Original Article

Characterizing the online trade of live mammal species in the Philippines

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ABSTRACT

Mammals are a diverse group of vertebrates that occur in various habitats and play important ecological roles. This study provides the first quantitative assessment of the online live mammal trade in the country, based on surveys of 20 Philippine-based Facebook wildlife trade groups in 2022 and 2024. A total of 16 species were recorded, dominated by non-native species such as the Four-toed Hedgehog *Atelerix albiventris* and the Sugar Glider *Petaurus breviceps*. In addition, two novel species in the Philippine pet trade, namely the African Pygmy Dormouse *Graphiurus murinus*, and the Indomalayan Bamboo Rat *Rhizomys sumatrensis*, were documented. Native species comprised 7.35% of all individuals, but included taxa of conservation concern such as the Philippine Long-tailed Macaque *Macaca fascicularis philippensis*, the Leopard Cat *Prionailurus bengalensis*, and the Bearcat *Arctictis binturong*. Despite legal protection under Republic Act No. 9147, macaques and other wild-caught native species continue to be available in trade, indicating ongoing poaching and trafficking. The presence of the tiger *Panthera tigris*, a Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix I-listed species, highlights the demand for high-value wildlife for use as a status symbol. Ambiguities in Philippine laws regarding the classification of domesticated versus wildlife species complicate regulation and enforcement efforts. This study documents a dynamic live mammal trade that poses ecological, conservation, and regulatory challenges. Strengthened law enforcement, clearer legal definitions, and stronger inter-agency coordination are urgently needed to achieve more effective biodiversity conservation in the Philippines.

Keywords: e-commerce, invasive alien species, social media, wildlife trade, zoonotic disease

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INTRODUCTION

Mammals are a diverse group of vertebrates occurring in a wide range of habitats. They are represented by 6,758 species (Mammal Diversity Database 2026) and play vital ecological roles as dispersers, pollinators, predators, prey, and ecosystem engineers that influence habitat structure and biodiversity (Seidensticker and Suyono 1980; Corlett and Lucas 1990; Lacher et al. 2019). Internationally, mammals are exploited for food, fur, biomedical research, tusks, traditional medicine, and cultural, religious, and entertainment purposes, while also being used in farming, tourism, and the pet trade (Ojeda and Mares 1982; Iriarte and Jaksic 1986; Milner-Gulland 1991; Romagosa 2015; Badihi et al. 2024). Mammals represent one of the most species-rich vertebrate groups in the international pet trade and are consistently in high demand (Mahmood et al. 2011; Bush et al. 2014). Live mammals are traded not only as household pets, but also as display animals in zoological facilities and as performing animals in circuses for public entertainment. The trade is driven by factors such as their charismatic appearance, perceived intelligence, and cultural or social value (Mahmood et al. 2011; Romagosa 2015). The trade in mammals contributes substantially to global wildlife markets, with implications for animal welfare, public health, and wildlife conservation (Badihi et al. 2024).

The trade in exotic mammals poses significant risks to native biodiversity and ecosystems. Both deliberate and accidental introductions may result in resource competition with native species, habitat modification, and the transmission of pathogens (Lee et al. 2005; Borroto-Páez 2009; Mazzamuto et al. 2021). Generalist species dominate the pet trade because of their high adaptability, thereby increasing the likelihood of biological invasions (Gippet and Bertelsmeier 2021; Harrington et al. 2021). In Cuba, for example, 29 invasive mammal species, including rodents, dogs, cats, and ungulates, threaten endemic fauna (Borroto-Páez 2009). Comparable risks are evident in the Philippines, where the introduced Finlayson's Squirrel *Callosciurus finlaysonii* (Horsfield, 1823) has established breeding populations in several areas of Luzon Island (Heaney et al. 2016). Documented and potential negative impacts include bark stripping, crop damage, predation on native bird nestlings, competition with native species for resources, and the transmission of pathogens (Mayuga 2021; Mazzamuto et al. 2021; Bertolino and Lurz 2022).

