DEALING IN DISEASE

How U.S. Wildlife Imports Fuel Global Pandemic Risks

CENTER FOR BIOLOGICAL DIVERSITY • 2020

DEALING IN DISEASE:

How U.S. Wildlife Imports Fuel Global Pandemic Risks

A CENTER FOR BIOLOGICAL DIVERSITY REPORT

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EXECUTIVE SUMMARY

As the COVID-19 pandemic demonstrates, human health is gravely threatened by pathogens that pass from wildlife, livestock or pets to people. These zoonotic diseases do not recognize national boundaries. Research shows that a disease harbored in a person or animal can travel halfway around the globe in under 24 hours by airplane.[1] Thus it matters less where a disease emerges than why it emerges.

Many people in the U.S. wrongly believe zoonotic diseases stem only from foreign live wildlife markets and consumption. But U.S. commercial demand for wildlife products is one of the largest drivers of wildlife exploitation and trade across the globe.[2] By putting species that aren't normally near each other in contact while stressed, the wildlife trade creates the perfect conditions for new diseases to emerge and infect people. By fueling this trade, U.S. demand for wildlife products increases the risk of another deadly pandemic as well as animal extinctions around the globe.

We found that the U.S. imported almost **23 million whole animals, parts, samples and products made from bats, primates and rodents — animals that harbor 75% of known zoonotic viruses —** over a recent five-year period.

This report examines U.S. trade in three types of mammals known to harbor many zoonotic diseases: bats, primates and rodents. Together bats, primates and rodents have been implicated as the hosts for more than 75% of known zoonotic viruses.[3]

We analyzed U.S. import data collected by the U.S. Fish and Wildlife Service from wildlife declaration forms required upon import.[4] The data discussed here includes live and dead animals; parts like skulls or meat; products such as leather, fur and animal-hair paint brushes; and derivatives and samples including blood. The most common commercial products made from these animals are decorative items made of bats encased in acrylic; primate skulls for décor; and fishing flies made with rodent hair.

We found that the U.S. imported almost 23 million specimens of, and products derived from, these animals known to harbor zoonoses — including whole animals, their parts, samples and items made from them — over a recent five-year period.

These findings underscore that the United States cannot avoid responsibility for disease emergence in other regions of the world that is fueled by the wildlife trade. U.S. demand plays a significant role in the global wildlife trade and this trade risks deadly global pandemics like COVID-19 and loss of biodiversity — the fabric of life on Earth.

While much about zoonotic disease occurrence and transmission is complex, the solution is relatively straightforward: To protect life on Earth and reduce the risk of another pandemic, we must end the demand for wildlife in consumer markets such as the United States and transition to new livelihoods in producing markets.

Crab-eating macaque by Paul Williams

KEY FINDINGS

Over the most recent five-year period for which data are available (2010-2014), the United States imported:

- 96,475 bats and bat parts, including live and dead animals, skeletons, skulls, bat parts sold as jewelry, meat, skins, trim and hunting trophies;

- 2,068,328 primates and primate parts, including live and dead animals, skulls, products (such as boots), milliliters of blood, skins and hunting trophies; and

- 20,784,238 rodents and rodent parts, including live animals, hair and hair products (such as fishing flies and paint brushes), leather products, garments, skins and hunting trophies.

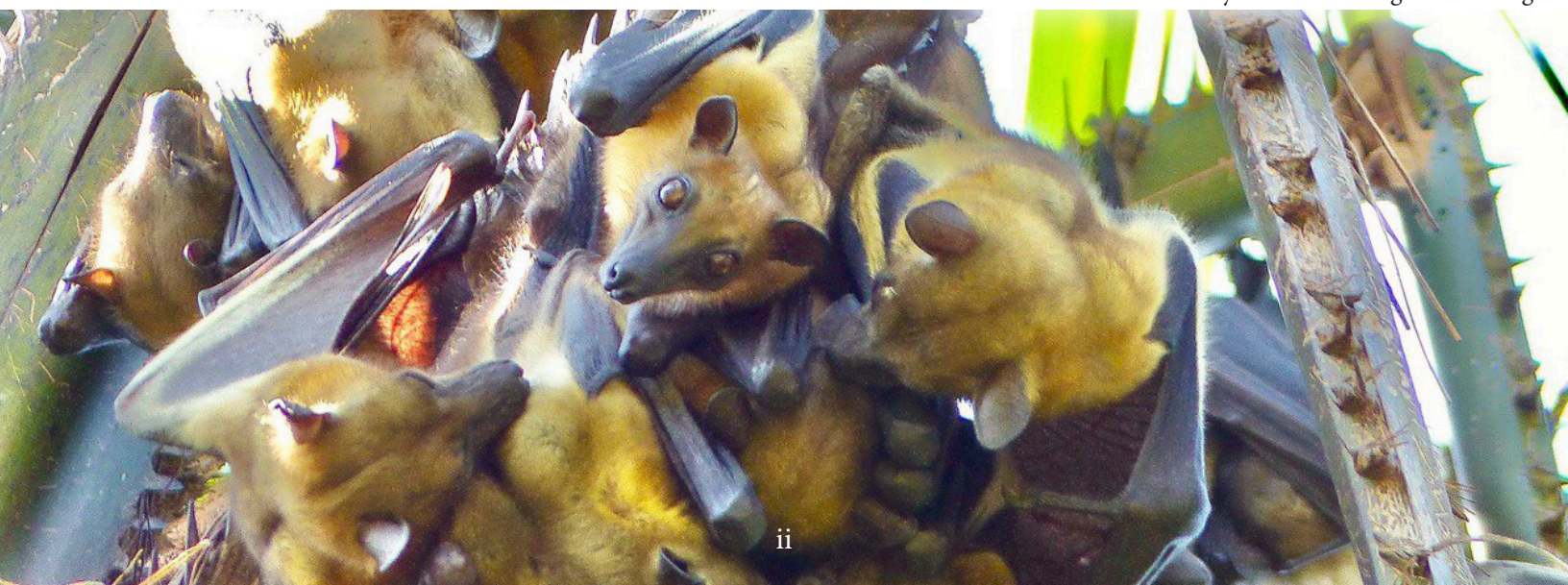
Most of the imported bats and rodents were captured from the wild — more than 93% and 90%, respectively — while about 21% of the primates were wild-sourced, as opposed to coming from captivity or other non-wild sources (Figures 3, 7, 11).

Very few of these imported animals were alive when they entered the United States: 1% of bats and 4% of rodents and primates. While dead animals and animal parts present less risk of disease transmission upon entry into the country, the production of these parts and products shifts the risk of disease emergence to other countries where wildlife is collected, transported and slaughtered before export. This risk is primarily outsourced to the developing world and China (Figures 13 and 14), with a few notable exceptions in rodent products, as shown in Figure 15. The trade data show that the United States cannot solely blame other regions of the world when new zoonotic diseases emerge.

