

VIEWPOINT

Helping to save pangolins from extinction

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Abstract

Pangolins, widely distributed in Asia and Africa, have been described as the most heavily trafficked wild mammals globally. Following the emergence of COVID-19, researchers suggested that the Sunda pangolin (*Manis javanica*) may have been the intermediary host of SARS-CoV-2 in a transmission chain from bats to people. Although subsequent studies have shown that this is unlikely, the impact of this association on pangolins is unknown. In this article, we reflect on the potential impacts of this association in the context of critical knowledge gaps that need to be filled to inform pangolin conservation and mitigate the threats the species face.

KEYWORDS

Pangolin, Conservation, COVID-19, Local Ecological Knowledge, CITES, Placental mammal

Pangolins, widely distributed across sub-Saharan Africa and large parts of Asia, have been described as the most heavily trafficked wild mammals globally (Ingram et al., 2018). Following the emergence of COVID-19, researchers suggested that the Sunda pangolin (*Manis javanica*) may have been the intermediary host of SARS-CoV-2 in a transmission chain from bats to people (Lam et al., 2020). Although subsequent studies have shown that this is unlikely (e.g., Frutos, et al., 2020), the impact of this association on pangolins is unknown. In this article, we reflect on the potential impacts of this association in the context of critical knowledge gaps that need to be filled to inform pangolin conservation and mitigate the threats the species face.

All pangolin species are threatened by overexploitation (Challender et al., 2020). Although they have started to receive concerted research attention in the last decade (Heighton & Gaubert, 2021), further research is needed to inform pangolin conservation and management. In a recent review, Pietersen and Challender (2020) identified six areas requiring further study, including trade and trafficking and associated policy; forensics; biology and ecology; genetics; husbandry and veterinary health; and, the effects of climate change. The trade in pangolins, in particular, has been the subject of research in recent years (e.g., Ingram et al., 2018) but additional research is critically needed to generate a better understanding of the links between offtake for local, national (i.e., domestic), and/or

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international use and trade (inclusive of illegal trade) and how this has, and does, vary spatiotemporally. For example, Mambeya et al. (2018) reported that an emerging illegal trade in pangolin scales from Gabon utilized novel supply chains distinct from the domestic trade in wild meat. Future research should focus on generating knowledge of harvest incentives at source sites, the supply chains and the actors involved, and the broader social–ecological systems in which harvest and trade of pangolins and their parts takes place. This is important to informing interventions at local levels that are endogenous and resilient and likely to result in positive outcomes for pangolins in the long term (e.g., it may include the devolution of property and resource rights to local people) to interventions at the international level (e.g., action agreed via CITES, the Convention on International Trade in Endangered Species of Wild Fauna and Flora, that targets organized crime groups). All such interventions should be critically evaluated a priori giving consideration to the likelihood that they will deliver positive outcomes for pangolin populations and explicitly consider social equity.

This research should include examining the potential impacts that COVID-19 has had on the use, trade, and trafficking of pangolins. During 2020 in particular, lockdowns associated with COVID-19 obligated millions of people to return to their villages and/or stay in their homes in many parts of the world and some started to rely on the local forests and wildlife for their basic needs (Matthews, 2020). It is possible that pangolins have been subject to greater levels of offtake—legal and/or illegal—as a result. Evidence suggests that increased human confinement, the reduction in conservation enforcement caused by the redirection of funds to dealing with the public health components of the COVID-19 pandemic, and the limited mobility of researchers may have increased the likelihood of poaching activities at some locations (Ghosal & Casey, 2020; Manenti et al., 2020). While the long-term effects of the COVID-19 pandemic on biodiversity conservation are still to be assessed, it is also possible that the association between pangolins and the emergence of COVID-19 has led to the persecution of the species where they occur because of perceived disease risks. Theoretically, this may have placed greater pressure on pangolin populations in particular areas. Further, the impact of policy measures taken in response to COVID-19 that concern pangolins should also be evaluated to determine if and how they are contributing to pangolin conservation. For instance, in 2020 China promulgated new legislation prohibiting the trade and consumption of particular species, including the eating of terrestrial wild animals (Li, 2020), and transferred pangolins from State Category II to I protected species. In Gabon, the consumption of pangolins was banned following the implication that the species were involved in the

emergence of SARS-CoV-2 (France24, 2020a) and while it has been suggested that the sale of pangolins at wild meat markets fell as a result (France24, 2020b), the longer-term impact of these measures on the species require investigation and evaluation.