Wild mammals kept as pets also present public health concerns due to their role as reservoirs of zoonotic pathogens. An estimated 58% of known zoonoses are associated with primates, ungulates, carnivores, and bats, including Ebola Reston virus, Herpes B virus, SARS-CoV-2, and rabies (Shivaprakash et al. 2021). Moreover, bats, rodents, and marsupials are recognized as important potential reservoirs of future disease emergence (Cleaveland et al. 2001; Engel et al. 2002; Miranda et al. 2002; Hampson et al. 2009; Shivaprakash et al. 2021).

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The Philippines harbors a highly rich assemblage of mammalian fauna, comprising 214 terrestrial (Heaney et al. 2010; Eger et al. 2025; Fidelino et al. 2025; Heaney et al. 2025) and 27 marine species (Alava et al. 2012), of which 154 (63.9%) are endemic to the archipelago. This high level of species richness and endemism is largely attributed to the archipelago's long and complex geological history and diverse habitats, ranging from lowland forests to montane microhabitats and extensive coastal and marine ecosystems (Heaney et al. 2016).

Under Republic Act No. 9147, or the Wildlife Resources Conservation and Protection Act of 2001, all terrestrial wildlife, whether native or non-native, are legally protected (Republic Act No. 9147 2001). The Department of Environment and Natural Resources (DENR) is designated as the primary agency responsible for enforcing the law. Prohibited activities include the killing, collection, import, export, possession, transport, and trade of wildlife without the necessary permits. Republic Act No. 3639, enacted on 07 December 1929 and implemented on 01 January 1930, established the Bureau of Animal Industry (BAI) under the Department of Agriculture (Republic Act No. 3639 1929). Among its key functions, the BAI is mandated to regulate, quarantine, and inspect the transportation of domestic animals.

The Philippines has long been documented as having a dynamic wildlife trade industry. Research on wildlife trade in the country has largely focused on vertebrates, including fish (Muyot et al. 2019; Sy and Melgar 2022), amphibians (Sy 2014), reptiles (Sy 2015a, 2015b, 2018; Sy and Lorenzo 2020, 2023a, 2023b), and birds (Canlas et al. 2017; Sy et al. 2022; Raymundo et al. 2023; Sy and Shepherd 2025). Studies on the trade of live mammals have been more limited in scope, with an emphasis on species such as the Philippine pangolin *Manis culionensis* de Elera, 1915 (Gomez and Sy 2018; Sy and Krishnasamy 2020; MacBeath et al. 2022) and on cases involving smuggled Indonesian mammals (Shepherd and Sy 2017; Shepherd et al. 2019; Gomez et al. 2022). This study was undertaken to provide baseline information on the trade of live mammals in the Philippines. Establishing baseline data is essential for understanding mammal trade dynamics, identifying threatened species involved, and assessing biosecurity implications and implications for biodiversity conservation. The findings of the study could support future research directions, guide policy development and improvement, and inform wildlife law enforcement strategies in the country.

METHODS

Online Surveys

We conducted two online market surveys across 10 active Philippine-based Facebook wildlife trade groups specializing in the sale of non-traditional (i.e. exotic) and mammalian pets. These groups, both private and public, were selected because they were the most active. Domesticated and traditional companion or farm animals

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(e.g. dogs, cats, rabbits, guinea pigs, and pigs), as well as mammals typically used as feeder animals (i.e. mice and rats), were excluded from the survey.

The first survey was conducted over a three-month period from July to September 2022, during which all online posts offering live mammals were manually reviewed and documented daily. For each post, information on species, quantity, price, and seller location was recorded. Species identification and verification were conducted using available guides such as the Field Museum's Synopsis of Philippine Mammals. Counts were based on the photographs included in the post. For posts without photographs, unless specified by the seller, it was assumed that one individual was being offered for sale. The second survey, conducted from February to April 2024, excluded three commonly captive-bred hamster species (Cricetidae) to focus on species of greater conservation concern.

