



LETTER

Exotic animal cafes are increasingly home to threatened biodiversity

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Abstract

Exploitation of species for wildlife trade, including the demand for exotic pets (likely sourced from the wild or recent generations of captivity) is a major threat to biodiversity. Although not traditionally considered “pet keeping” countries, pet ownership is growing in Asia. Exotic animals are also appearing in cafes, which are growing in popularity and have the potential to impact wild populations by stimulating exotic pet trade. We identified 406 animal cafes across Asia, of which 27% housed exotic species, including mammals (e.g., otter, slow loris, meerkat), birds (e.g., owls, hawks, parrots), and reptiles (e.g., geckos, pythons, turtles). Of the 252 exotic species recorded, 46% were threatened either as classified by the IUCN Red List, having a decreasing population trend, and/or threatened by the pet trade. These results, alongside the alignment of cafe traits with recognized factors influencing exotic pet trade, demonstrate as yet unclear (but potentially dramatic) implications for conservation.

KEYWORDS

exotic animal cafe, exotic pet trade, pet cafe, threatened species, wildlife trade

1 | INTRODUCTION

The natural world is experiencing declines in biodiversity unprecedented in human history (Díaz et al., 2019). Exploitation of species for wildlife trade, including the demand for exotic pets, is one of the major drivers of biodiversity loss (Baker et al., 2013; Moorhouse, Balaskas, D’Cruze, & Macdonald, 2017; Scheffers, Oliveira, Lamb, & Edwards, 2019; Tingley, Harris, Hua, Wilcove, & Yong, 2017). Overexploitation for the pet trade is occurring across a range of taxa and has impacted wild populations of many species (Bush, Baker, & Macdonald, 2014; Harris et al., 2017). The interest in exotic pets has increased markedly

in recent decades (Grant, Montrose, & Wills, 2017) both in terms of number of animals sold and geographic extent (Lockwood et al., 2019).

The factors influencing the demand for exotic pets are varied and complex (Figure 1) and include public perceptions and attitudes, species popularity, and accessibility and exposure to species. The public’s perceptions of wild species are influenced by representations in the media, zoos, aquariums, and museums (Liska, 1999). The context in which humans view an animal can have a significant effect on how they perceive that species. Images of chimpanzees in the presence of humans influenced not only the perception that these animals were “pet appropriate,” but

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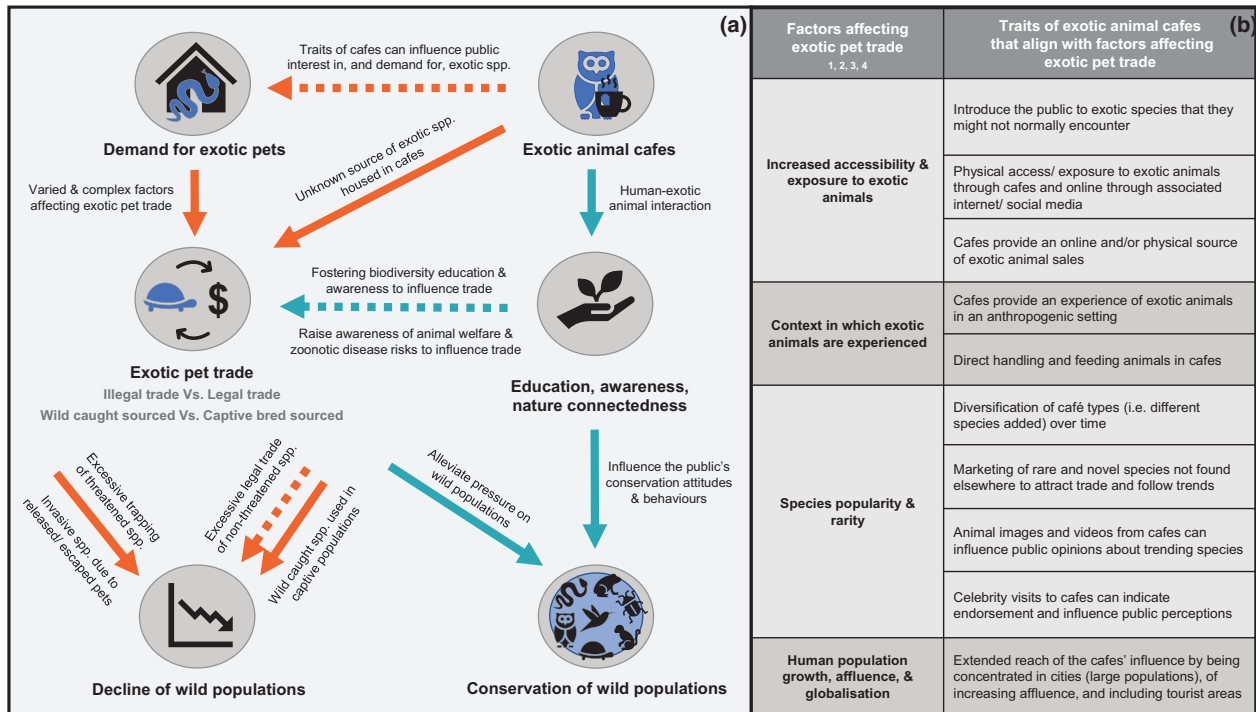