Scientific research has documented that animals become more stressed the longer they are in the supply chain (e.g., from their point of capture to processing). This stress increases the risk animals will both shed and pick up diseases and trade makes it more likely wildlife will come into contact with other captured species and people, increasing the chance for diseases to evolve that may infect people.[5]

New diseases are emerging at an increasing rate as more people enter new habitats and hunt down previously isolated animals.[6] These same practices — wildlife exploitation and habitat destruction — are also driving the extinction crisis[7] and the loss of species at more than a 100 times the natural rate.[8] By ending wildlife trade and decreasing demand for wildlife, we are not just protecting human health but also species, their habitat and our planet.

Straw-coloured fruit bats by Antonio Rodríguez Arduengo



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DETAILED FINDINGS

GLOBAL TRADE, U.S. DEMAND

Globally wildlife is traded for pets, luxury foods, fashion, décor and medicine.[9] A 2005 estimate put the annual global live animal trade at 40,000 primates, 4 million birds, 640,000 reptiles and 350 million tropical fish.[10] The primary consumers of wildlife globally are the United States, China, the European Union and Japan.[11]

The United States consumes about 20% of the global wildlife market.[12] Despite its significant wildlife imports, the U.S. screens or tests virtually no imports for diseases,[13] and only a handful of wildlife are banned from entering the country.[14] For example, the Centers for Disease Control and Prevention (CDC) banned imports of primates as pets[15] and certain rodents due to disease risk but only after disease outbreaks occurred in the United States.[16]

FEDERAL DATA ON IMPORTS OF BATS, PRIMATES AND RODENTS

This report examines the U.S. role in trade in bats, primates and rodents — animals that harbor many of the zoonotic diseases that have spilled over to infect people in recent decades.[17]

Bats are known to harbor many diseases, particularly viruses, partly due to their unique biology.[18] Primates are identified as key reservoir and intermediary host species for zoonoses in part because their genetic makeup is so similar to humans, enabling diseases to spread more readily to people.[19] Rodents are highlighted because of their significant presence on nearly every continent and their propensity to spread diseases.[20]

We examined data the U.S. Fish and Wildlife Service collects from wildlife declaration forms that are required upon import for all wildlife,[21] including live or dead bodies, parts, products, and derivatives into the United States. The Service enters this information into its Law Enforcement Management Information System (LEMIS) database. This data was collected and curated by other researchers.[22]

The numbers in this report do not represent individual animals. The "quantity" field of the LEMIS data documents the number of individual animals imported but also includes kilograms of meat, milliliters of blood, grams of skins and numbers of animal products (ranging from paint brushes with animal hair to fur trim on garments). Many of the shipments simply have zeros in the quantity field as well. Thus, the numbers in this report provide only a rough sketch of U.S. imports of these animals and the domestic consumer demand for them.

Eastern gray squirrel by DaPuglet/Flickr

The LEMIS database has a field indicating whether the animal, specimen or product is sourced from the wild. Non-wild sourced animals include those that are captive bred, ranched or farmed. The database also indicates whether the shipment contains live animals and the purpose for the shipment ranging from commercial to scientific or biomedical use. For each shipment a brief description of its contents is included such as skulls, garments, trim, hair products, skeletons, skins or hunting trophies. The data used in this report is available upon request.

U.S. BAT IMPORTS

Unique among mammals for their ability to fly, bats are both revered and feared by people. Bats are vastly understudied compared to many mammals, and the conservation status of numerous bat species is unknown.[23] Yet they provide key ecosystem services, curtailing insect populations and protecting crops and people alike.[24]

Scientists attribute the high number of zoonoses (and viruses in particular) associated with bats to their unique biology and roosting behaviors.[25] Bats are documented to be reservoirs for more diseases than other mammals.[26] At the same time, people are increasingly coming into contact with bats as people capture them for the wildlife trade or infringe upon their habitats.[27] Many recent diseases likely originated from bats, including filoviridae viruses like Ebola and Marburg,[28] paramyxoviruses like Nipah and Hendra[29] and coronaviruses like SARS and COVID-19.[30]

Over the five years reviewed, the United States imported 2,121 shipments of bats containing a total of 96,475 whole dead and living bats; skeletons; skulls; bat products (such as jewelry); meat; skins and trim; and hunting trophies. At bare minimum, these shipments included 27,567 individual bats.[31]

As illustrated in Figure 1, scientific research was the main purpose for these imports, but commercial products are a close second, followed by biomedical research. Most bats were sourced from the wild, as shown in Figure 3. Living bats represent only 1% of total bat imports, and a similarly small percentage (0.01%) of the commercial imports were living, meaning that the majority of our bat imports are dead.

Most commercial imports of bats arrive as whole dead bodies, skeletons and skulls. Our research found the vast majority are encased in acrylic, then sold as paperweights and other "decorative" items. These are marketed as educational products, steampunk/goth décor and general curios, and are sold to consumers at a range of places — from Amazon and eBay to obscure online sources, as well as trade shows and other domestic vendors.

By far, most commercial bat imports are sold as paperweights and other decorative items encased in plastic.

BATS GET A BAD RAP

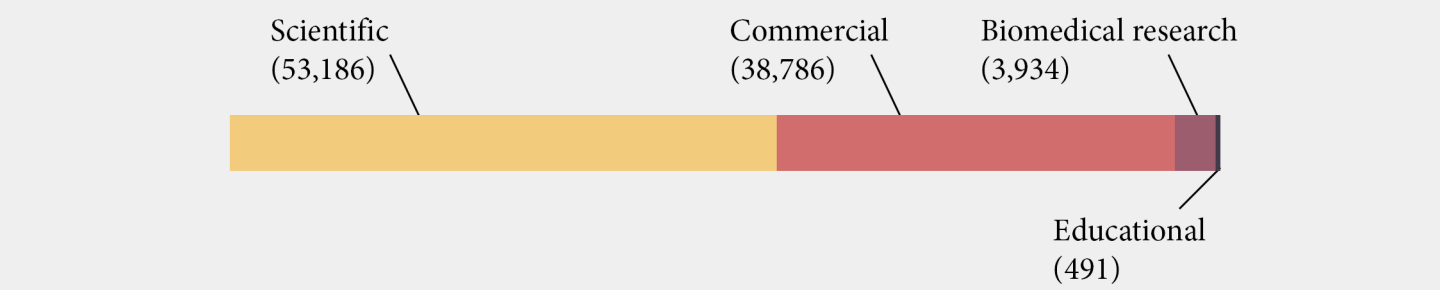
Every year bats provide billions of dollars' worth of free pest control by eating tons of insects that attack crops and trees. Bats provide ecosystem services by dispersing seeds, and their poop is an essential source of nutrients in cave environments, supporting other species like salamanders, fish and crayfish.[32] But perhaps most important, some bats are pollinators, and they help feed people around world by pollinating crops,[33] including agave from which tequila is made.[34]

Yet bats have gotten a bad rap lately because of their potential role in the emergence of the virus causing the COVID-19 outbreak. There have been calls to cull these amazing mammals because of the diseases they harbor. But bats aren't the problem. The real issue is the people who invade their habitat and exploit these animals.