Deactivated groups were replaced with new groups of similar interest to maintain a total of 10 active groups throughout the survey period. All posts were treated as advertisements. However, some reflected completed sales. Traders operating multiple Facebook accounts were consolidated under a single identity based on similarities in advertisement wording and photographs of animals offered for sale. No traders were contacted during the survey. To avoid overestimation, duplicate postings across different groups were recorded only once in the dataset. Reliance on photos and information provided by the seller may have resulted in an underestimation, where individuals were not fully visible or specified.

Exchange Rate

The exchange rate between the Philippine Peso (PHP) and the United States Dollar (USD) fluctuated between 2022 and 2024, but the exchange rate of PHP 57.6578 = USD 1 (as of 30 April 2024) throughout this report for consistency (www.oanda.com/currency-converter).

RESULTS

Online Trade

In the first survey in 2022, a total of 402 posts from 230 online traders were documented, collectively offering 1,948 individual mammals belonging to 12 species (Table 1 and 2). Based on quantity, the majority of these were three commonly captive-bred hamster species (Table 2), which collectively comprised 1,266 individuals, or 65% of the total quantity. The three hamster species were excluded from the subsequent survey and analysis. Upon exclusion, the remaining total was 682 individuals.

Table 1. List of mammals in the online Philippine pet trade. Species in bold text are native species. *All populations are included in Appendix II, except the populations of Bangladesh, India, and Thailand, which are

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included in Appendix I. ** Wild populations are included in Appendix I; specimens of the domesticated form are not subject to the provisions of the Convention.

Species & Taxonomic Authority	English Name	IUCN Red List	CITES Appendix	2022	2024	TOTAL
Atelerix albiventris (Wagner 1841)	Four-toed Hedgehog	LC	NL	356	161	517
Petaurus breviceps (Waterhouse 1839)	Sugar Glider	LC	NL	261	235	496
Meriones unguiculatus (A. Milne-Edwards 1867)	Mongolian Gerbil	LC	NL	47	7	54
Paradoxurus philippinensis Jourdan 1837	Philippine Palm Civet	LC	NL	10	53	63
Panthera tigris (Linnaeus 1758)	Tiger	EN	I	3	1	4
Arctictis binturong (Raffles 1821)	Bearcat	VU	III	2	2	4
Macaca fascicularis philippensis I. Geoffroy Saint-Hilaire 1843	Philippine Long-tailed Macaque	EN	II	1	8	9
Prionailurus bengalensis (Kerr 1792) *	Leopard Cat	LC	II	1	7	8
Viverra tangalunga J.E. Gray 1832	Malayan Civet	LC	NL	1	1	2
Callosciurus finlaysonii (Horsfield 1823)	Finlayson's Squirrel	LC	NL	-	3	3
Chinchilla chinchilla (H. Lichtenstein 1830) **	Short-tailed Chinchilla	EN	I / NL	-	3	3
Graphiurus murinus (Desmarest 1822)	African Pygmy Dormouse	LC	NL	-	1	1
Rhizomys sumatrensis (Raffles 1821)	Indomalayan Bamboo Rat	LC	NL	-	6	6
TOTAL				**682**	**487**	**1,170**

Table 2. Three hamster species documented in the Philippine pet trade in 2022.

Species	English Name	IUCN Red List	CITES Appendix	2022
Mesocricetus auratus Waterhouse 1839	Golden Hamster	EN	NL	795
Phodopus campbelli (Thomas 1905)	Campbell's Dwarf Hamster	LC	NL	428
Phodopus roborovskii (Satunin 1903)	Roborovski's Dwarf Hamster	LC	NL	43
TOTAL				**1,266**

In the second survey in 2024, a total of 231 posts from 170 online traders were documented, collectively offering 487 individual mammals representing 13 species (Table 1). When data from both surveys were combined, the two most traded species, Four-toed Hedgehog *Atelerix albiventris* (Wagner, 1841) and Sugar Glider *Petaurus breviceps* Waterhouse, 1839, accounted for 86.6% (1,013 individuals) of the total quantity (excluding hamsters).

