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Wildlife Trade and COVID-19: Towards a Criminology of Anthropogenic Pathogen Spillover

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WILDLIFE TRADE AND COVID-19: TOWARDS A CRIMINOLOGY OF ANTHROPOGENIC PATHOGEN SPILLOVER

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The general remit of this paper is the role of wildlife trade in pathogen spillover. Its underlying assumption is that, so far from being the exclusive domain of the life sciences, the study of pathogen spillover will be greatly enhanced by multi-perspectival approaches, including One Health and those employed here, namely, non-speciesist green criminology and critical animal studies. The paper moves from discussions of zoonosis, anthroponosis and wildlife trade to the emergence of COVID-19 in Wuhan, China. The paper recommends the abolition of all wildlife trade and the reclamation of wildlife habitat and broaches discussion of the extension of legal personhood to wild animals.

Key Words: anthroponosis, COVID-19, pathogen spillover, speciesism, theriocide, wildlife trade, zoonosis, Wuhan

Introduction

The general remit of this paper is how wildlife trade encourages pathogen spillover. Its particular focus is zoonosis, though the very neglected anthroponosis will have its say here too. Entangled and distinct though the numerous species on planet Earth may be, the study of pathogen transmission is conventionally framed in the speciesist worldview of human exceptionalism, i.e. in respect of COVID-19, a zoonosis, we humans are the devastated victims of a disease transmitted to us by non-human animals (henceforth, 'animals'). The paper is intended as a corrective to this prejudice. Its underlying assumption is that, so far from being the exclusive domain of the life sciences—conservation biology, ecology, epidemiology, infectious diseases, microbiology, tropical medicine, veterinary science and biosecurity studies—the study of pathogen transmission is greatly enhanced by multi-perspectival approaches, including those employed here, namely, non-speciesist green criminology and critical animal studies.

At the most abstract level, much of the modern predicament, the philosopher Giorgio Agamben indicates, is the relationship between nature and humankind. He suggests that the key to this relationship is 'only the 'between', the interval…or the play between the two' (Agamben 2004: 83). As it now stands, it is the ideology and practices of speciesism that govern the 'between' between Agamben's nature and humankind. Speciesism is the ideological anchor of the intersecting networks of the animal industrial complex: factory farms; vivisection; hunting/fishing; zoos/aquaria and wildlife trade. The anthropogenic harms and pollution of this unprecedented biopower are seriously aggravated by deforestation and mining operations. In sum, they are rapidly pushing planet Earth towards climatic and ecological catastrophe (Brisman *et al.* 2018: chapter 4; White 2018; Kramer 2020). The loss of biodiversity is manifest in myriad

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ways, including the declining health and possible extinction of charismatic megafauna and of lesser known or still undiscovered species of amphibians, birds, fishes, reptiles and flora. Indeed, a recent United Nations (2019) report on global biodiversity estimates that the past half-century, due to unprecedented anthropogenic activity, 82 per cent of wild mammal biomass has been lost worldwide. Moreover, 40 per cent of amphibians, almost a third of reef-building corals, more than a third of marine mammals and 10 per cent of all insects face looming extinction (Bar-On *et al.* 2018; Brisman and South 2019; World Wildlife Fund 2020).

Green criminologists have done much of late to excavate the various components of the animal industrial complex, especially wildlife trade. In particular, in vigorously opposing animals' master status as human property, they have addressed how wildlife trade contributes to habitat degradation and to declining species diversity (e.g. Wyatt 2013; White 2017; 2018; Taylor and Fitzgerald 2018; Sollund 2019). They have also shown how, like other trades having both legal and illegal sectors, such as those in drugs, guns and humans, estimates of the extent of wildlife trade inspire little or no confidence (Maher and Wyatt 2017; Sollund 2019: 9; 224–26). This is so because monetary estimates cannot but fail to grasp the harms experienced by victimized animals themselves. From a non-speciesist perspective, these harms primarily lie in the trauma of abduction, pain and suffering, deprivation of bodily liberty and, ultimately, the loss of all future enjoyment of their lives through theriocide (Beirne 2014; 2018: chapter 2).