FIGURE 1 The influence of exotic animal cafes on biodiversity. Box a—Conceptual framework illustrating the potential pathways that exotic animal cafes can influence wild populations. Solid lines represent direct impacts and broken lines indirect impacts. Blue lines represent positive impacts and orange lines negative impacts. Box b—How traits of exotic animal cafes align with the factors that affect the exotic pet trade. The traits identified account for the cafes' impacts on the demand for exotic pets; influence on the exotic pet trade; contribution to education, awareness, and nature connectedness; and subsequent impacts on wild populations, illustrated in Box A. ¹Courchamp et al. (2006), ²Nekaris et al. (2013), ³Bush et al. (2016), ⁴Harrington et al. (2019)

also influenced people's perception of their status in the wild (i.e., a stable/healthy wild population) (Ross, Vreeman, & Lonsdorf, 2011). Viewing animals in close proximity to humans conveys an inaccurate perception, that like domestic pets, the animals are easy to handle and rear (Ross et al., 2011).

The popularity of a species can also drive consumer demand and can be influenced by the species' rarity (the "anthropogenic Allee effect"; Courchamp et al., 2006) as well as fashionable trends including celebrity attention (Harrington, Macdonald, & D'Cruze, 2019). The public's interest in particular pet species can also be influenced by digital media (Jones, Thomas-Walters, Rust, & Verissimo, 2019), as evidenced by increased registrations, imports, or popularity of Dalmatians, green iguana, and red-eared sliders seen in *101 Dalmatians* (Herzog, Bentley, & Hahn, 2004), *Jurassic Park* (Nijman & Nekaris, 2017), and *Teenage Mutant Ninja Turtles* (Ramsay, Ng, O'Riordan, & Chou, 2007). However, this digital media "effect" is debatable as no increase of the import/export or purchase of owls, *Amphiprion ocellaris/percula*, or *Paracanthurus hepatus* was detected following the release of the movies, *Harry Potter* (Megias, Anderson, Smith, & Verissimo, 2017), *Finding Nemo* (Miltz & Foale, 2017), or *Finding Dory* (Verissimo,

Anderson & Tlusty, 2019), despite widespread media coverage to the contrary.

More recently the internet and social media have been implicated in increasing accessibility to (Morgan & Chng, 2017), and amplifying popularity of exotic pet ownership (Kitade & Naruse, 2018; Siritwat & Nijman, 2018). Domestic pets are familiar to us, but the internet can connect the public with otherwise unfamiliar species (e.g., slow loris; Nekaris, Campbell, Coggins, Rode, & Nijman, 2013). In addition to providing a platform for advertising, sourcing and trading animals (Hinsley, Lee, Harrison, & Roberts, 2016; Sung & Fong, 2018), these platforms increase access to information which can stimulate pet ownership through the spread of viral pet images and videos (Nekaris et al., 2013) and connect like-minded consumers. Harrington et al. (2019) found an increase in the number of pet otter videos on social media between 2016 and 2018 and suggested that the increase in activity had the potential to not only influence the popularity of pet otter ownership, but also increase the awareness and perception of this species as a potential pet.