Understanding how ongoing use and trade of pangolins, both legal and illegal, is impacting populations of the species is also critical to informing conservation action. For instance, Ingram et al. (2018) suggested that hunting of pangolins in Central Africa is likely unsustainable because sub-adult and juvenile animals were being harvested, an indicator of overexploitation. While it is known that pangolin hunting and poaching is indiscriminate regarding the age of animals across geographies (Challender et al., 2020), the impact of exploitation on populations in quantitative terms is lacking for most species in virtually all range countries. This is partly because detecting and monitoring pangolin populations is challenging due to their elusive nature and because basic ecological data (e.g., density estimates and home range size) are missing for several species (Willcox et al., 2019). Consequently, there remains an urgent need to identify the most appropriate monitoring methods for the different species while considering habitat type, which may include one or a combination of burrow counts, targeted camera-trapping, detection dogs, DNA-based methods, and among others, social science research (IUCN SSC Pangolin Specialist Group, 2018). The use of social science research, including using Local Ecological Knowledge (LEK), has proven successful and cost-effective for rapidly assessing the status of the Chinese pangolin (*M. pentadactyla*) on Hainan Island, China (Nash et al., 2016), and similar approaches have been used to generate knowledge of the Philippine pangolin (*M. culionensis*) in the Philippines (Archer et al., 2020). These approaches provide opportunities to not only gather data on the status of the species, but also to understand offtake levels and supply chains (e.g., Archer et al., 2021), and to understand local perceptions and levels of awareness, which may be useful for engaging local people in conservation actions directly. However, future monitoring efforts would ideally go beyond surveillance monitoring and align with the principles of targeted monitoring and active adaptive management, in order to explicate the factors determining changes in species status and how species respond to management actions (Morin et al., 2020). This is a contemporary challenge for those conducting research on pangolin populations.

A field of study that could help to address the illegal trade in pangolins and generate knowledge relevant to understanding associated impacts on populations is molecular forensic identification of species and the geographic origins of specimens confiscated from illegal trade. This is currently challenging because there are only two

pangolin species with published genome sequences (Choo et al., 2016). Further, with limited genetic population markers, it remains difficult to estimate how the illegal wildlife trade influences population declines of the pangolin species. There is a definite need for better and more accurate data on both trade and populations of pangolins. The availability of genome sequences for all pangolin species and genetic markers can help for both.

The conservation of pangolins, as for many species, cannot rely only on the efforts of a single country or stakeholder group; it needs collaboration between academics and researchers, civil society organizations, local communities and, among others, local and national governments of many countries, especially pangolin range states. We call on members of all these groups to help fill the key knowledge gaps discussed to help save pangolins from extinction.

AUTHOR CONTRIBUTIONS

All authors wrote and approved the paper.

DATA ACCESSIBILITY STATEMENT

No datasets were generated or analyzed in this study.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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REFERENCES