A preliminary caution must be issued about how this paper engages with the meaning of wildlife trade. By this term, the paper refers to the entire chain of commodified activities, legal or illegal, from the forcible capture and abduction of wild animals and their body parts to their subsequent transport and translocation within and between one or more regions and eventual sale in a market in person or online for pecuniary or other gain. However, it refrains from examining the manifest theoretical difficulties with the characteristics commonly attributed to *wild* animals—such as whether the conventional distinction between wild and domesticated animals is misplaced, whether mosquitoes and arachnids, e.g., are wild animals and how wild the lives of animals actually can be in the Anthropocene.

Moreover, whereas green criminology tends to hold that wild animals are neither domesticated nor livestock nor animals appointed as companions (Wyatt 2013: 2; Nurse 2015: 15) and also that they 'live free from human dominion' or are 'born as free individuals' (e.g. Goyes and Sollund 2018: Sollund 2019: 5; 364), these identifying criteria are not employed here. This is not because the concept of wildlife awaits renewed theorization in criminology (of any stripe and hue), which it does, but that in respect of those animals who cower or disappear in the pages of this paper, wild animals can be *locationally wild* and survive in remote 'wilderness' regions and protected areas (Benton 1993: 66–68) or *dispositionally wild* and held captive in intensive rearing regimes, experimental laboratories, zoos/aquaria and even in urban areas and domestic residences (cf. 'Whom and what do I touch when I touch my dog? [I touch the wild. I touch family]' Haraway 2008: 1).

The paper moves from a discussion of (1) zoonosis and anthroponosis to (2) wildlife trade and industrial animal production to (3) their conjunction in the likely emergence of COVID-19 in Wuhan, China, where the virus surfaced as, perhaps, the last link in a lengthy chain of national and international wildlife trade.

Zoonosis and Wildlife Trade

The term zoonosis is a late-19th-century invention coined from the ancient Greek ζῳον (one of the classical words for 'animal') and νόσος ('disease'). The term typically refers to a pathogenic bacterium, fungus, parasite or virus and the process of its transmission either from animal to animal or from animal to human. In the 1940s, when the study of zoonosis first gained prominence, it was understood as a chain whose necessary and ascending links were enzootic-epizootic-zoonosis. Since the early 1990s, between-the-species pathogen transmission has been articulated as emergence or spillover, reassortment and species jumping or, even, the happenstance of the wrong bat meeting the wrong pangolin meeting the wrong human at the wrong place. A zoonosis can be transmitted to humans through contact with the saliva, blood, urine, faeces or flesh of an infected animal through bites from certain arachnids and insects, by touching a surface or an object touched by an infected animal and by encountering pathogens through contaminated aerosols and liquids. At least 60 per cent of known infectious diseases are zoonoses. For previously unknown ('novel') or emerging infectious diseases, the figure is closer to 75 per cent (Centers for Disease Control and Prevention 2020).

The Oxford English Dictionary adds another dimension to zoonotic transmission, namely, that it is 'a disease communicated from one kind of animal to another or to a human being…*usu[ally] restricted to diseases transmitted naturally to man from animal*' [italics added]. This definition harbours several difficulties. What does 'naturally' mean? Not all zoonoses are naturally transmitted *from animals to humans*. Some -noses are *anthropo*noses. For example, there is strong evidence that *H1N1* is mostly an anthroponosis (Nelson and Vincent 2015). There will be more to say on this later.

Another difficulty is that the OED's adverbial 'naturally' is too vague. What is natural about 'diseases transmitted naturally?' Is it their inevitability, perhaps? Does it mean that they conform with the laws of nature? If so, then presumably a sufficient explanation of a zoonotic event would naturally embrace *no more than* concepts and empirical statements drawn from the life sciences and packaged into the aetiological architecture of positivist science. However, such an explanation would be overly narrow- or closed-minded. Consider, e.g., the origin(s) of the influenza pandemic of 1918–20. While its precise evolution is still uncertain, a life science explanation would read something like this: 'it is almost certain that the ancestral virus of this pandemic underwent two host shifts: at first, at some point before 1918, from an avian reservoir to a mammalian one and, afterwards, from mammals to humans in what eventually became the viral genome'. However, as an explanation of infection, outbreak or pandemic, this would not suffice. It could explain neither the geographical origin nor the rapid growth of the influenza outbreak, e.g., nor why some human populations were more affected than others in the subsequent pandemic (Reis *et al.* 2009).