Exotic pets (i.e., pet species "without a long history of captivity and are likely to have been sourced directly or within a few generations from wild populations" (Bush

et al., 2014)) are often associated with animals kept in a domestic setting for personal interest, entertainment, or companionship. However, exotic animals are also recently appearing in animal or pet cafes where they provide an opportunity for human–animal interaction in a cafe setting. Originally the concept was based on domesticated animals such as ‘cat cafes’. The popularity of these cafes is spreading globally, particularly across Asia. Many of the cafes can be described as a small, indoor petting zoo, with human–animal interaction via either indirect contact (e.g., dangling toys at the animal in an enclosure), or direct contact through physical handling and/or feeding of animals. There is a range of pathways by which these cafes can affect wild populations (Figure 1), but little data or understanding as to their potential effects on biodiversity (i.e., direct impacts on wild populations and/or people’s perceptions and subsequent exotic pet ownership). Therefore, we investigated the number and distribution of animal cafes in Asia, and the diversity and conservation status of the species they housed.

2 | METHODS

As Asia is the birthplace of animal cafes, a major hub for international wildlife trade, and pet keeping is increasingly popular, we focused the study across ten Asian regions, including Cambodia, Hong Kong Special Administrative Region, Indonesia, Japan, People’s Republic of China, Philippines, South Korea, Taiwan, Thailand, and Vietnam. These provide representation across East and South-east Asia, developed and developing countries, and both consume and supply wildlife. Between August and October 2019, we used the internet search engine Google to search for animal cafes (e.g., websites, online media), using keywords (e.g., “animal cafe,” “pet cafe”; see Table S1 for further details) in both English and the primary native language of the respective region. Search results were sequentially reviewed until no new cafes were identified. If the site’s information referred to another cafe, this reference was also reviewed and relevant data collected.

To establish a baseline of cafe types, numbers, and species housed, and to understand trends in cafe development and diversification, we compiled species information and cafe (business) opening date, where possible, except for China where opening dates could not be found. Cafes were categorized based on the species present: (1) at the time of cafe opening (often indicated by the cafe name and/or description), and (2) based on the species present at the time of the online review (Table 1). Some cafes were found to be permanently closed, but their details were still available. In such instances, the cafe type and opening

TABLE 1 Criteria for categorizing animal cafe types

Cafe type	Taxa displayed
Domestic	Domestic pet species only
Bird	Predominantly bird species
Reptile	Predominantly reptile species, but some also included invertebrates
Bird/Reptile	A mix of bird and reptile species, where there is not a significant dominance of one taxon
Mammal	Predominantly mammal species
Multi	A mix of any of domestic, bird, reptile, mammal species, but always included exotic species

Note: We defined animal cafes as cafe-businesses where the public could interact with animals. Therefore, we did not include restaurants which solely kept animals in displays (e.g., behind glass) for entertainment while dining (e.g., Penguin bars) or indoor animal zoos. In addition, some cafes had expanded to include franchise stores. Where such cafes had been opened in different locations, these were included as separate cafes in our analysis.

date were recorded, but they were not included in further analysis.

Many cafes did not provide information regarding the number of individuals of each species displayed. Therefore, we collected occurrence data representing the number of times a species was recorded across all the cafes. Species displayed were identified based on the scientific or common name provided (Sung & Fong, 2018). We conducted a preliminary cross-check of a subset of posts to check the accuracy of the names provided. Specialists for different taxonomic groups were consulted to confirm any ambiguities (e.g., due to language translation). Where scientific/common names were not provided, photos were used for identification assisted by specialists. Assumptions regarding species identifications are provided in Table S2. The cafe name, business and web address were used to avoid potential overestimation by duplicating records but are not disclosed here due to ethical considerations (Hinsley et al., 2016).

