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Beyond Conservation and Security:

Public Health Consequences of Wildlife Trafficking

The illegal wildlife trade is a globalised, billion-dollar industry

Value: $7-23 billion, World Bank; $20 billion, Interpol

Multiple **drivers**: Food, Medicinal, Ornamental, Pet trade.

At least **4000 species** implicated in illegal trade

Fragmented regulation: CITES – international trade only.

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Extraction → Farming → Transport → Consumption → Seizure → Rescue/Release

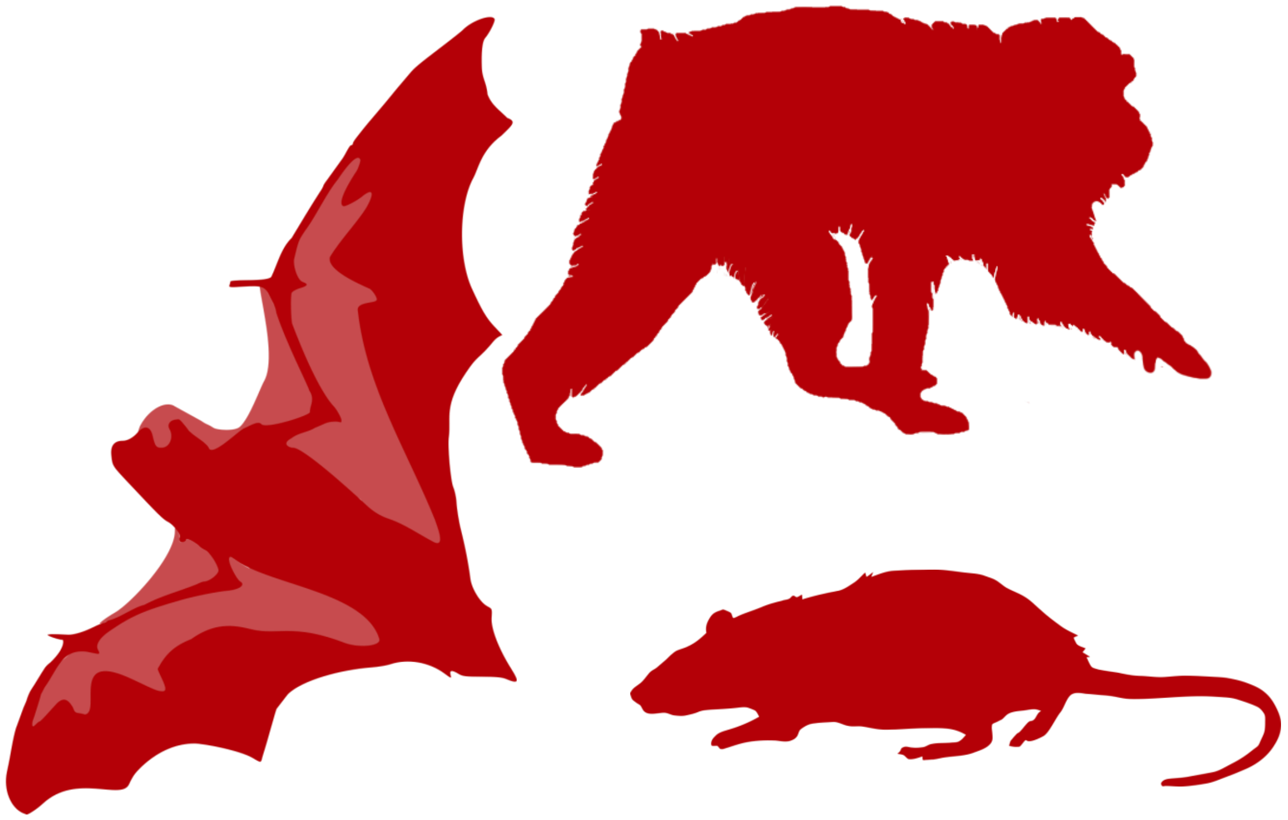
Repeated human–animal–environment contact points = spillover risk

- Trafficking creates high-risk interfaces across the supply chain

- Each node should be treated as a biosecurity checkpoint

Extraction | Farming | Transport | Consumption | Seizure | Rescue/Release

- **High-risk taxa**
- Bats, rodents, primates are over-represented hosts of zoonotic viruses → higher baseline risk when targeted by poachers and wild meat markets.[1]



1. Olival, K. J., Hosseini, P. R., Zambrana-Torrelio, C., Ross, N., Bogich, T. L., & Daszak, P. (2017). Host and viral traits predict zoonotic spillover from mammals. Nature, 546(7660), 646-650..