Some have claimed that the 1918 influenza outbreak originated in Kansas in the United States. Well-attested documentation from early 1918 shows that farmworkers and others in Haskell County, Kansas, came down with a virulent strain of flu and that, after they had enlisted as military recruits, the virus quickly spread to soldiers at Fort Riley and Camp Funston in southwestern Kansas and for whom pigs and poultry were bred for consumption in intensive rearing regimes Barry 2004; Cheng and Leung 2007; Byerly 2010; : 360). There is more, however. While American soldiers by the

thousands actually did leave for the Western front of World War I in 1917 and 1918, some of their basic training in Kansas had been undertaken by British and French officers diverted from the European theatre. So, who transmitted the virus to whom and when? Poor Kansas farmers, American recruits or British and French officers? What eco-sociological contexts did each of these groups bring to the others?

The leading British virologist, Professor John Oxford and his colleagues offer a convincing explanation of the flu's outbreak among British soldiers fighting in France during World War I. They show that the first of several waves of the epidemic occurred between December 1916 and March 1917 at the British military base in Étaples in northern France (Oxford *et al.* 2005: 942; Oxford and Gill 2018):

> In the outbreak soldiers were admitted to the base hospitals, suffering from an acute respiratory infection, high temperature, and cough at a time when recognised influenza was present…Undoubtedly, overcrowded conditions on the Western front and in the camp, with most of the 100,000 soldiers being housed in tents or temporary wooden barracks, were ideal for spread of a respiratory virus. At this time, ambulance trains were arriving day and night from the Somme battlefield. The camp also had an extensive piggery whilst in nearby villages soldiers could purchase live geese, chickens and ducks. Therefore, the requisite conditions for cross species transfer of avian influenza A virus existed at the camp alongside large numbers of young soldiers in overcrowded conditions and many with a compromised respiratory system after gas attacks. In total, two million soldiers camped in this small region of Northern France, and six million soldiers occupied stretches of the 10-mile-wide trench system from the English Channel to Switzerland.

In this account of the influenza's growth, note that 'undoubtedly, overcrowded conditions on the Western front and in the camp…were ideal for spread of a respiratory virus'; that '[t]he camp also had an extensive piggery'; that '[in nearby villages] soldiers could purchase live geese, chickens and ducks' and that '[t]herefore, the requisite conditions for cross species transfer of avian influenza A virus existed'.

In other words, an explanation of the growth of the 1918–20 flu pandemic necessarily involves reference to at least two lines of enquiry. One is the virological transmission from the reservoir species to an intermediate host—the proper focus of life science enquiry. The other is the eco-sociological context in which the virus was transmitted to a human, who then infected other humans. If Oxford's data about the rearing and consumption of species as edibles are accurate, then pigs and chickens were produced on factory ('extensive') farms ('piggeries') and geese and ducks were either similarly produced or else were captured in the wild. Overcrowded conditions on the Western front encouraged the virus to spread from one human to another and then quickly to become an outbreak and pandemic.

Might this sort of multidisciplinary explanation of the origins of the 1918 flu pandemic also apply to other zoonotic outbreaks? Among the most notorious of such outbreaks, post-1920 and continuing, are these 15: rabies; equine influenza; Rift Valley fever; Q fever; West Nile virus; hantavirus; acquired immune deficiency syndrome (AIDS); Lyme disease; Ebola; variant Creutzfeldt–Jakob disease; Nipah virus; avian flu; severe acute respiratory syndrome (SARS); swine flu; and Middle East respiratory syndrome (MERS). My reading of scholarly articles published in major life science journals from 1998 to 2020 is quite instructive about the origins of these 15 diseases (Purdey 1998; Webster *et al.* 2002; Webster *et al.* 2002; Muranyi *et al.* 2003; Reid *et al.* 2004; Leroy *et al.* 2005; Taubenberger *et al.* 2005; Luby *et al.* 2006; Angelakis and Raoult 2010; Sharp

and Hahn 2010; Raj *et al.* 2014; Houston *et al.* 2015; Nelson and Vincent 2015; Velasco-Villa 2017; Centers for Disease Control and Prevention 2019, Lake 2020; van Staden 2020; World Health Organization 2003, 2004, 2020; World Organization for Animal Health 2020).