The species identified were categorized as domestic (e.g., cat, see also Table S2) or exotic (e.g., slow loris, see also Table S3). We reviewed all animal cafes identified, including those displaying domestic and/or exotic species, because some cafes that had originally opened as “domestic” cafes (e.g., “cat cafes”) have diversified by adding exotic species over time. However, as our interest is the effect of cafes on wild populations, only cafes displaying exotic species were included in the species analysis. We compiled information about the species conservation status (critically endangered, CR; endangered, EN; vulnerable, VU), population trend (increasing, stable, decreasing, unknown, unspecified), and threat from the pet trade (as

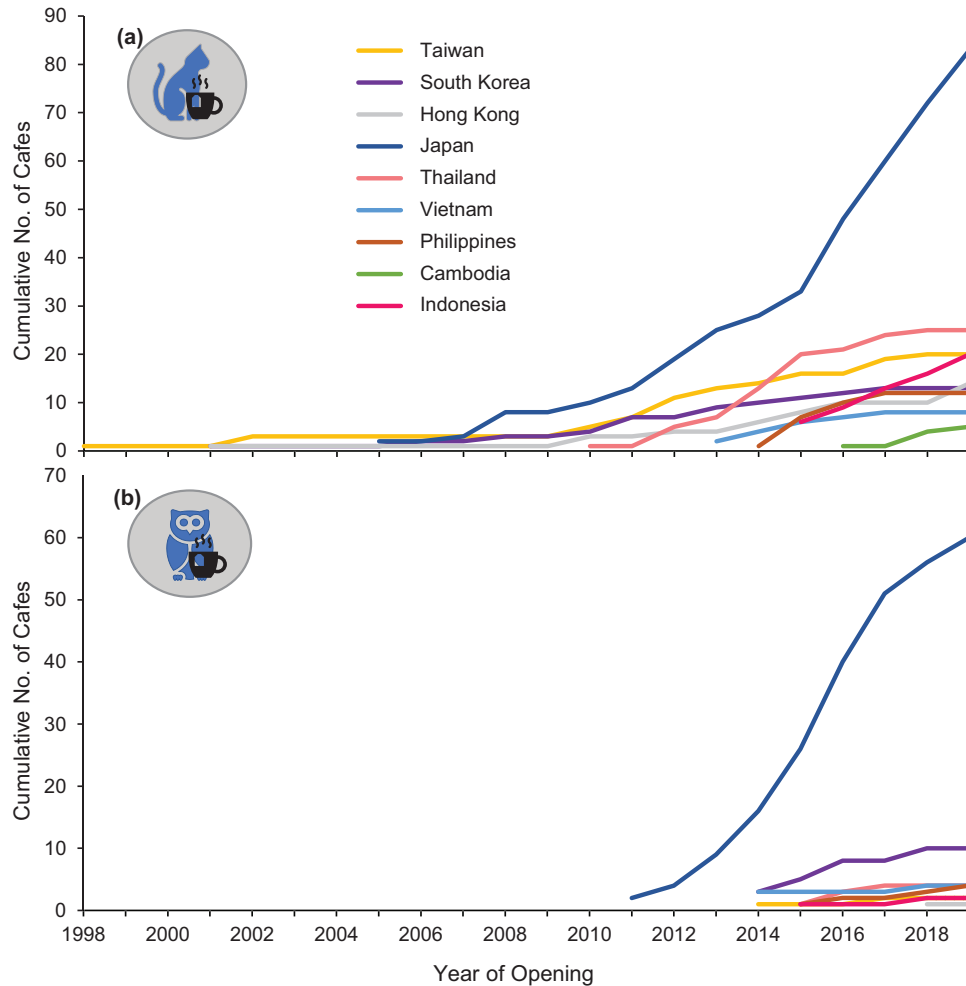


FIGURE 2 Opening years of domestic (a) and exotic (b) animal cafes across different regions ($n = 286$). Data for exotic animal cafes in Cambodia is obscured; two exotic animal cafes in 2018 only.