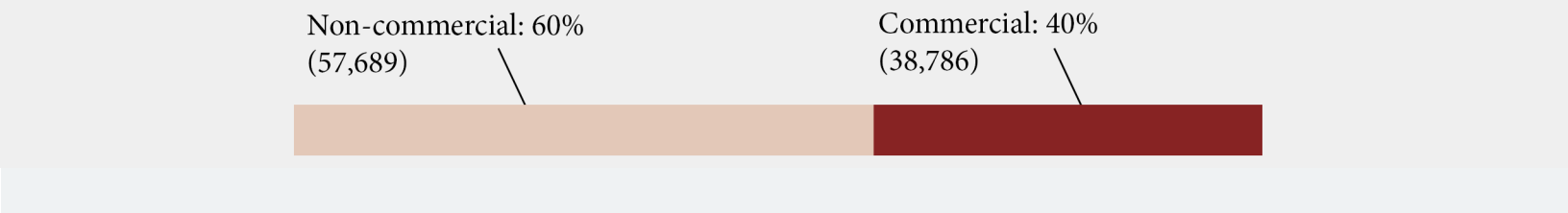
Humans need to find safe ways to coexist with bats. For example, Nipah virus outbreaks in Bangladesh were associated with consumption of date palm sap contaminated by fruit bat saliva. Farmers responded by covering the sap pots with bamboo skirts to protect them from bats overnight.[35] Solutions like this transform how people interact with wildlife and are key to reducing disease risk.

BATS

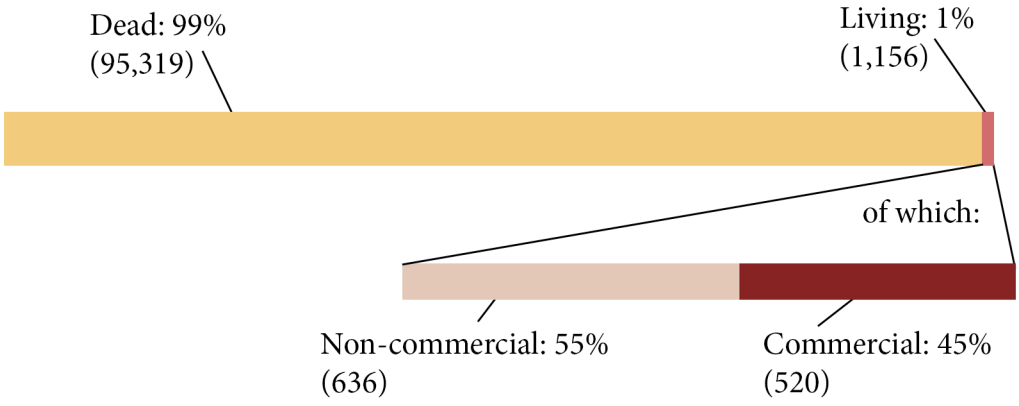
Top 4 Purposes for Imports *(Figure 1)*



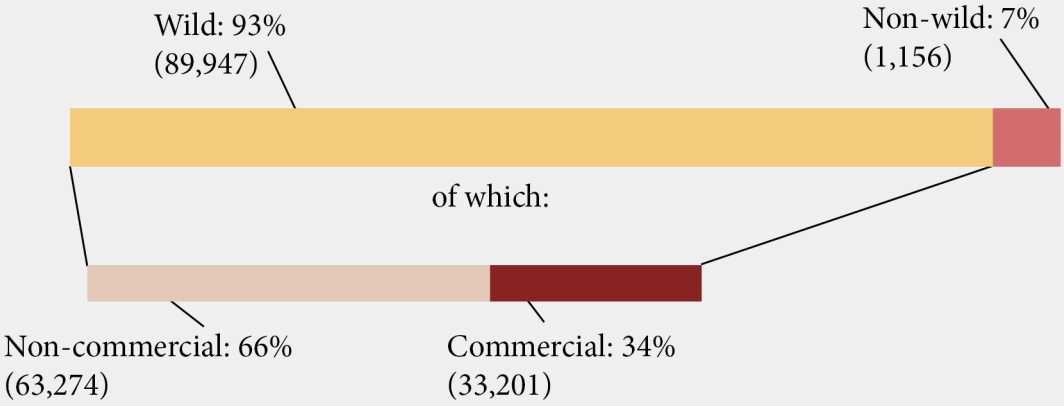
Commercial vs. Non-commercial Imports *(Figure 1a)*



Living vs. Dead Imports *(Figure 2)*



Wild vs. Non-wild Imports *(Figure 3)*



Top 5 Species Imported *(Figure 4)*

1. Unspecified species
38,966 imported
Photo by Gerry Carter

2. Japanese pipistrelle *(Pipistrellus abramus)*
9,634 imported
Photo by Manuel Ruedi

3. Common or vampire bat *(Desmodus rotundus)*
6,502 imported
Photo by Mark Dumont

4. Straw colored bat *(Eidolon helvum)*
4,038 imported
Photo by Diana Ranslam

Seba's short-tailed bat *(Carollia perspicillata)*
2,318 imported
Photo by Bernard DUPONT

U.S. PRIMATE IMPORTS

Primates are highly imperiled: Around 60% are threatened with extinction, and 75% are declining in number.[36] These animals play a key role in their ecosystems, especially in the tropics, where they help regenerate forests and maintain ecosystem health.[37] Primates include apes, monkeys, lemurs, lorises, tarsiers — and, of course, humans. Because we are so closely related, nonhuman primates can be key hosts or intermediaries for zoonotic diseases.[38] Scientists believe great apes are most likely to transfer diseases to people since they are our closest relatives, as humans are part of the same taxonomic family (Hominidae).[39]

Over the five years reviewed, the United States imported 13,225 shipments of primates containing a total of 2,068,328 dead and live individual primates, primate skulls, products (such as boots), milliliters of blood, skins and trophies. These shipments included, at bare minimum, 109,745 primates.

The primary purpose for these imports was biomedical research, but commercial imports were a close second, followed by scientific research (Figure 5). Only about 21% of the imported primate products were sourced from the wild. There is limited trade in living primates (5%), which is due in part to a CDC ban on U.S. imports of live primates as pets due to previous disease outbreaks.[40]

The vast majority of primates are imported as "specimens" for the biomedical research industry, and these imports include milliliters of blood (imported as "ml") and other samples. Some primates were imported for commercial use, with live animals brought in by such companies as Charles River, Genentech, VRL Laboratories and Medimmune.