Three aspects of these zoonoses deserve further comment. First, the species diversity of animal hosts, both reservoir and intermediate, is extraordinary. The list includes antelopes; badgers; bats; birds; camels; cats (companion, feral and wild); cattle; chickens; chimpanzees; civets; dogs (domesticated, stray and free-roaming); ducks; equidae (donkeys, horses and mules); ferret-badgers; foxes; geese; genets; goats; gorillas; insects (mosquitoes and sandflies); linsangs; marine mammals and turtles; monkeys; mustelids; otters; martens; minks; pigs; porcupines; racoon dogs; rodents (mice and rats); sheep; skunks; snakes; ticks; turkeys; weasels and wolverines.

Second, the highest-risk taxa for zoonotic transmission are probably bats, rodents and non-human primates, and the major spillover sites are wildlife trade and industrial animal production on factory farms.[1] Wildlife trade led to eight outbreaks (rabies, West Nile virus, hantavirus, AIDS, Lyme disease, Ebola, avian flu and SARS); industrial animal production led to five (equine influenza, Rift valley fever, Q fever, variant Creutzfeldt Jacob disease and swine flu) and both sites led to two outbreaks (Nipah virus and MERS).

Third, speciesism infiltrates knowledge of whose deaths are monitored and afterwards recorded and publicized. It has been recognized since the 1980s that, for any given cause (e.g. homicide, suicide and natural causes), the number of actual and recorded deaths sometimes differ. There are more or less accurate records of human deaths that result from all 15 zoonotic outbreaks above. However, on most occasions, the species and number of theriocides ('culls') are either officially recorded as unknown or else altogether unmentioned. As in life, so too in death and post-mortem, speciesism rules.

The causal influence of wildlife trade on the emergence of zoonotic outbreaks can be divided into five analytically discrete, if in practice often overlapping, sites of human–animal interaction:

(1) *Commodification of wildlife*. Worldwide, the highest concentrations of wildlife often occur in indigenous land, though indigenous subsistence hunting rarely, if ever, creates the conditions for biodiversity loss and pathogen transmission. Harms to indigenes, to biodiversity and to animals are enabled when professional hunters and organized profit seekers transform animal bodies into commodified objects of wildlife trade (Wyatt 2013; van Uhm 2016; Potter 2017; Sollund 2019).

(2) *Degradation of wildlife habitat through rapid population growth and intrusive activity*. The growth of human profit-seeking activities and the expansion of human dwellings increasingly allow access to and abut, overlap, pollute, cut through, reduce and destroy wildlife habitat. When humans force animals of numerous species to share their habitats with us, through deforestation or mineral extraction, e.g.,

[1]Zoonoses also occur in the trade for exotic 'pets'. For example, within the French exotic pet trade, a rousette bat (*Rousettus aegyptiacus*) imported from Nigeria infected 120 persons in 1999, while, in Texas, an outbreak of monkeypox among humans in 2003 emerged from pet prairie dogs held in cages adjacent to infected rodents from Ghana (Chomel *et al.* 2007: 9). A laboratory-acquired zoonosis (*Brucellosi*), transmitted from sheep and goats, has even been reported among clinicians working in microbiology laboratories in Spain (11.9 per cent) and elsewhere (up to 2 per cent; Seleem *et al.* 2010: 394).

and when we abduct them, buy and sell their bodies and kill them, we and they are entering unusual and very close relationships rife with massive animal abuse, pathogen spillover and potentially fatal outcomes for all and species extinction for some (Lynch *et al.* 2017; White 2017; Brisman and South 2019).

(3) *Wildlife habitat destruction leads to expanded wildlife trade.* Habitat destruction in one area leads to depopulation, scarcity or extinction of animals and to expanded wildlife trade with adjacent or more distant regions. Increasingly, local wildlife trade becomes national, international and global (Arroyo-Quiroz and Wyatt 2019; Goyes 2019; Sollund 2019)

(4) *More intense contact between species leads to spillover events.* Wildlife trade brings together animals of different species, including humans, who would normally not be in contact with each other. Greater animal-to-animal contact and animal-to-human contact increase the likelihood of zoonotic infection. The growth of wildlife trade and of modern systems of transport and communication allow a virus to travel within a day or two to most corners of the world (Petrovan *et al.* 2020).