Note: 45 cafes were permanently closed (including, 1 each in Cambodia, Taiwan, and Hong Kong, 2 each in the People's Republic of China and Indonesia, 3 in South Korea, 4 in the Philippines, 5 in Vietnam, and 13 each in Japan and Thailand). Of these, the opening dates were available for 21 cafes and used in the analysis

specified in the IUCN Red List category “Threats”) from the International Union for Conservation of Nature Red List of Threatened Species (IUCN Red List) (IUCN, 2019); and international regulation from the CITES appendix listing (UNEP-WCMC (Comps.), 2019). We used a chi-square test to examine differences in the abundance of cafes across regions and abundance of cafe types. Data were analyzed using R version 4.0.0.

3 | RESULTS

A total of 451 animal cafes were identified across ten regions. Of those, 45 were permanently closed—and therefore only used to observe cafe opening dates. Of the 406 open cafes, 72.66% (295 cafes) were domestic animal cafes

and 27.34% (111 cafes) were exotic animal cafes. All regions had both domestic and exotic cafes. Cafe opening dates were available for 76.68% (286 cafes) of all cafes identified, excluding cafes in China. The establishment of domestic animal cafes preceded exotic in most regions (Figure 2) and are a relatively recent phenomenon with the first exotic animal cafe opened in Japan in 2011, and those of other regions only opening since 2014 (Figure 2).

Japan dominated the animal cafe industry having the highest number of cafes across the regions ($\chi^2 = 521.54$, $df = 9$, $p < 0.001$) (Figure 3), and has seen a substantial increase not only in cafe numbers but also diversity of cafe types over time (Figure S1, Supporting Information). Although bird cafes were the most abundant exotic animal cafe type (46 cafes) ($\chi^2 = 935.34$, $df = 5$, $p < 0.001$), they were concentrated in Japan and absent from many

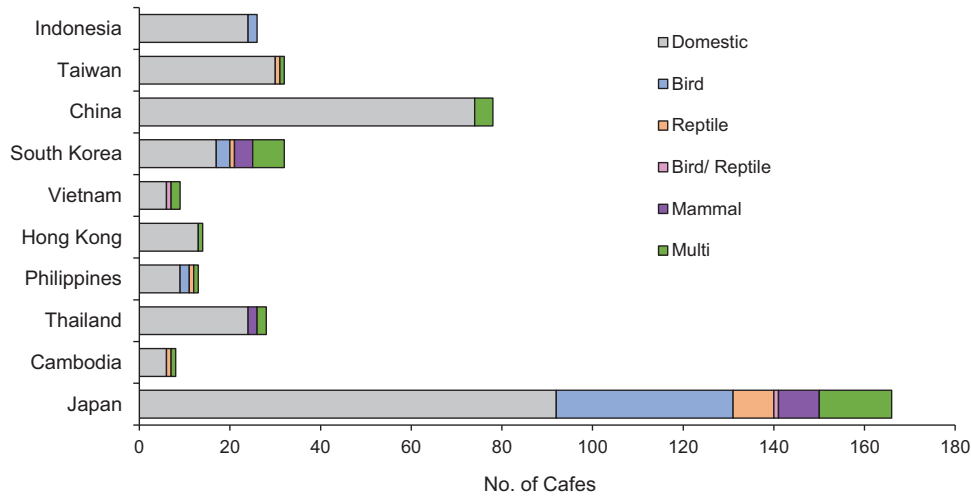


FIGURE 3 Cafe types across the study area

TABLE 2 Exotic species listed in the IUCN Red List and CITES Appendices

		CITES				ID to genus	Total
		App I	App II	App III	Not listed		
IUCN Red List Status	CR	1	1	0	1	0	3
	EN	2	5	0	1	0	8
	VU	3	13	0	4	0	20
	NT	0	5	0	5	0	10
	LC	3	107	4	74	0	188
	DD	0	0	0	0	0	0
	Not listed	0	12	0	6	0	18
ID to genus		0	2	0	0	5	7
Total		9	145	4	91	5	254

Note: Two species were listed under both Appendix I and II of CITES to regulate trade of individuals from different geographic areas. App I – commercial trade of wild-caught individuals is prohibited. App II – trade requires a permit from exporting countries. App III – trade requires a permit of origin.

other regions. Birds were the most common taxa (111 bird species) (Figure 4). In contrast, multi cafes (having a mix of species, but always including exotic species), which were the second most abundant cafe type, had a large spread and dominated the market in three regions (Figure 3). The presence of different species varied across regions, and was most notable in the predominance of owl species in Japan compared to other regions, and the variation in mammal species across regions (Table S3). Sugar glider (*Petaurus breviceps*) (13 cafes), Asian small-clawed otter (*Aonyx cinereus*) (10 cafes) and Meerkat (*Suricata suricatta*) (10 cafes) were the most popular mammal species in Japan, while Raccoon (*Procyon lotor*) was most popular in South Korea (10 cafes).