Commercially, the U.S. also imported primate skulls and primate "bodies" as décor, including baboons, macaques and slow lorises. The U.S. also imported shoes (from unknown marmoset parts) and medicinal products containing primates, though around half of the medicinal products were refused entry.

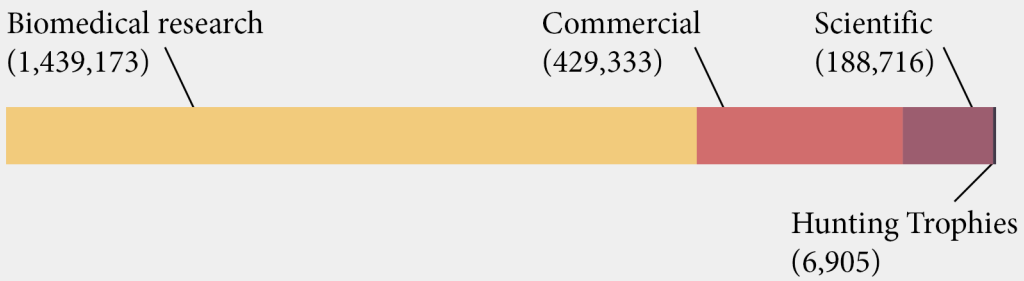
Over the 5 years, 1,014 primate skulls (in 37 shipments) were imported.
Photo by Museum of Veterinary Anatomy FMVZ USP.

BIOMEDICAL RESEARCH AND THE PRIMATE TRADE

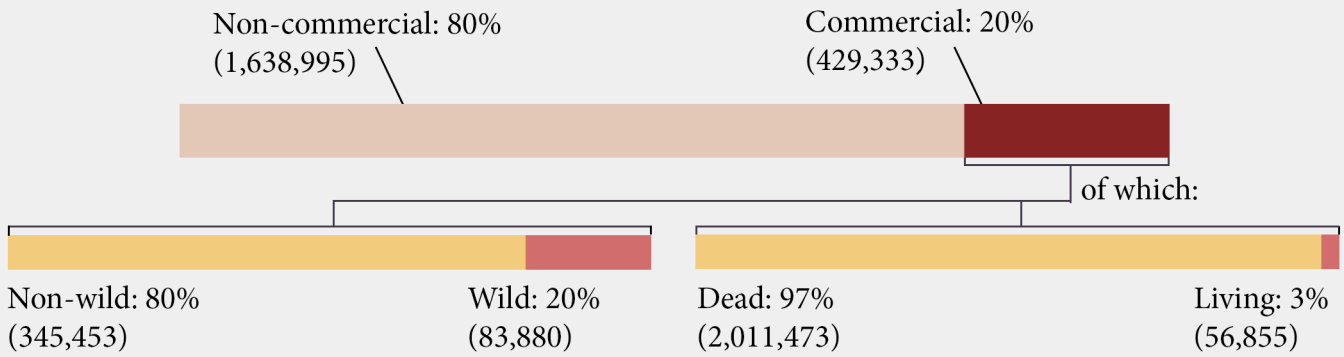
During the period in review, biomedical research was the primary purpose for U.S. primate imports. Of the 1,439,173 primate imports reported, around half represent milliliters of blood and other samples imported for biomedical use. Of the imports for biomedical purposes, 237,036 were from wild-caught primates. While most of these imports are from primates sourced from captivity, all primates can be sources of pathogens, regardless of their source.[41]

Of the biomedical imports, 36,795 were living primates. Laboratories have been identified as posing a risk of viral spread due to the direct interface of humans and primates.[42] For example, the United States previously imported the Ebola virus in primates from the Philippines brought to a U.S. lab.[43]

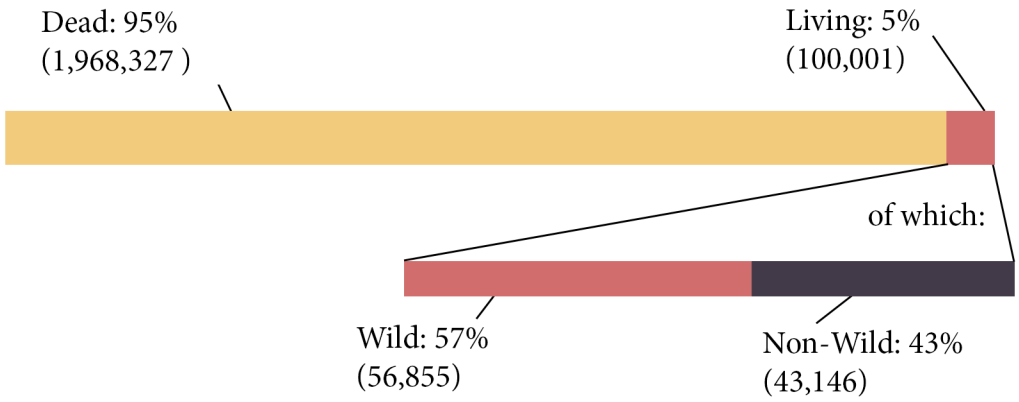
Top 4 Purposes for Imports *(Figure 5)*



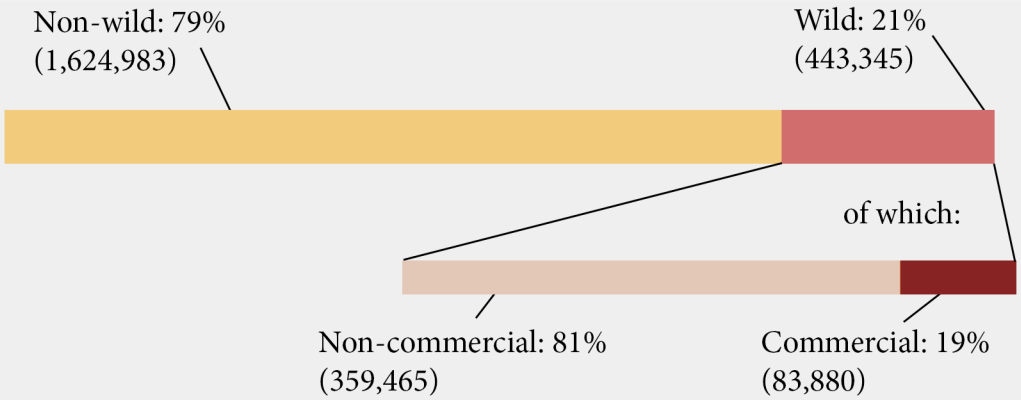
Commercial vs. Non-commercial Imports *(Figure 5a)*