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Notably, a total of four tigers, *Panthera tigris* (Linnaeus, 1758) individuals, were recorded across both survey periods. The emerging availability of the African Pygmy Dormouse *Graphiurus murinus* (Desmarest, 1822), also known as the Micro Squirrel in the pet trade, and the Indomalayan Bamboo Rat *Rhizomys sumatrensis* (Raffles, 1821) was noteworthy. To our knowledge, these two species were newly observed in the Philippine pet trade, indicating growing interest in trading and keeping novel species. In addition to the commonly traded non-native species, five native mammals were also recorded during the surveys: the Philippine Long-tailed Macaque *Macaca fascicularis philippensis* (I. Geoffroy Saint-Hilaire 1843), Leopard Cat *Prionailurus bengalensis* (Kerr, 1792), Malayan Civet *Viverra tangalunga* Gray, 1832, Bearcat *Arctictis binturong* (Raffles, 1821), and Philippine Palm Civet *Paradoxurus philippinensis* Jourdan, 1837. A total of 86 individuals of these species were documented, representing 7.35% of all individuals recorded across both surveys (Figure 1A–D; Table 1).

Figure 1. Screenshots of Facebook posts offering for sale: A) the Bearcat *Arctictis binturong* (Raffles 1821), B) the Leopard Cat *Prionailurus bengalensis* (Kerr 1792), C) the Philippine Palm Civet *Paradoxurus philippinensis* Jourdan 1837, and D) the Malayan Civet *Viverra tangalunga* J.E. Gray 1832.

Online Traders

A total of 399 unique Facebook accounts offering live mammals were documented, with traders located on at least four islands in the Philippines. Among the 208 accounts that provided location details, the majority were based in Luzon, particularly within the National Capital Region (NCR; n = 57) and Cavite Province (n = 50) (Figure 2).

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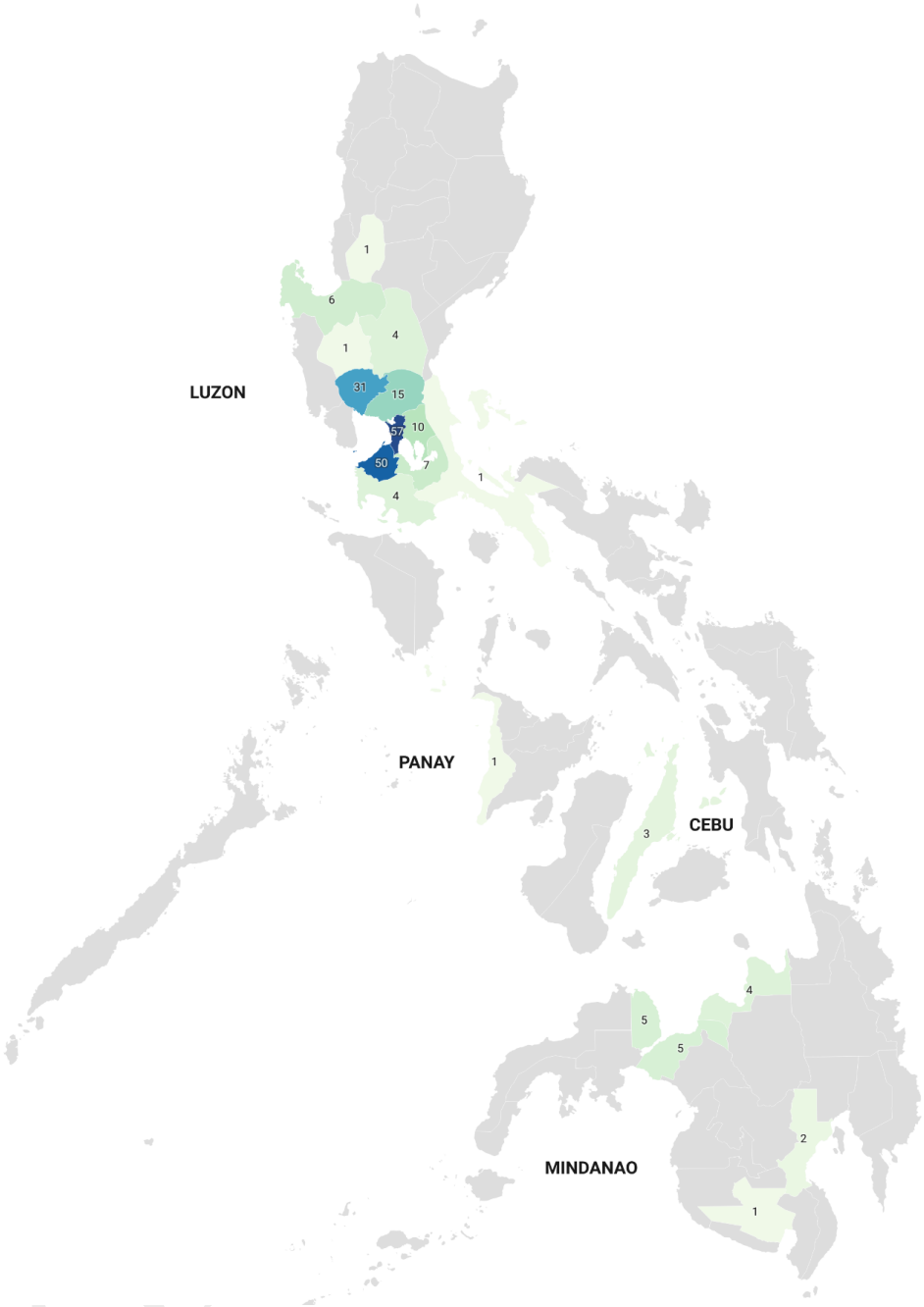