- Archer, L. J., Papworth, S. K., Apale, C. M., Corona, D. B., Gacilos, J. T., Amada, R. L., Waterman, C., & Turvey, S. T. (2020). Scaling up local ecological knowledge to prioritize areas for protection: Determining Philippine pangolin distribution, status and threats. *Global Ecology and Conservation*, 24, e01396. <https://doi.org/10.1016/j.gecco.2020.e01395>
- Archer, L. J., Turvey, S. T., Apale, C. M., Corona, D. B., Amada, R. L., & Papworth, S. K. (2021). Digging deeper: Understanding the illegal trade and local use of pangolins in Palawan province, Philippines. *Frontiers in Conservation Science*, 2, 746366. <https://doi.org/10.3389/fcsc.2021.746366>
- Challender, D.W.S., Nash, N. & Waterman, C. (Eds.). (2020). *Pangolins: Science, Society and Conservation*. London, UK, San Diego, CA, USA: Academic Press.
- Choo, S. W. (2016). Pangolin genomes and the evolution of mammalian scales and immunity. *Genome Research*, 26(10), 1312–1322. <https://doi.org/10.1101/gr.203521.115>
- France24 (2020a). France 24. Gabon bans eating of pangolin and bats amid pandemic. Available from: <https://www.france24.com/en/20200403-gabon-bans-eating-of-pangolin-and-bats-amid-pandemic> (accessed December 13, 2021).
- France24 (2020b). France 24. Pangolin sales plunge in Gabon over coronavirus fears. Available from: <https://www.france24.com/en/20200316-pangolin-sales-plunge-in-gabon-over-coronavirus-fears>. (accessed December 13, 2021).
- Frutos, R., Serra-Cobo, J., Chen, T., & Devaux, C. A. (2020). COVID-19: Time to exonerate the pangolin from the transmission of SARS-CoV-2 to humans. *Infection, Genetics and Evolution*, 85, 104493. <https://doi.org/10.1016/2Fj.meegid.2020.104493>
- Ghosal, A., & Casey, M. (2020). Coronavirus lockdowns increase poaching in Asia, Africa. AP News. Available from: <https://apnews.com/article/india-ap-top-news-international-news-asia-virus-outbreak-9df0cc21045578ad86696bc05721c706>. (accessed December 13, 2021).
- Heighton, S. P., & Gaubert, P. (2021). A timely systematic review on pangolin research, commercialization, and popularization to identify knowledge gaps and produce conservation guidelines. *Biological Conservation*, 256, 109042. <https://doi.org/10.1016/j.biocon.2021.109042>
- Ingram, D. J., Coad, L., Abernethy, K. A., Maisels, F., Stokes, E. J., Bobo, K. S., Breuer, T., Gandiwa, E., Ghiurghi, A., Greengrass, E., Holmern, T., Kamgaing, T. O. W., Ndong Obiang, A. -M., Poulsen, J. R., Schleicher, J., Nielsen, M. R., Solly, H., Vath, C. L., Waltert, M., ... Scharlemann, J. P. (2018). Assessing Africa-wide pangolin exploitation by scaling local data. *Conservation Letters*, 11(2), e12389. <https://doi.org/10.1111/conl.12389>
- IUCN SSC Pangolin Specialist Group (2018). Methods for monitoring populations of pangolins (Pholidota: Manidae). IUCN SSC Pangolin Specialist Group. Available from: https://www.pangolinsg.org/wp-content/uploads/sites/4/2020/05/Guidance-on-the-ecological-monitoring-of-pangolin_EN.pdf. (accessed December 13, 2021).
- Lam, T. T.-Y., Jia, N., Zhang, Y. W., Shum, M. H., Jiang, J. F., Zhu, H. C., Tong, Y. G., Shi, Y. X., Ni, X. B., Liao, Y. S., Li, W. J., Jiang, B. G., Wei, W., Yuan, T. T., Zheng, K., Cui, X. M., Li, J., Pei, G. Q., Qiang, X., Cheung, W. Y., ... Cao, W. C. (2020). Identifying SARS-CoV-2-related coronaviruses in Malayan pangolins. *Nature*, 583, 282–285. <https://doi.org/10.1038/s41586-020-2169-0>
- Li, Y. (2020). China's announcement on wildlife trade—What's new and what does it mean? Oxford Martin School. Available from: <https://www.oxfordmartin.ox.ac.uk/blog/chinas-announcement-on-wildlife-trade-whats-new-and-what-does-it-mean/>. (accessed December 13, 2021).
- Mambeya, M., Baker, F., Momboua, B. R., Pambo, A. F. K., Hega, M., Okouyi, V. J. O., Onanga, M., Challender, D. W. S., Ingram, D. J., Wang, H., & Abernethy, K. (2018). The emergence of a commercial trade in pangolins from Gabon. *African Journal of Ecology*, 56(3), 601–609. <https://doi.org/10.1111/aje.12507>
- Manenti, R., Mori, E., Di Canio, V., Mercurio, S., Picone, M., Caffi, M., Brambilla, M., Ficetola, G. F., & Rubolini, D. (2020). The good, the bad and the ugly of COVID-19 lockdown effects on wildlife conservation: Insights from the first European locked down country. *Biological Conservation*, 249, 108728. <https://doi.org/10.1016/j.biocon.2020.108728>
- Matthews, A. (2020). The wild animals at risk in lockdown. BBC Future Planet. Available from: <https://www.bbc.com/>

- [future/article/20200520-the-link-between-animals-and-covid-19](#). (accessed December 13, 2021).
- Morin, D., Challender, D. W. S., Ichu, I. G., Ingram, D. J., Nash, H. C., Panaino, W., Panjang, E., Sun, N., C.-M., & Willcox, D. (2020). Developing robust ecological monitoring methodologies for pangolin conservation. In: D.W.S. Challender, N. Nash, & C. Waterman (Eds.), *Pangolins: Science, society and conservation, Biodiversity of world: Conservation from genes to landscapes* (pp. 545–558). London, UK, San Diego, CA, USA: Academic Press.
- Nash, H. C., Wong, M. H. G., & Turvey, S. T. (2016). Using local ecological knowledge to determine status and threats of the Critically Endangered Chinese pangolin (*Manis pentadactyla*) in Hainan, China. *Biological Conservation*, 196, 189–195. <https://doi.org/10.1016/j.biocon.2016.02.025>
- Pietersen, D. W., Challender, D. W. S. (2020). Research needs for pangolins. In: D. W. S. Challender, H. C. Nash, C. Waterman (Eds.). *Pangolins: Science, society and conservation* (pp. 537–543). Cambridge MA: Academic Press. <https://doi.org/10.1016/B978-0-12-815507-3.00034-4>
- Willcox, D., Nash, H. C., Trageser, S., Kim, H. J., Hywood, L., Connelly, E., Ichu, G. I., Nyumu, K. J., Moumbolou, C. L. M., Ingram, D. J., & Challender, D. W. S. (2019). Evaluating methods for detecting and monitoring pangolin (Pholidata: Manidae) populations. *Global Ecology and Conservation*, 17, e00539. <https://doi.org/10.1016/j.gecco.2019.e00539>

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