Living vs. Dead Imports *(Figure 6)*



Wild vs. Non-Wild *(Figure 7)*



Top 5 Species Imported *(Figure 8)*

1. Crab-eating macaque *(Macaca fascicularis)*
1,744,628 imported
Photo by Paul Williams

2. Rhesus monkey *(Macaca mulatta)*
95,024 imported
Photo by Sharp Photography

3. Green monkey *(Chlorocebus sabaeus)*
65,160 imported
Photo by Sharp Photography

4. Grivet *(Chlorocebus aethiops)*
47,673 imported
Photo by Rod Waddington

5. Olive baboon *(Papio anubis)*
11,061 imported
Photo by Vince Smith

U.S. RODENT IMPORTS

Rodents make up roughly 40% of all mammals,[44] and given their near omnipresence, they can rapidly spread disease. Like bats they come from an ancient order that is diverse, experience states of torpor (light hibernation), and live around humans — all of which make them susceptible carriers of disease.[45] While bats host more viruses per species than rodents, rodents host more zoonotic viruses overall because, by all estimates, there are twice as many rodents as bats.[46]

Though people commonly think of mice and rats as rodents, these animals range from chipmunks and squirrels to chinchillas and hamsters to porcupines and beavers. A 2015 study found that rodents from the wild "were implicated as a source of spillover for 58% . . . of zoonotic viruses."[47] Rodents are present on nearly every continent and play important ecological roles in the ecosystems in which they are found.[48]

Over the five years reviewed, the United States imported 23,571 shipments of rodents containing 20,784,238 rodent hair and hair products (such as fishing flies and paint brushes); leather products, garments and skins; live animals; and hunting trophies. These shipments included, at bare minimum, 2,464,583 rodents.[49]

Most of the top 20 importers of rodent hair products are sporting goods or outdoor companies.
Photo by Andrew Bonamici.

WHAT YOU MIGHT NOT KNOW ABOUT THE PET TRADE

Wildlife captured and sold as pets spurs disease outbreaks around the world. For example, the 2003 monkeypox outbreak in the United States was tied to imports of small African rodents that passed the disease on to prairie dogs and then people.[51] Ringworm infections were traced to African pygmy hedgehogs or chinchillas.[52]

Many salmonella outbreaks in people have been attributed to the pet trade. This includes salmonella outbreaks in people traced to African pygmy hedgehogs in the United States and Canada,[53] reptiles (particularly iguanas)[54] and some wild passerine birds from Norway.[55]

A new variant of the rabies virus arose in Brazil from marmosets (a type of primate) captured for the pet trade.[56] The importation of a live Egyptian rousette bat to a French pet store caused 120 people to become infected with encephalitis, which causes brain inflammation.[57] Commercially traded prairie dogs from the wild led to a tularemia outbreak, which causes fever, inflammation, and other symptoms in people.[58]

Some of the small carnivore trade implicated in the emergence of SARS was driven by people keeping animals as pets or using them for exhibition in private zoo collections.[59] An outbreak of the lymphocytic choriomeningitis virus, which has numerous symptoms and causes neurological disease, resulted from the hamster trade for pets.[60]

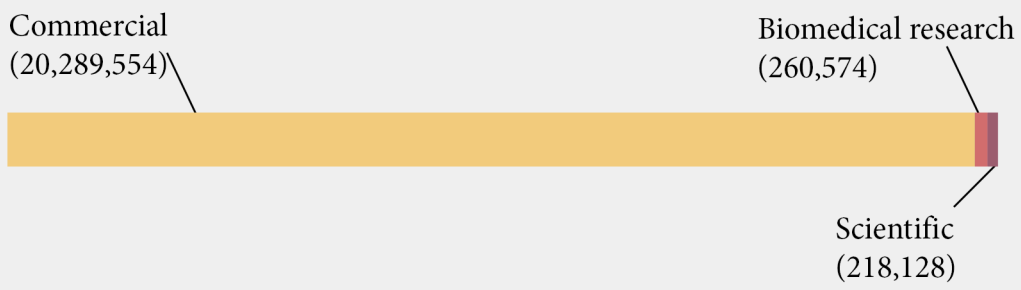
These are just a few of the known examples of diseases spread to people from the pet trade. But the pet trade is also implicated in diseases that infect wildlife as well.[61] Many of the measures being proposed and adopted in response to the current pandemic fail to address the pet trade. While our research did not identify any pandemics that were tied to trade for pets, this live trade in wildlife undeniably spreads disease and threatens biodiversity.

Most of these imports were for commercial reasons, followed by biomedical research and scientific purposes (Figure 9). The vast majority were wild-caught, as shown in Figure 11, and as noted above, wild rodents have been tied to 58% of zoonotic viruses.[50] Living rodents represent only 4% of the total number of rodent imports. A similarly small percent (0.04%) of commercial imports were living, meaning that the majority of rodent imports are dead.

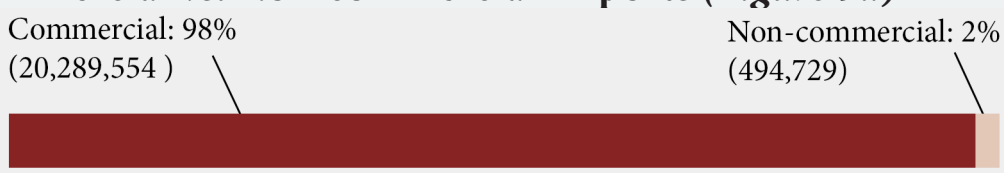
Products made with rodent hair were the top commercial imports, including fishing flies and paint brushes. For skins, all the imports were of muskrats from Canada. The live imports were primarily hamsters from the Czech Republic.

RODENTS

Top 3 Purposes for Imports *(Figure 9)*

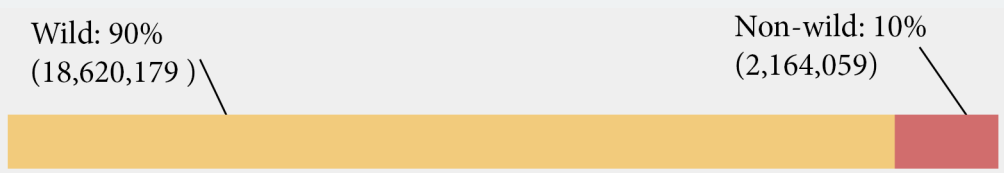


Commercial vs. Non-commercial Imports *(Figure 9a)*



Living vs. Dead Imports *(Figure 10)*

Wild vs. Not Wild *(Figure 11)*



Top 5 Species Imported *(Figure 12)*

1. Eastern gray squirrel *(Sciurus carolinensis)*
14,842,974 imported
Photo by BirdPhotos.com

2. Common muskrat *(Ondatra zibethicus)*
1,632,005 imported
Photo by eugene beckes

3. Chinese hamster *(Cricetulus griseus)*
771,377 imported
Photo by Tristanspotter

4. American beaver *(Castor canadensis)*
643,120 imported
Photo by Steve/Flickr

5. Eastern or fox squirrel *(Sciurus niger)*
465,734 imported
Photo by Ingrid Taylar

U.S. IMPORTS IN SUM

U.S. imports of bats, primates and rodents include substantial commercial trade (Figures 1a, 5a, 9a) for décor, hobbies, fashion and pets. The most common commercial imports were primate skulls, bat paperweights and rodent hair fishing flies and paint brushes.