(5) *Spillover events need human assistance.* Zoonotic spillover needs not only the commodification of animal bodies, wildlife abductions, habitat degradation, rapid growth of human populations and their profit-seeking activities and abnormal human–animal contact but also a failure to marshal the necessary resources (local, national and international) to detect and treat a viral infection and prevent its spread (Bell *et al.* 2004; Keck and Lynteris 2018; Johnson *et al.* 2020).

While the ultimate origin of much, if not most, zoonoses is anthropogenic, it would be a vanity and quite mistaken to think that pathogen transmission is only a one-way matter. The paper, therefore, now turns to human-to-animal transmission ('anthroponosis').

Anthroponosis

A search of the Scopus database on 21 September 2020 had 26,748 hits for 'zoonosis' but only 607 for 'anthroponosis' or 'reverse zoonosis' for 1963–2020. Anthroponosis has been only sparsely recognized by the life sciences, and its incidence and aetiology only very rarely debated. In the case of those intermediate hosts of the influenza A virus, e.g., the anthroponotic transmission of H1N1 is far more common than from pigs to humans. Pigs can serve as intermediate mixing vessel hosts of avian and human influenza viruses but can also reassort genome segments so as to produce novel viruses. The 2009 H191 influenza virus, which killed as many as 575,000 persons worldwide, e.g., was at first thought to have originated in pig herds. Soon thereafter, it was found that that humans and birds were actually the transmission hosts (Centers for Disease Control and Prevention 2010).

One wonders if this compels further evaluation of the 1918–20 influenza pandemic. Thus: 'During the early stages of the 1918 pandemic, outbreaks of the virus were identified in both humans and swine in the USA', write Nelson and Vincent (2015: 143; see also Messenger *et al.* 2014), and 'it remains impossible to determine whether humans first transmitted the virus to pigs, or vice versa, owing to the lack of data from that time'. More recently, however, after the removal of sampling biases—e.g., the tendency of some societies to monitor viruses less often and some not to monitor them at all—H1N1 transmission from humans to pigs has been found multiple times in

North, Central and South America and in the Caribbean, Asia and Europe (Nelson and Vincent 2015; Chastagner *et al.* 2019).

Anthroponosis has been found on every continent. For example, humans have transmitted tuberculosis to elephants in zoos, circuses and parks in the United States and France and when they perform logging work or are attached to temples in southern India, Nepal and Laos (Lainé 2018). This particular mycobacterium anthroponosis is further encouraged by daily contact among captive elephants, vets, caretakers and the viewing public. In their comprehensive survey of existing research, Messenger *et al.* (2014) identify escalating reports of anthroponosis in 56 countries. Anthroponotic bacterial infections were reported in 21 countries, chiefly in North America and Europe; viral pathogens in 16, well distributed globally; human parasites in 12, chiefly in Africa and fungi or other pathogens in 7, almost exclusively in India. A recalibration of these data reveals that 50 per cent of the infections were of wildlife, 43 per cent livestock, 23 per cent animal companions and 4 per cent unknown. Anthroponosis has also been found in laboratories, zoos, aquaria, veterinary hospitals and in the wild (Ali *et al.* 2011; Song *et al.* 2012; Messenger *et al.* 2014; Nelson and Vincent 2015). Anthroponosis has even been recently detected among seabirds in Antarctica (Cerdà-Cuéllar *et al.* 2019).

In respect of wildlife, one recent study has found that anthroponotic transmission has led to deadly pneumonoviral outbreaks among non-human primates, including chimpanzees in an Ugandan national park (Negrey *et al.* 2019). This study also documents similar fatal viruses in western chimpanzees in Côte d'Ivoire, eastern chimpanzees in Tanzania, mountain gorillas in Rwanda, lowland gorillas in the Central African Republic and bonobos in the Democratic Republic of Congo. Chief among the suspected sources of transmission are ecotourists, park workers, visiting scientists and local consumers of bushmeat.[2] Another study is less reticent in apportioning blame: it asserted that endangered wild African painted dogs were infected with human strains of *Giardia duodenali* transmitted through 'open defecation in and around national parks by tourists and local residents' (Messenger *et al.* 2014: 7).