Extraction | Farming | Transport | Consumption | Seizure | Rescue/Release

- **Great-ape carcasses → Ebola**
- 2001–03 clusters in Gabon/Rep. Congo linked to handling ape carcasses[1].
- bushmeat hunting = direct exposure to high-consequence pathogens

Figure 2. Morrison-Lanjouw, S., Spijker, R., Mughini-Gras, L., Coutinho, R. A., Chaber, A. L., & Leeflang, M. (2023). A systematic review of the intercontinental movement of unregulated African meat imports into and through European border checkpoints. *One Health*, *17*, 100599.

1. Rouquet, P., Froment, J. M., Bermejo, M., Kilbourn, A., Karesh, W., Reed, P., ... & Leroy, E. M. (2005). Wild animal mortality monitoring and human Ebola outbreaks, Gabon and Republic of Congo, 2001–2003. *Emerging infectious diseases*, *11*(2), 283.

Extraction | Farming | Transport | Consumption | Seizure | Rescue/Release

- **Forest edge work → greater contact with wild species, new pathogens**

- Study: deforestation brings people/macaques/mosquitoes together; occupational malaria risk at edges.[1]

eLIFE Research article

Epidemiology and Global Health

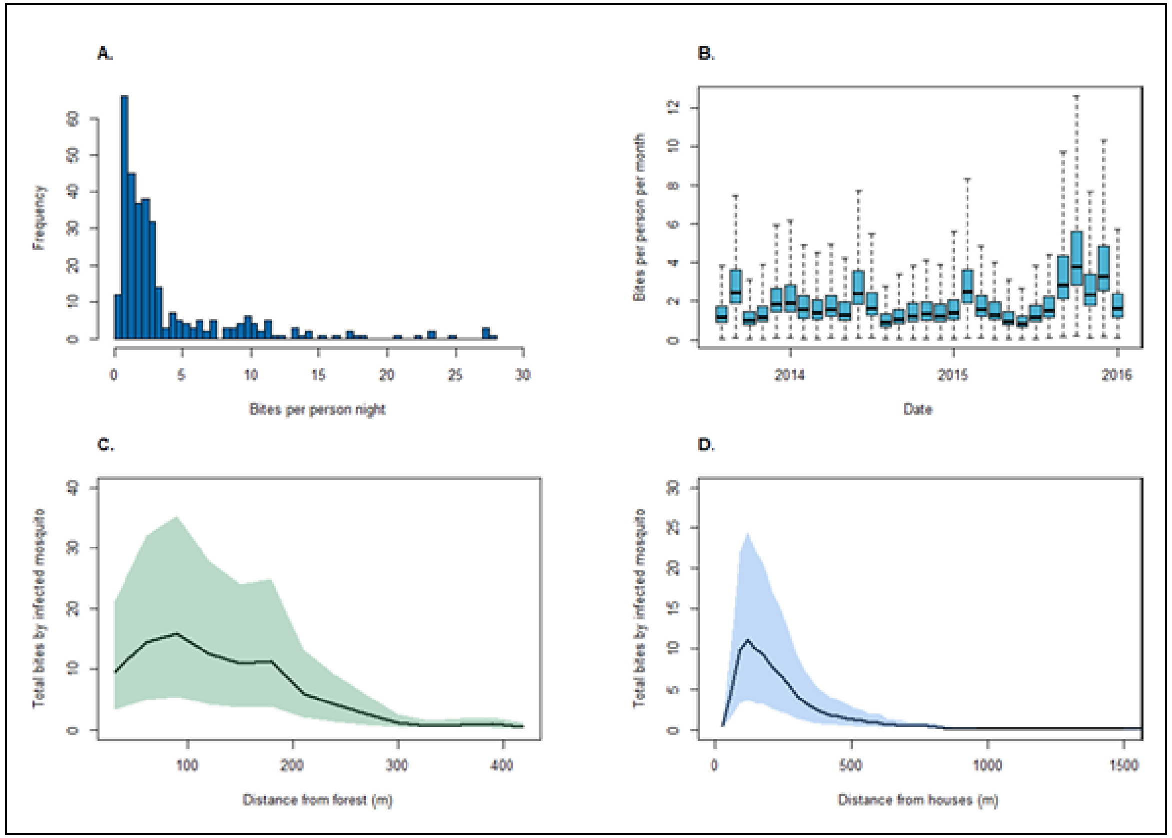


Figure 4. Mosquito biting rates. (A) *An. balabacensis* biting rate per person-night from data collected in Matunggong, (B) Predicted mean *An. balabacensis* biting rates per month from spatiotemporal models, (C) Predicted number of bites for all individuals residing in Matunggong by distance from secondary forest, and by (D) Distance from households.

DOI: https://doi.org/10.7554/eLife.47602.009