If commercial consumer demand for these animals and products made from them were eliminated, it would reduce U.S. imports of bats by 40%, primates by 20% and rodents by 98%. Clearly consumer wildlife demand in the United States plays a role in driving wildlife exploitation.

Most U.S. imports are not live animals (Figures 2, 6, and 10) but are instead (dead) wildlife products. This means the United States outsources initial disease risks to other countries where the wildlife is captured, transported, killed and processed before being shipped. Yet, as the COVID-19 pandemic has demonstrated, when diseases emerge in other countries, they can rapidly spread back to the United States.

In sum, U.S. consumer demand for things like decorations made from bats encased in acrylic, primate skulls for décor, and rodent-hair fishing flies fuels risky interactions with wildlife and habitat by people in other countries.

This data also reveals that U.S. wildlife demand is helping fuel the extinction crisis. The high percent of wild-caught imports, especially of bats (93%) and rodents (90%), shows that the U.S. market fuels exploitation of wildlife, which is driving species' loss at a large-scale.[62]

Curtailing the wildlife trade in the United States would not only benefit future efforts to avoid the emergence of new diseases but also help combat the ongoing loss of species globally.

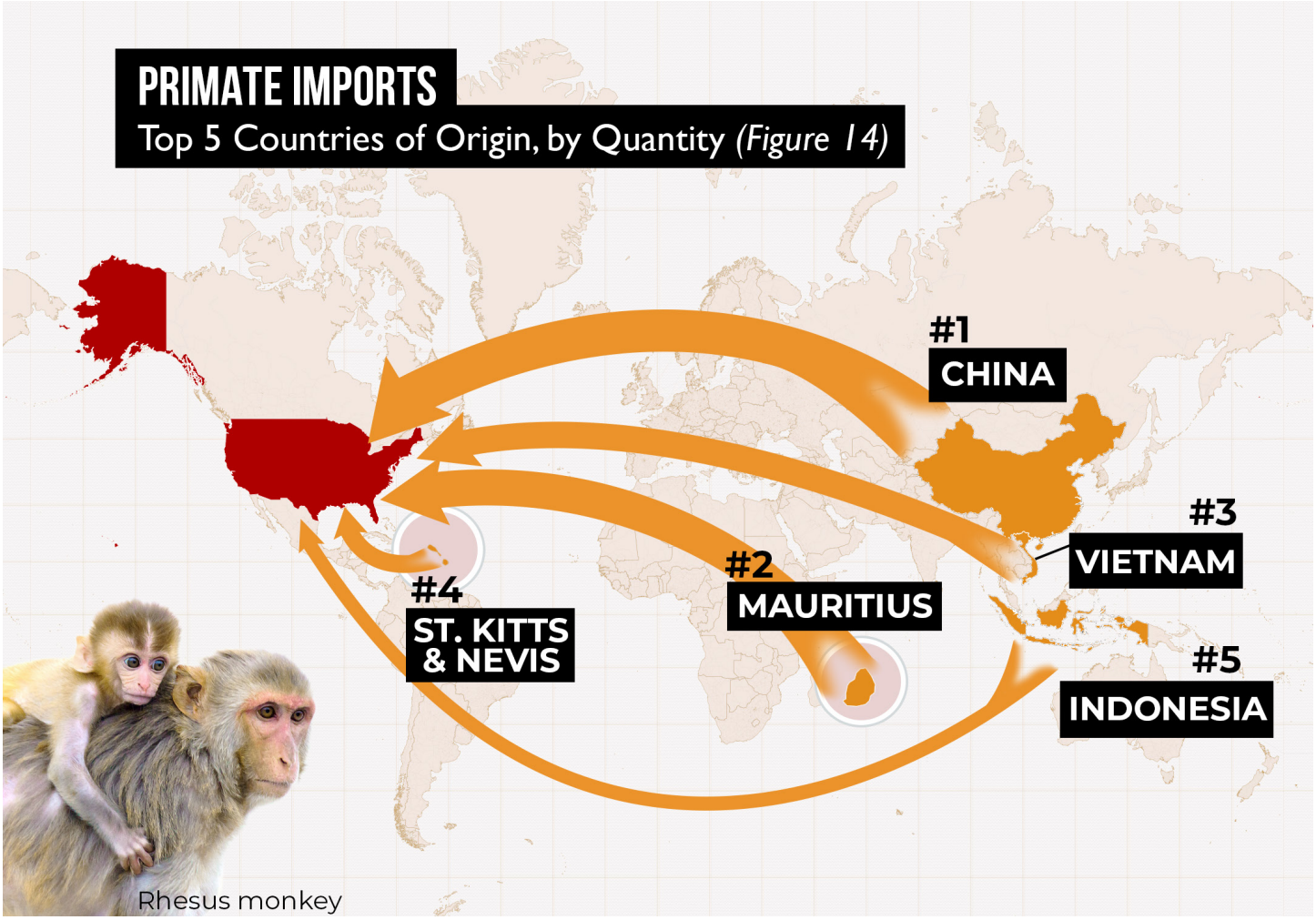
Photo by Mokele

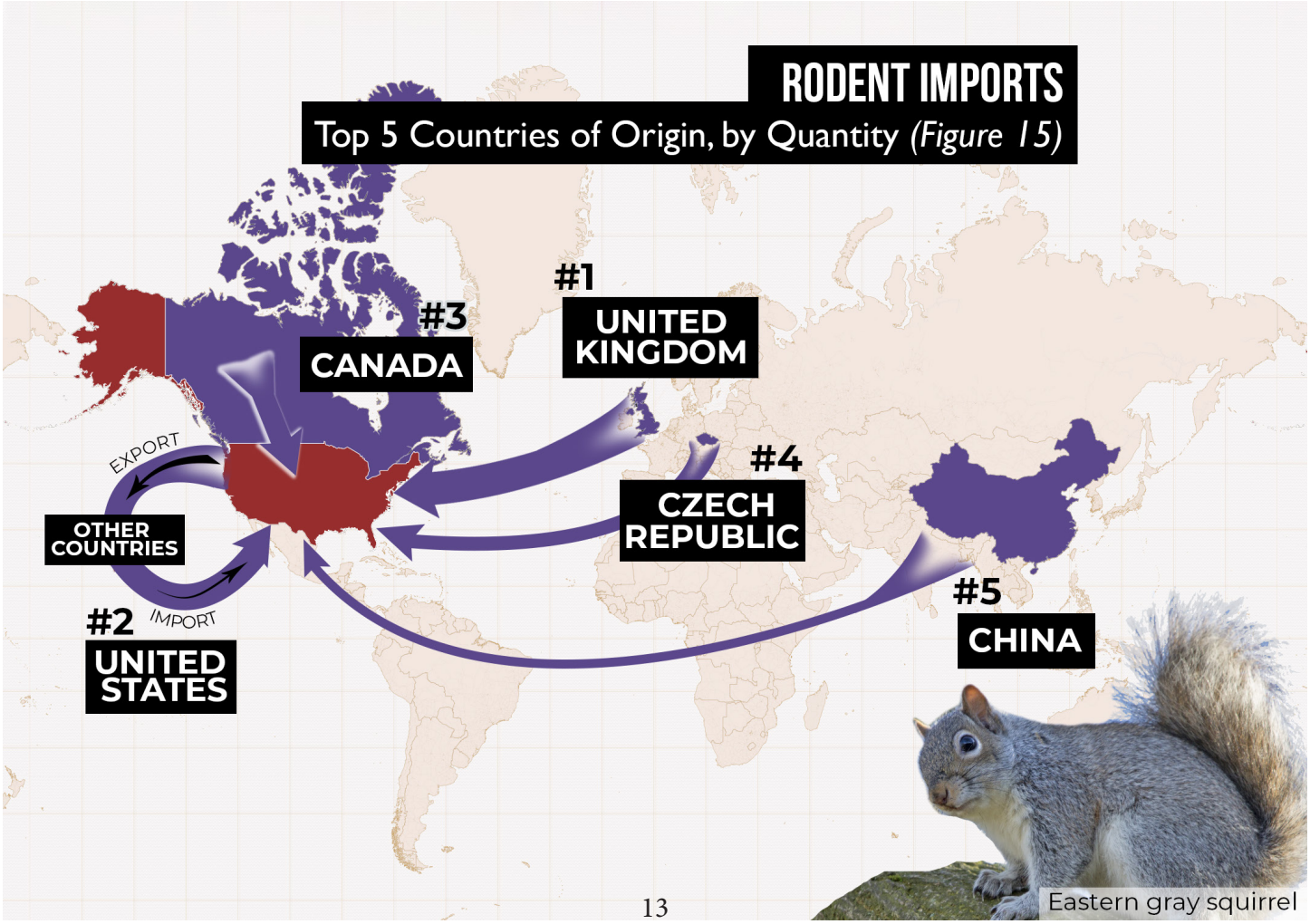
Photos from top:
Pet pygmy marmoset,
vampire bat skeleton,
squirrel fur skins.

Caged monkey in a market by Wolf Gordon Clifton / Animal People, Inc.

WHERE DO IMPORTED BATS, PRIMATES AND RODENTS COME FROM?

We analyzed the top five countries from which the United States imported bats, primates and rodents. The following diagrams show the origins of U.S. imports.


PRIMATE IMPORTS
Top 5 Countries of Origin, by Quantity (Figure 14)
#1
CHINA
#2
MAURITIUS
#3
VIETNAM
#4
ST. KITTS & NEVIS
#5
INDONESIA
Rhesus monkey


RODENT IMPORTS
Top 5 Countries of Origin, by Quantity (Figure 15)
#1
UNITED KINGDOM
#2
UNITED STATES
#3
CANADA
#4
CZECH REPUBLIC
#5
CHINA
EXPORT
IMPORT
OTHER COUNTRIES
Eastern gray squirrel

China makes the top five for all three groups. A number of other countries primarily though not entirely in the developing world are also top exporters of bats, primates and rodents to the United States.