Figure 2. Distribution of online traders with location details.

DISCUSSION

To our knowledge, this study provides the first quantitative assessment of the online trade in live mammals conducted via Facebook groups in the Philippines. The quantities presented should be regarded as conservative estimates due to the limited survey period and the small number of Facebook wildlife trade groups surveyed. Nevertheless, the findings provide valuable insights into trade dynamics and highlight several emerging conservation and regulatory concerns.

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Risk of Introduced Species

One of the key conservation concerns identified in this study is the invasive risk posed by the high trade volumes of the Sugar Glider and the availability of the invasive Finlayson's Squirrel (Figure 3), driven in part by accidental or intentional releases. In Luzon, Finlayson's Squirrels have been documented from multiple localities within the National Capital Region (Makati City, Manila City, Quezon City, and Taguig City) and adjacent provinces, including Laguna and Rizal (Heaney et al. 2016; Monoy and Layusa 2021). In a social media post by a news outlet in March 2024, an individual squirrel, likely an escaped pet, was captured in the wild after causing a power outage in Iloilo Province, Panay Island. However, further field validation is required to validate if the species has established population on Panay Island.

Figure 3. Finlayson's Squirrel *Callosciurus finlaysonii* (Horsfield 1823) photographed in Quezon City, NCR, Luzon Island, in April 2025. Photo © Josh Emmanuel L. Cruz.

The majority of Sugar Gliders available through the online pet trade are reportedly captive-bred. However, smuggling of wild-caught individuals from Indonesia persists, as demonstrated by the seizure of 110 Sugar Gliders along with other smuggled Indonesian wildlife in the NCR in March 2018 (Figure 4). The increasing popularity of Sugar Gliders in the exotic pet market is influenced by their attractive appearance, small body size, trainability to perform tricks, the availability of various color morphs, and their relative ease of care and breeding in captivity. Even though the species is currently classified as Least Concern on the IUCN Red List and is not

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listed under any CITES Appendices, its presence in trade raises concerns about accidental release and potential establishment in the Philippines, which could lead to significant ecological and economic impacts. In Brazil, concerns regarding the invasive potential of Sugar Gliders have been linked to their high reproductive output, omnivorous diet, and ecological adaptability (da Rosa et al. 2018). Similarly in Tasmania, introduced populations have been documented preying on cavity-nesting birds, including the critically endangered Swift Parrot *Lathamus discolor* (Shaw, 1790) (Campbell et al. 2018).

Figure 4. Wild-caught Sugar Gliders (Waterhouse 1839) smuggled from Indonesia were seized by authorities in Quezon City in March 2018. Photo © Emerson Y. Sy.