1. Fornace, K. M., Alexander, N., Abidin, T. R., Brock, P. M., Chua, T. H., Vythilingam, I., ... & Drakeley, C. (2019). Local human movement patterns and land use impact exposure to zoonotic malaria in Malaysian Borneo. Elife, 8, e47602.

- **Wildlife Farming: Civets & SARS**
- Farmed/marketed civets carried SARS-CoV; Guangzhou restaurant cluster implicated food handling/consumption.[1]
- The first SARS pandemic is likely due to bat reservoir transfer to civets as an intermediate host before spilling over to humans through wildlife trade [2]

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IUCN SSC Small Carnivore Specialist Group

Fig. 2. Examples of standard civet enclosures at three farms visited during the surveys. Enclosures are typically small and made of metal mesh or bars, with open bottoms that allow faeces and urine to be washed with water from the floorbelow (or collected for coffee). All three photographs taken in June 2020. (Photo: Trinh Thi Mai / Save Vietnam's Wildlife.)

1. Wang, M., Yan, M., Xu, H., Liang, W., Kan, B., Zheng, B., ... & Xu, J. (2005). SARS-CoV infection in a restaurant from palm civet. Emerging infectious diseases, 11(12), 1860.

2. Wang, L. F., & Eaton, B. T. (2007). Bats, civets and the emergence of SARS. Wildlife and emerging zoonotic diseases: the biology, circumstances and consequences of cross-species transmission, 325-344.

- **Bushmeat via airports**
- Seized primate/rodent meat carried simian retro-/herpesviruses (US airports).[1]
- PLOSEU seizures: viral screening of simian bushmeat (France) + bacterial hazards in EU passenger foods.[2]
- Bushmeat seizures in Belgian airports [3]