Ferality undoubtedly complicates conventional notions of wildlife, including those of green criminology that proceed with binary distinctions between domesticated and wild species (but see White 2017). While feral dogs, e.g., have been recognized as vectors of zoonosis, their complex role in spillover events has commanded only minimal attention. A recent study in Brazil has found anthroponotic infections in both feral and domesticated dogs (Ellwanger *et al.* 2019). Feral dogs roam between urban centres and semi-wild national park areas in Brazil and they can and do transmit pathogens to wild animals. But they also have the potential to act as 'spillover bridges' for the jump of pathogens from wild animals to humans. One must, therefore, ask: If feral dogs in one locale have the capability to transmit pathogens to wild animals, to be infected by wild animals and to infect humans, then what pathways of spillover among camels, cats, dingoes, goats, horses and swine, e.g., await discovery elsewhere and what threats to ecosystems and species diversity might they represent?

[2]Demand for bushmeat in the Global North increasingly causes the theriocide of edible wild animals in other regions. Among these animals are CITES-listed non-human primates, crocodiles and pangolins—their bushmeat is known to contain viable counts of zoonotic bacterial pathogens and unsafe levels of carcinogens (Chaber and Cunningham 2016: 135).

The highest consumption of animal flesh ('meat'), it is generally agreed, occurs in the world's three largest economies, namely, the United States, the European Union and China. Yet, meat consumption was unavailable to the great mass of the Chinese population barely 50 years ago. During the Great Leap Forward and the Cultural Revolution and amid widespread and prolonged famine, Mao Zedong encouraged the impoverished peasantry to survive by hunting and rearing wild animals, which he declared to be their rightful property. In the early 1980s, following the drift of the Chinese Communist Party (CCP) towards Leninist state capitalism and more efficient industrialized farming, meat production accelerated at an extraordinary rate of 5.8 per cent p.a. (Zhou *et al.* 2020). From 1985 to 2014, meat production in China increased by 344 per cent, and it became the largest sector of the food industry. In 2018, China became the world's largest producer and importer of meat (United Nations Food and Agriculture Organization 2019). By weight, pigs were the species most produced, with all of the dreadful environmental harm, pathogen transmission and social disorganization that accompanies intense industrial animal production (Fitzgerald *et al.* 2014; Mao *et al.* 2020). Since mid-2018, deadly tick-hosted African swine fever has been sweeping through China's pig herds. By early March 2020, the virus had reached Hubei province, where it has been detected among wild boars (United Nations Food and Agriculture Organization 2020).

With an average economic growth of 6.6 per cent p.a. in the past two decades and a population of 1.44 billion, China has a large and burgeoning middle class with the rising disposable income needed to satisfy its expectation of daily meat-eating—meat, i.e. taken not only from pigs, sheep, poultry and cattle but also, for the indeterminate minority who can afford it, from wildlife. Just as they are in other countries, the motives for buying and selling wildlife and 'game' animals in China are culturally quite diverse.

There are two categories of legal wildlife industry in China. One is the trade of animals legally caught in the wild and lawfully traded as fur, food, zoos/tourism and vivisection. The other is of dispositionally wild animals who are captive bred on licensed farms and lawfully traded for any of the aforementioned reasons. A state-sponsored confirmation of the tremendous size of the legal wildlife trade in China was published in 2017 by the Chinese Academy of Engineering ('CAE'), whose stated aim was to promote the sustainability of the industry in China 'from a resource management perspective…[focused] on commerce, profits and development' (CAE 2017: 5–13).[3] The CAE reports that, in 2016, the industry generated a staggering USD143 billion and employed 29 million workers.

Although the CAE refrains from discussing the illegal wildlife trade in China, it is widely known that animal victims are illegally abducted both from inside China and also from other countries, including Laos, Myanmar, Nepal, Nigeria, Thailand, Tibet and Vietnam.[4] Moreover, by Chinese and foreign judicial systems, customs agencies, wildlife police, border control and by national and international wildlife protection

[3]At one point, the CAE report is surprisingly candid about animal cruelty in small family-run arms in China (2017: 161–162; and see Whitfort 2019a; 2019b). The CAE's comments in this regard do not reflect a genuine concern for animal suffering—as stated, they are motivated simply by the drive for economic efficiency and fear of criticism from Western NGOs.