Across the cafes we recorded a total of 252 exotic species, of which 117 (46.43%) are threatened or declining; 31 are classified as threatened on the IUCN Red List (three CR, eight EN, and 20 VU species, Table 2), and a further 86

are not yet formally threatened, but have declining populations (44), or are threatened by pet trade (24), or both (18) (Figure 4, S3, Supporting Information). Of the exotic species, the trade of 158 (62.70%, $n = 252$) is regulated by CITES, with nine species listed in Appendix I, 145 species in Appendix II, and four in Appendix III (Table 2).

4 | DISCUSSION

Since the opening of the first cat cafe in Taiwan in 1998, the popularity of animal cafes has grown across Asia. We identified 406 animal cafes in operation across ten regions. While 295 (72.66%) cafes displayed domestic species only (e.g., cats, dogs, etc.), the overall quantity demonstrates the appeal of cafe environments which facilitate interaction with animals. Although not traditionally considered “pet keeping” countries, pet ownership is growing in Asia.

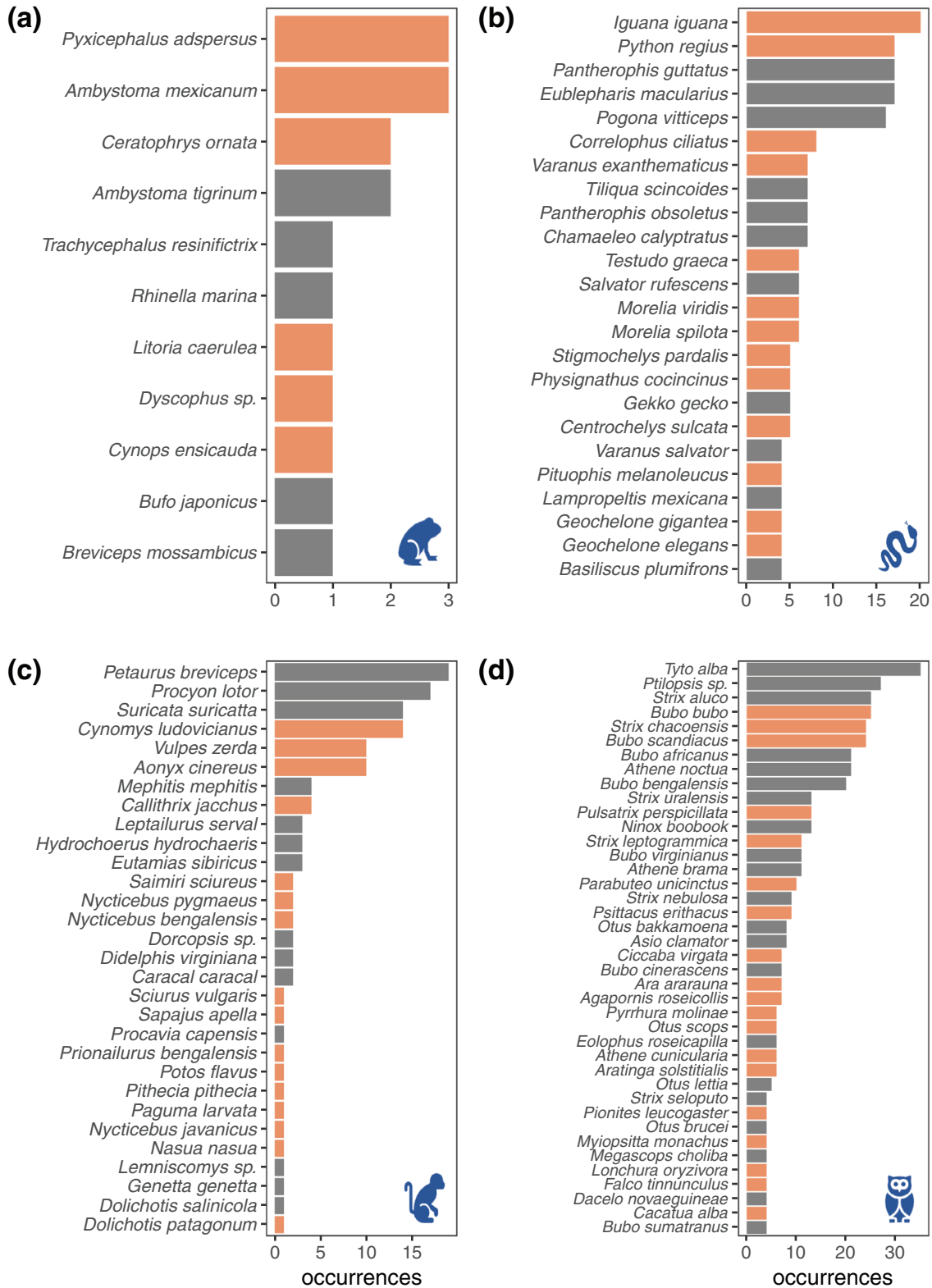


FIGURE 4 Threatened species in exotic animal cafes. a–amphibians, b–reptiles, c–mammals, d–birds. Orange bars represent species threatened on the IUCN Red List (CR, EN, VU) and species not yet formally threatened but with decreasing population trend and/or threatened by the pet trade. Occurrences represent the number of times a species was recorded across all of the cafes—for birds (111 species), reptiles (100 species), mammals (30 species), amphibians (11 species). The large number of individuals of birds and reptiles with occurrences <3 are omitted for clarity. See **S3, Supporting Information** for details

Japan is considered the world's largest exotic pet-owning country (Wakao, Janssen, & Chng, 2018), as well as one of the world's largest consumers of live reptile species (Auliya et al., 2016) and demand for unusual, exotic species is increasing (Sung & Fong, 2018; Wakao et al., 2018). This interest in unusual species was reflected in the increasing diversity of cafe types observed, with new taxa added over time (Figure S1, Supporting Information). Overall, these results demonstrate that exotic animal cafes are rapidly emerging as a destination for threatened wildlife.