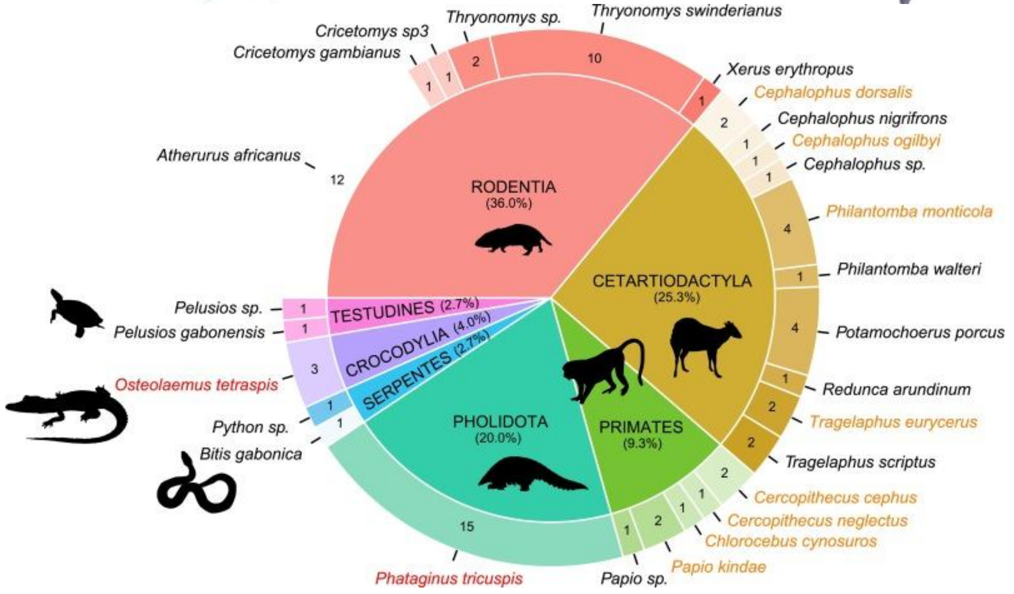
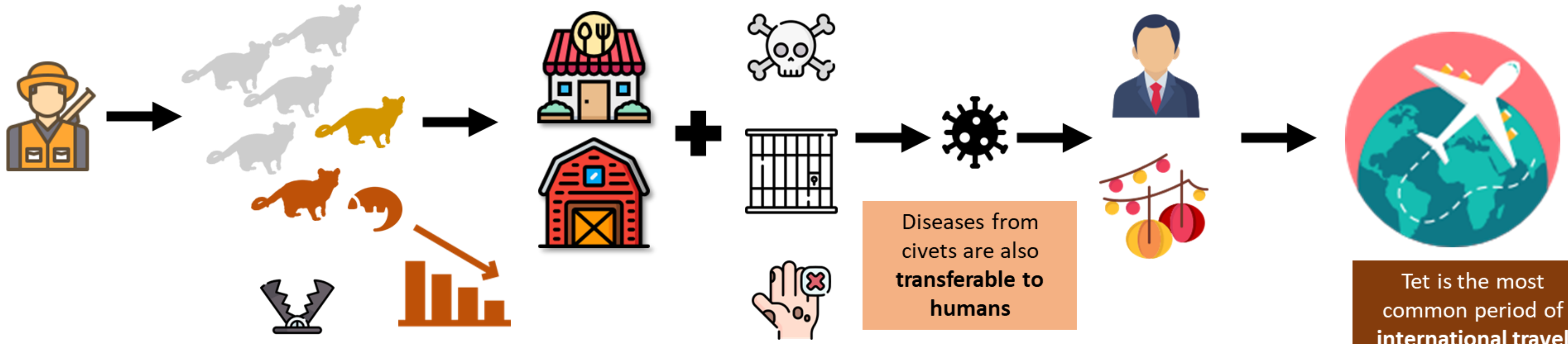


Figure 1. Temmam, S., Davoust, B., Chaber, A. L., Lignereux, Y., Michelle, C., Monteil-Bouchard, S., ... & Desnues, C. (2017). Screening for viral pathogens in African simian bushmeat seized at a French airport. Transboundary and emerging diseases, 64(4), 1159-1167.
Figure 4. Chaber, A. L., Moloney, G. K., Renault, V., Morrison-Lanjouw, S., Garigliany, M., Flandroy, L., ... & Gaubert, P. (2023). Examining the international bushmeat traffic in Belgium: A threat to conservation and public health. One Health, 17, 100605..

1. Smith, K. M., Anthony, S. J., Switzer, W. M., Epstein, J. H., Seimon, T., Jia, H., ... & Marano, N. (2012). Zoonotic viruses associated with illegally imported wildlife products. PloS one, 7(1), e29505..
2. Temmam, S., Davoust, B., Chaber, A. L., Lignereux, Y., Michelle, C., Monteil-Bouchard, S., ... & Desnues, C. (2017). Screening for viral pathogens in African simian bushmeat seized at a French airport. Transboundary and emerging diseases, 64(4), 1159-1167
3. Chaber, A. L., Moloney, G. K., Renault, V., Morrison-Lanjouw, S., Garigliany, M., Flandroy, L., ... & Gaubert, P. (2023). Examining the international bushmeat traffic in Belgium: A threat to conservation and public health. One Health, 17, 100605

Holiday/travel amplifiers

- Demand for wild meat/medicinals often peaks around holidays & mass travel → prioritize inspections/monitoring windows.[1]



Hunters catch civets due to high demand using snare traps. **Snare traps** also cause the decline and **potential extinction of Endangered species.** and thousands of **abandoned snare traps** continually **killing more** bycatch

Civets are brought to wildlife farms, where they are **kept in unhygienic conditions, and prone to disease** and death, then sold to restaurants or traders.