Above all else, this data and the related diagrams illustrate the truly global nature of the wildlife trade and the role that the United States plays in fueling demand for species known to harbor diseases from around the world.

The data shows that U.S. consumers help fuel disease risk in China and other countries through our demand for wildlife, including animals known to harbor many diseases like bats, primates and rodents. Thus when diseases break out in countries that supply the wildlife trade, consumer countries such as the United States must also be held accountable for their role in the trade.

Curtailing consumer demand is also key to fighting the extinction crisis. As the diagrams show, bats, primates and rodents imported to the United States are sourced from many biodiverse regions of the world. U.S. exploitation of wildlife and our consumption of at least 20% of the trade means that the United States also needs to transform its current practices if we are to halt the ongoing loss of biodiversity.

BACKGROUND

ZOONOTIC DISEASE EMERGENCE AND THE EXTINCTION CRISIS — WHAT'S DRIVING THE RISK?

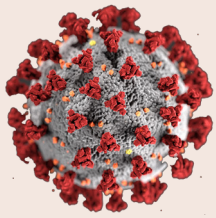
Infectious diseases cause about a quarter of all human deaths annually, and almost 60% of infectious diseases are zoonotic in nature.[63] Of all known zoonotic diseases, more than 70% are from wildlife versus domesticated animals.[64] The World Health Organization (WHO) and many experts predict future human pandemics will stem primarily from wildlife, like the SARS-CoV-2 virus causing COVID-19 with catastrophic global consequences.[65] Wildlife are natural reservoirs for disease[66] and also hold the unique genetic material that can enable diseases to transmit to humans.[67]

Zoonoses include bacteria, viruses, fungi, parasites and prions.[68] Viruses such as bird flu are the best known and the most frequent zoonoses: They make up more than two-thirds of new pathogens infecting people.[69]

From 1980 to 2005, the worst disease outbreaks were all zoonotic — including HIV, Ebola, SARs and bird and swine flu — and these types of disease outbreaks have been increasing exponentially.[70] Scientists documented over 25 years the emergence of 35 new infectious diseases that can spread to people — the equivalent of a new disease emerging every eight months.[71] They estimate that potentially 650,000 to 840,000 zoonoses have yet to emerge.[72]

Zoonotic diseases emerge not because of wildlife, but because of people. We put ourselves at risk of contracting novel pathogens by exploiting wildlife[73] and destroying and fragmenting wildlife habitat.[74]