Many exotic species traded as pets are threatened (Bush et al., 2014). Baker et al. (2013) found that wildlife trade was driven by demand for pets and entertainment in 22% of the reports they analyzed. Moreover about 17% of mammal species assessed by IUCN listed the main threat as "intentional use of the species," which includes pet trade (Bush et al., 2014). Of the 252 exotic species recorded in the cafes, the trade of 158 (62.70%) is regulated under CITES and 12.30% are listed as imperiled (CR, EN, VU) on the IUCN Red List (Table 2). While the remaining species are listed as Near Threatened or Least Concern, 86 have declining populations and/or are threatened by pet trade, and an additional 25 are either not listed or identified to genus only. Potential impacts on such nonthreatened species should not be underestimated, as it often takes severe decline to flag a species for conservation attention (Scheffers et al., 2019). Furthermore, our study was limited to cafes that have an online presence (and are detectable by Google search) such that the figures presented here are likely an underestimate of the scale of the cafes' influence.

While some individuals of the species observed in cafes were clearly captive-bred as evidenced by various color morphs and hybrid forms shown on the websites, there is uncertainty regarding the source (legally or illegally sourced, wild caught or captive bred) of others. While the negative impacts of wild caught, threatened species on wild population viability are generally accepted (Harris et al., 2017), the pros and cons of the supply of legal and/or captive bred animals for the pet trade are debatable (Figure 1). While captive breeding facilities have been promoted as a conservation tool to alleviate pressure on wild populations (Burivalova et al., 2017; Challender, Harrop, & MacMillan, 2015), captive breeding is not always possible or sustainable (Bush et al., 2014; Lyons & Natusch, 2011; Shi, Parham, Lau, & Chen, 2007). It is also suspected that some "breeding facilities" provide a mechanism to launder wild sourced animals (Bush et al., 2014; Janssen & Chng, 2018; Lyons & Natusch, 2011; Nijman & Shepherd, 2015), making it difficult to separate the market between captive-bred versus wild-caught animals (Bush et al., 2014).