Diseases from civets are also **transferable to humans**

Civets are often hunted, and prepared to sell **surrounding Tet Holiday,** which means the human-wildlife interface **and zoonotic disease transfer risk is heightened** around this time

Tet is the most common period of **international travel** to **highly-populated** tourist destinations

1. Save Vietnam's Wildlife (Unpublished Data).

- **SARS & high-risk cuisine**
- Civet meat handling/consumption linked to SARS cases in Guangzhou (2003–04).[1]

1. Wang, M., Yan, M., Xu, H., Liang, W., Kan, B., Zheng, B., ... & Xu, J. (2005). SARS-CoV infection in a restaurant from palm civet. Emerging infectious diseases, 11(12), 1860.

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Public health crises fuel demand

- During COVID-19, wildlife-derived remedies (e.g., bear bile injection) were officially promoted in China, raising consumption/ethics concerns.[1]
- Consumer analyses show wildlife meat/medicinals and pets remained key use classes during the pandemic. [2]
- China deregulated rhino horn trade during Covid-19 as medicine [3]

Sources:
1. UNDARK – The night I was a bear (Top)
2. National Geographic - China promotes bear bile as coronavirus treatment, alarming wildlife advocates. National Geographic. (Right)

1. Fobar (2020). China promotes bear bile as coronavirus treatment, alarming wildlife advocates. National Geographic.
2. TRAFFIC (2021). Situation Analysis: Covid-19, wildlife trade, and consumer engagement
3. Cheung, H., Mazerolle, L., Possingham, H. P., & Biggs, D. (2021). China's legalization of domestic rhino horn trade: Traditional Chinese medicine practitioner perspectives and the likelihood of prescription. Frontiers in Ecology and Evolution, 9, 607660.

Macaque Herpes B (high-consequence)

- Rare but often fatal without immediate first aid and PEP; follow CDC protocols.[1]

Figure 3. Garber, P. A., Estrada, A., Shanee, S., Svensson, M. S., Arregoitia, L. V., Nijman, V., ... & Hansen, M. F. (2024). Global wildlife trade and trafficking contribute to the world's nonhuman primate conservation crisis. *Frontiers in Conservation Science*, *5*, 1400613.

1. CDC (2024) About B Virus https://www.cdc.gov/herpes-b-virus/about/index.html

- **Imported parrots & HPAI H5N1 (UK 2005)**
- Quarantine facility incident underscores strict biosafety needs.[1]

Source: The Guardian - EU may ban imports of wild birds as lethal flu strain found in Britain

1. USDA GAIN (2005) United Kingdom Poultry and Products USDA Foreign Agricultural Service GAIN Report Global Agriculture Information Network Date: 11/16/2005 GAIN Report Number: UK5031 Update on HPAI H5N1 in quarantine in the UK 2005

Release Introduction/ Malpractice

- Chytrid fungus spread via amphibian trade/reintroductions; panzootic lineages documented.[1]
- Ranaviruses track with pet/food trade; broad host range.[2]
- Many rescue/release programs across Southeast Asia focus on expedited release without further quarantine, planning, or mitigatory vaccination[3]

Source: VietnamNews - 11 rare monkeys released back into wild in central Việt Nam

1. Schloegel, L. M., Toledo, L. F., Longcore, J. E., Greenspan, S. E., Vieira, C. A., Lee, M., ... & James, T. Y. (2012). Novel, panzootic and hybrid genotypes of amphibian chytridiomycosis associated with the bullfrog trade. Molecular ecology, 21(21), 5162-5177.
2. Herath, J., Ellepola, G., & Meegaskumbura, M. (2021). Patterns of infection, origins, and transmission of ranaviruses among the ectothermic vertebrates of Asia. Ecology and Evolution, 11(22), 15498-15519.
3. Rivera, S. N., Knight, A., & McCulloch, S. P. (2021). Surviving the wildlife trade in Southeast Asia: reforming the 'disposal'of confiscated live animals under CITES. Animals, 11(2), 439.

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Practical Takeaways

- **Understand Zoonotic Health risks** at each point of the wildlife trade chain
- **Treat seized/traded wildlife as biohazards** (quarantine, diagnostics, DRA)
- **Target the calendar & routes** (holidays, airports, known hubs).
- **Integrate One Health + cyber-monitoring** for early warnings/trends and safer response.
- **Build Capacity and Resource Needs** for high volume IWT destination countries to prevent rescue/release malpractice