[4]The report gives only the most limited consideration to zoonoses arising from China's wildlife industry, mentioning Bluetongue disease as a potential issue in the farming of antelopes, whose horns are used widely for tCm (CAE 2017: 120–21). On potential anthroponoses on Chinese wild animal farms, see CAE (2017: 13–14).

organizations, efforts to confront animal abuse tend overwhelmingly to favour iconic megafauna—rhinos, elephants, leopards, tigers, bears and wolves, for example. Problems of extinction aside, in the calculus of abuse, it is not these megafauna who suffer the most often but amphibians, reptiles and smaller mammals (Whitfort 2019b: 206–9).[5] Greater attention to these less esteemed creatures is long overdue, an omission that is compounded by the fact that it is they—rodents, bats, civet cats and pangolins—who loom very large as agents of transmission in zoonoses like SARS and COVID-19.

Guangdong

Emerging and re-emerging zoonoses have been identified as a significant threat to public health in China for at least the past two decades. The 2002–03 SARS outbreak in Guangdong is, therefore, most instructive. SARS is recorded to have infected 8,096 persons worldwide and to have killed 774 (The number of theriocides: a vague 'tens of thousands' of civets drowned and electrocuted has been widely circulated). The earliest SARS patients in Guangdong were likely to report living near a wet market selling live animals.[6] Of these early case patients, 24 per cent were healthcare workers and 39 per cent animal transporters and handlers (Xu *et al.* 2004: 1034). One Guangdong restaurant chef, who prepared steamed dishes, reportedly also had contact with snakes, foxes and rats. Moreover (ibid.: 1032),

> A high proportion (9/23, 39%) of early cases were food handlers (this category includes persons who handle, kill, and sell food animals, as well as those who prepare and serve food)….Of the nine early cases in food handlers, seven were restaurant chefs working in township restaurants (where a variety of animals were slaughtered on the premises), one was a market produce buyer for a restaurant, and one was a snake seller in a produce market (where a variety of live animals were offered for sale).

The overrepresentation of slaughterers, butchers and sellers of wild animals among early onset cases with no contact history is highly significant. This is especially so because none of the early case patients in Guangdong was a commercial farmer handling livestock or poultry.

A loose scientific consensus has it that the reservoir hosts of the outbreak were rufous horseshoe bats (*Rhinolophus sinicus*; Hu *et al.* 2017); members of this species are the reservoir of numerous pathogens, including multiple SARS-CoV-like viruses. But how did these bats infect humans? Perhaps they had entered the market at night to congregate there with fellow colonists. Perhaps, along with other wild animals, they had been captured in caves and taken to the market as objects of wildlife trade—most likely to be used in traditional Chinese medicine ('tCm').

The intermediate host of the SARS outbreak was likely either a Himalayan or masked palm civet (*Paguma larvata*) or a raccoon dog (*Nycin tereutes procyonoides*). Members of

[5] Chow *et al.* (2014; and see Jing 2012) used semi-structured interviews to survey practices in 39 wildlife markets in Guangdong and Guangxi provinces. They found that reptiles, including turtles, lizards and snakes, were most often traded and most often CITES-listed as critically endangered, endangered or vulnerable.

[6] Often open air, wet markets flourish throughout China and southeastern Asia. Many do not participate in illegal wildlife trade, catering mainly to the day-to-day needs of households and restaurants for fruits, vegetables and other perishable items (Wong 2020). Some, perhaps most, of the wild animals for sale have been raised legally on farms, both small and industrialized, to be slaughtered to order at the market. If captured in the wild, some animals are bought and sold legally at markets, others not so (if they are protected, e.g., or are 'game' out of season).

these two species had not been reported freely roaming the streets of Guangdong or randomly biting human passers-by. Probably they were for sale in Guangdong wet markets (At other times and places, SARS-Cov has also been found in Chinese ferret-badgers (*Melogale moschata*), red foxes (*Vulpes vulpes*) and cats). These animal victims had either been abducted from their natural habitats or else had been reared 'as wild' on farms, either state-owned or private, large or small, ultimately to be bought and sold. In Guangdong wet markets, the animals were held in stacked metal cages, cramped and terrified and defecating and urinating on other animals, of the same or different species, similarly caged next to or below them. Such a stressful and unfamiliar situation was a perfect environment for the spread and mutation of pathogens from one animal to another and then from an animal to a human.