Of potentially greater significance is the cafes' capability to influence the public's perceptions and subsequent interest in exotic pet ownership. The alignment of the cafes'

traits (e.g., the setting, context, and operation of the cafes in which the human-wildlife interactions occur), with the factors affecting the demand for exotic pets (outlined in Figure 1, Box B) underpins and potentially strengthens this influence. While we have some understanding of the mechanisms affecting the exotic pet trade (discussed in the Introduction), specific research into the cafes' connection and influence on exotic pet ownership is required, particularly as the demand for exotic pets is recognized as a substantial driver of the wildlife trade (Baker et al., 2013). The accessibility of the cafes and their visitors provides an opportunity to collect direct data (e.g., through interview/questionnaire approaches) and hence further our understanding of attitudes and drivers of exotic pet ownership.

It could also be argued that the cafe experience could foster biodiversity education and conservation awareness, similar to the influence associated with human-wildlife experiences in zoos and aquaria (D'Cruze et al., 2019; Fernandez, Tamborski, Pickens, & Timberlake, 2009) (Figure 1). However, results are inconclusive regarding the negative, neutral, or positive impact of human-wildlife interaction in such facilities and therefore further research is required (D'Cruze et al., 2019). Additional potential consequences of the cafes include associated issues of animal welfare (Baker et al., 2013; D'Cruze et al., 2019), the establishment of non-native species due to pet releases or escapes (Lockwood et al., 2019; Measey et al., 2019), or the risk of zoonotic disease resulting from increased contact between humans and wild animals (Karesh, Cook, Gilbert, & Newcomb, 2007) (Figure 1). Infectious disease risk will likely be a particularly important force in the future of exotic animal cafes given the COVID-19 pandemic and the susceptibility of domesticated pets to SARS-CoV-2 infection (Shi et al., 2020). The connection of these issues to animal cafes and the potential for bidirectional influence requires further research. Where deemed necessary, interventions could include legislative regulation and enforcement to manage impacts to threatened species. Animal registration could facilitate transparency of the animals' origins and manage illegal or unsustainable trade. Public education and awareness could be used to disincentivize exotic pet ownership and/or influence cafe visitation. Critically, given the variation in the cafes identified across regions, interventions must reflect local socio-economic, legislative, and cultural contexts.

5 | CONCLUSION

The increasing popularity of animal cafes and species they house has the potential to affect wild populations. While these impacts could be either positive or negative, the

housing of exotic and threatened species and alignment of cafe traits with the factors influencing the exotic pet trade is cause for concern. As the demand for wildlife increases, so too does the pressure on wild populations (Janssen & Chng, 2018; Lyons & Natusch, 2011). This study highlights the pathways in which the cafes can influence the demand for exotic pets and subsequent exotic pet trade, including the source of the animals housed in the cafes, and/or perhaps more importantly through their potential to influence public attitudes and perceptions. As the factors affecting the exotic pet trade are varied and complex, further research into the cafes' effect on wild populations is required. Of particular importance is understanding how cafes may influence the public's desire and demand for exotic pets, as well as the drivers of cafe visitation and popularity including the choice of species housed. Research could include but not be limited to cultural, economic, and/or legislative factors, the phenotypic traits, provenance, and/or conservation status of the species housed, so as to understand the degree of the cafes' influence, particularly on threatened species and then based on such findings develop interventions as required.

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AUTHOR CONTRIBUTIONS

S.E.M., T.C.B. and C.D. conceived the study. S.E.M. and J.A.A. collected data. S.E.M. led the writing of the manuscript, and all authors contributed to its preparation, and approved the final version for submission.

DATA AVAILABILITY STATEMENT

Due to ethical considerations the data specific to individual cafes is only accessible to the authors; however, the full species data is provided in Table S3, Supporting Information.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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