Newly Recorded Species in the Philippine Pet Trade

The presence of two newly traded mammal species, namely, the African Pygmy Dormouse and the Indomalayan Bamboo Rat (Figure 5A–B), in the pet trade represents a notable finding, as, to our knowledge, these species have not been previously observed in the online or physical pet markets in the Philippines. Their availability may suggest an emerging trend within the exotic pet market toward the acquisition and commercialization of novel and non-traditional mammal species. This development likely reflects evolving

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consumer preferences and a persistent demand for rare and unusual animals, driven by factors such as aesthetic appeal, perceived rarity, and the desire for novelty.

Figure 5. Two novel species in the Philippine pet trade, namely, A) the African Pygmy Dormouse *Graphiurus murinus* (Desmarest 1822) and B) the Indomalayan Bamboo Rat *Rhizomys sumatrensis* (Raffles 1821). Photo © Nathalie Noval (A) and Nesryll Anne Asedillo (B).

Native Species

In contrast to the common captive-bred non-native species, the trade of the Philippine Long-tailed Macaque (Figure 6A), assessed as Endangered by the IUCN and listed in CITES Appendix II, is a concern. Although only nine Long-tailed Macaques were documented in this study, many were infants and juveniles, and the species is widely poached and trafficked across the Philippines. Its continued presence in trade highlights a direct threat to wild populations, primarily through the killing of adults and the subsequent capture and trafficking of orphaned infants (Sy and Melgar 2025), while the availability of tigers (Figure 6B) points to continued demand for threatened and high-value wildlife as status symbols.

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Figure 6. Screenshot of posts offering for sale: A) an infant Philippine Long-tailed Macaque *Macaca fascicularis philippensis* I. Geoffroy Saint-Hilaire 1843 and B) a Tiger *Panthera tigris* (Linnaeus 1758).

Gap in Regulatory Framework

The findings also highlight a gap in the national regulatory framework. Although RA No. 9147 assigns the DENR jurisdiction over terrestrial wildlife and the DA-BAI regulates domesticated animals, the absence of clear regulatory definitions distinguishing domesticated species from wildlife creates significant enforcement challenges. For example, it remains unclear whether commonly captive-bred, non-native, and non-CITES-listed mammals such as hamsters, hedgehogs, gerbils, and chinchillas should be classified as domesticated or wildlife. This ambiguity results in inconsistent policy implementation, where attention may be disproportionately directed toward widely available, low-risk species while species of greater conservation concern receive less attention.

Notably, the 2022 survey revealed that hamsters accounted for a significant share of the trade, indicating that low-risk species dominated the market. This created noise and obscured the prioritization of threatened species. Clear distinctions between domesticated species and wildlife can improve enforcement and ensure that efforts are aligned with species at higher risk and those that pose greater risks.

This study documented a dynamic online market dominated by captive-bred non-native species, but also involving threatened native and internationally protected species. Regulatory agencies need to clarify legal

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definitions and harmonize the mandates of their respective agencies to address existing enforcement gaps. Developing a list of allowed pets and guidelines on surrendering non-native pet species to designated institutions can be a practical tool to aid regulatory authorities in managing the trade of non-native species. Furthermore, the role of online platforms in facilitating wildlife trade should not be overlooked. Stronger cooperation between wildlife agencies, enforcement groups, and social media platfoms could greatly improve enforcement efforts. The evidence-based insights from this study can serve as a guide to clarify regulatory frameworks and inform future research directions toward more effective biodiversity conservation in the Philippines.

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GENERATIVE AI STATEMENT

The authors utilized ChatGPT to check and correct grammatical errors and to improve sentence structure. The authors did not use any AI tools for data generation, data analysis, interpretation of results, or the writing of original scientific content. The authors take full responsibility for the intellectual content, scientific arguments, and final decisions regarding the manuscript.

ETHICAL CONSIDERATIONS

All identifiable information related to traders has been anonymized. Any names, identifiers, or personal details have been removed to ensure that individuals cannot be recognized through the analysis or presentation of the data.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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