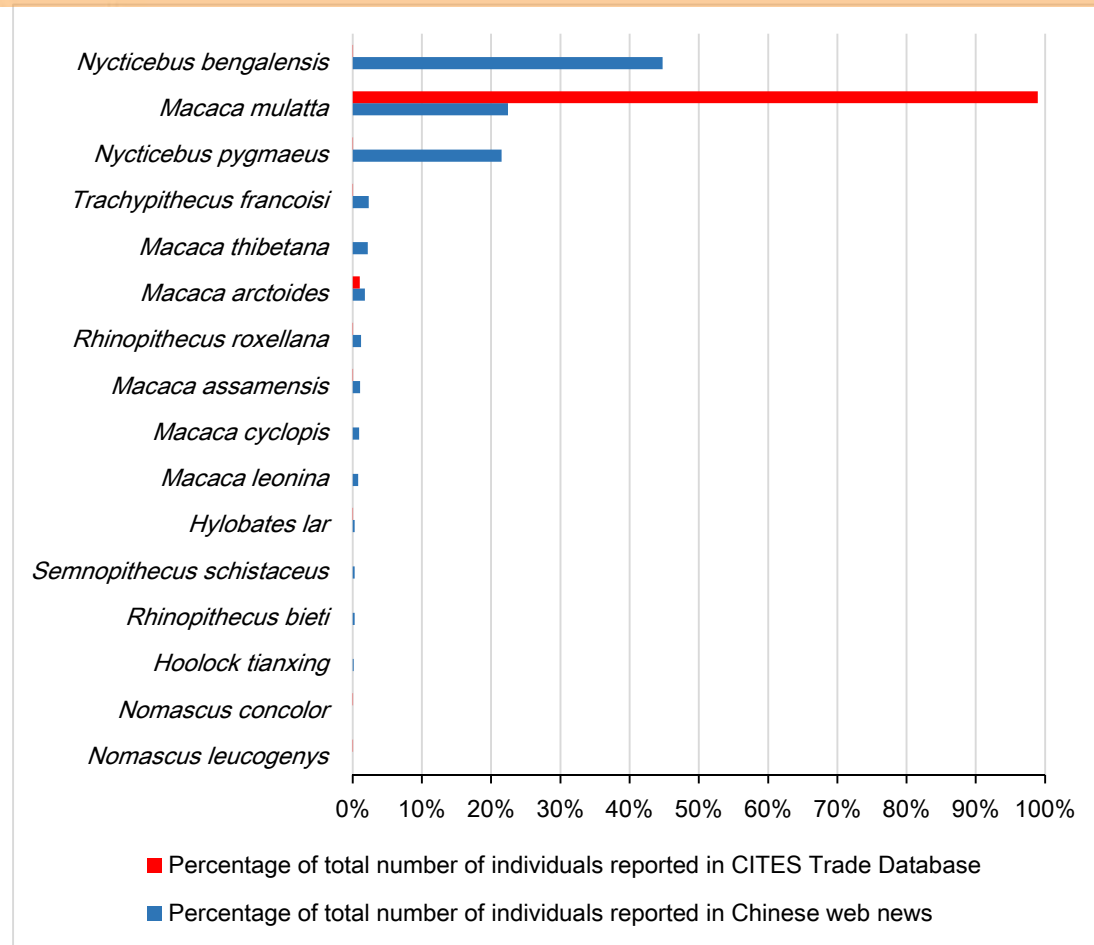


Figure 4(on next page)

Annual trends in traded or rescued primate individuals reported by CITES and web news

(A) Annual number of events and individuals reported in Chinese web news. (B) Annual number of individuals of slow lorises reported in Chinese web news. (C) Annual number of individuals of indigenous primates reported in CITES trade database