CORONAVIRUSES



Coronaviruses are RNA viruses that belong to the Coronaviridae family.[75] There are four main subgroups of coronaviruses: alpha, beta, gamma and delta.[76] Of these, the alpha and beta-coronaviruses infect mammals.[77] To date there are seven coronaviruses known to infect people, and they all came from animals.[78] Four of these viruses — HCoV-NL63, HCoV-229E, HCoV-OC43 and HKU1 — cause cold-like symptoms. Three have been far more detrimental to people. SARS (caused by SARS-CoV) emerged in 2002-03 with a 9-10% mortality rate in humans.[79] MERS (caused by MERS-CoV) emerged in 2012 with a 37% mortality rate in humans.[80] And now COVID-19 (caused by SARS-CoV-2) has emerged.[81] Both SARS and MERS are thought to have spilled over to people through intermediary hosts — civets and dromedary camels, respectively — with both viruses thought to originate from bat hosts.[82]

Asian palm civet by Praveenp

As our population grows and the climate changes, the risk increases of people encountering or playing a role in new diseases emerging.[83] People search for wildlife in new habitats, breed more animals and wildlife, transport more and varied species to markets or for processing into commodities (alive or dead) — all of which risks disease emergence.[84]

Whatever the zoonotic disease, it likely infected people exploiting wildlife, destroying or fragmenting habitat, or both. The pet trade, for example, caused a 2003 monkeypox outbreak in the U.S. that infected 72 people. Imported African rodents (including a Gambian giant pouched rat, dormice, and rope squirrels) transferred the virus to captive prairie dogs, who then spread the disease to people who purchased those prairie dogs as pets.[85]

Experts believe SARS originated from a bat and passed to a civet — nocturnal and adorable small carnivores captured for food, pets and international trade — before eventually infecting people.[86] Similarly, Ebola is tied to both pursuit of primates for meat and habitat fragmentation (by road building and mining in pristine habitats), likely spilling from bats to primates to people.[87]

But even years after the emergence of diseases like SARS and Ebola, scientists are still researching their precise origins.[88] We still do not know the exact manner in which many zoonoses came to infect people. This is especially true for viruses that can rapidly mutate to infect humans. Our lack of knowledge necessitates precaution.[89]

And humans are not the only ones at risk. The drivers of disease risk — wildlife exploitation and habitat loss — are also the primary causes of biodiversity loss, according to more than 140 experts convened by the UN.[90] These experts explained in 2019 that we stand to lose more than a million species in the coming decades if we continue with business as usual.[91] The loss of a species unravels its ecosystem with often unpredictable effects. Species extinction also has tangible consequences for people, such as diminished crop pollination, pest control and water purification, as well as spiritual and cultural losses.

Pangolins and snakes in an illegal market by Soggydan Benenovitch

HOW WILDLIFE TRADE FUELS DISEASE EMERGENCE

While wildlife markets and wildlife consumption are often at the fore of discussions of disease emergence, the wildlife trade is certainly the root cause of disease emergence.[92] A recent study found that of all the species on the IUCN Red List, those that are classified as threatened due to declining populations from exploitation "have over twice as many zoonotic viruses as compared to threatened species listed for other reasons."[93] This is likely due to the close contact between people and wildlife during hunting and the wildlife trade.[94]

This is borne out by other studies that tie trade to increased viral loading and disease presence in wildlife. A recent study in Vietnam found that the number of coronavirus-positive rodents increased along the wildlife supply chain.[95] The authors concluded that the "combination of increased coronavirus prevalence in traded wildlife and greater opportunity for human-wildlife contact as well as intra- and inter species contact in trade systems is likely to increase the risk of zoonotic transmission of coronaviruses in wildlife markets, restaurants, and other trade interfaces."[96] In other words, wildlife trade increases both disease prevalence and risk of transmission to people.

A review of pangolin samples in the wake of potential ties between pangolins and SARS-CoV-2 (the virus causing COVID-19) found no coronavirus evidence in pangolin samples confiscated within their country of origin.[97] However, pangolins confiscated in China, which were presumably far along the wildlife trade supply chain, tested positive for coronaviruses and a host of other diseases. The study theorized that the longer the animals were in the supply chain the more likely they were to acquire diseases.[98]

A similar study in China tested civets, the species thought to be the intermediary host for the SARS outbreak. The study found a higher incidence of antibodies in civet samples from markets compared to those from civet farms, with one exception: a farm that raised civets for the pet trade that had acquired its animals from markets.[99] The authors concluded that exposure to the virus likely occurred once the civets entered the wildlife trade supply chain. They identified two factors to support his theory: "most animal traders deal with multiple species" and housed "different animals in close proximity," both of which "facilitate[s] interspecies transmission" of disease.[100]

Another study found that "[d]iverse species of wild animals that are confined in zoos, sanctuaries, kept as pets, and sold at markets are also subject to circumstances that facilitate cross-species virus transmission via intimate contact, particularly for zoonotic viruses already adapted to transmission among domesticated animals."[101] In other words, when wildlife is traded, the disease risks increase.

These studies show that the exploitation of, human demand for, and trade in wildlife increases disease risk. By stressing animals and then putting them in unnatural combinations in trade and transit, the wildlife trade creates the perfect conditions for new diseases to emerge and infect people.

RECOMMENDED ACTIONS: END U.S. DEMAND BY HALTING THE WILDLIFE TRADE

We cannot continue to ignore that U.S. demand for wildlife is a problem that both increases the risk of disease emergence and drives the extinction crisis. Scientists researching both phenomena recommend re-envisioning our relationship with wildlife, animals and nature.[102]

It is crucial we evaluate risk along the entire supply chain from "collection, preservation, packing and shipment methods" and how species are transported and to where.[103] Change cannot occur only in wildlife-rich regions primarily in the developing world that commonly provide wildlife products.

Scientists have identified that threats to species are driven by consumer demand from around the world. Consumers who benefit from the resulting degradation and destruction of species and their habitat also bear responsibility for threat reduction.[104] This report documents the significant role the United States plays in the wildlife trade and highlights the need for U.S. action.

The overwhelming scientific evidence points to the need for swift U.S. action if we are to halt new diseases from emerging and curb species loss. Our detailed recommendations are available in "End Wildlife Trade: An Action Plan to Prevent Future Pandemics."[105] We highlight here that:

- The United States should immediately implement a ban or moratorium on the wildlife trade. This will reduce demand and dry up wildlife supply chains. However, to be effective, the moratorium must be accompanied by significant funds for international conservation and to transition livelihoods away from the wildlife trade in wildlife-producing countries.

- Efforts must be made to strengthen U.S. conservation efforts to fight the wildlife trade globally and to restore U.S. leadership in international wildlife and habitat conservation efforts. Only through a concerted global effort can we reduce risk.

It is past time that wildlife-consuming countries recognize their role in driving disease risk and species loss. We recommend further review and analysis of U.S. wildlife imports beyond bats, primates and rodents as many other kinds of wildlife are imported that are known to harbor zoonoses and face extinction from overexploitation. Only transformative change will suffice to protect our health and our planet.

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