On 2 March 2019, a team of Chinese scientists published the results of their research on bat viruses. Their warning: 'it is highly likely that future SARS- or MERS-like coronavirus outbreaks will originate from bats, and there is an increased probability that this will occur in China' (Fan *et al.* 2019: 210). To Wuhan, China, the paper now turns.

Wuhan

There is strong, if not irrefutable, evidence that, at some point before the end of December 2019, one or more animals infected with a novel coronavirus were bought and sold or otherwise consumed in the Huanan Seafood Wholesale Market in Wuhan. Located in eastern China, Wuhan (pop. 8.36 million) is the capital city of Hubei province and a major economic and transportation hub.[7] On 31 December, the Wuhan city government announced that local hospitals were treating dozens of patients with flu-like symptoms. The next day, the authorities disinfected, shut down and cordoned off the Huanan market, removing and perhaps incinerating all animals therein. On 11 January 2020, the first death from the virus was confirmed—a 61-year-old regular customer of the market (Anon 2020). On 11 March 2020, the World Health Organization declared that the emergence of what was designated as SARS-CoV-2 in animals and transmitted to humans as the novel coronavirus COVID-19 was a pandemic.

Reliable knowable about the origin of the outbreak in Wuhan has been quite limited. Harsh censorship by the CCP has surrounded the Huanan seafood market and the wildlife trade there. There has been much speculation in mainland China, Hong Kong and in Asia generally that the CCP has downplayed the spread of the virus in order to maintain its political authority as it had earlier with its handling and concealment of the SARS outbreak. Moreover, netizens in China have compared the CCP's response to COVID-19 with the USSR's obfuscations towards the Chernobyl disaster, though such posts were quickly censored and deleted.[8] In late March 2020, keywords—'Wuhan, concealment', 'concealing outbreak' and 'China secrecy outbreak'—were entered into

[7]In September 2019, the Wuhan Administration for Market Regulation posted on its website that enforcement agents had been sent to Huanan market to investigate the relevant permits for the sale of frogs, snakes and hedgehogs in eight shops. It reported no evidence of illegal wildlife trade (Zhou and Ma 2020). Nonetheless, photographic evidence from local residents revealed illegal sales of marmots and snakes in the market's more concealed spots (The Paper.Cn 2020).

[8]On 24 February 2020, *Lancet Global Health* published a letter from Yingchun Zeng and Yan Zhen (Zeng and Zhen 2020), two nurses at Guangzhou hospitals, in which they described the difficult and dangerous conditions of front-line medical personnel working to contain COVID-19. Two days later, the journal issued a curious comment in which it retracted the nurses' letter, stating: 'On Feb 26, 2020, we were informed by the authors of this Correspondence that the account described therein was not a first-hand account, as the authors had claimed, and that they wished to withdraw the piece. We have therefore taken the decision to retract this Correspondence'.

nationwide Chinese search engines, such as *Baidu*, *Tencent*, *Sina Weibo* and *China Daily*. All to no avail.

It is still not known whether the initial case of COVID-19 occurred in December 2019 or if the CCP intentionally concealed the timeline and extent of earlier infections and deaths (Ma 2020a). On 10 April 2020, an unsigned but ominous-looking statement was published at the websites of the prestigious Fudan University in Shanghai and the China University of Geosciences, Wuhan: all papers on the origins of COVID-19 were now to receive extra scrutiny from government and university officials before they could be submitted for publication. Hours later, the notice was deleted. No explanation was forthcoming.

The actual pathway of pathogen transmission that led to COVID-19 has, therefore, not yet been determined. Shortly after the outbreak, a Huanan wet market menu listing wildlife and their price was widely circulated on the Internet. The menu advertised the fare of a shop located at #7–13, 11th Alley East, Huanan market. The menu distinguishes between live and dead animals, the former commanding higher prices. Among these are civet cats (a suspected intermediate host of SARS), foxes, giant salamanders, scorpions, squirrels and turkeys. Some animals are sold as whole, others by individual body parts. Alligators, for instance, are sold by tongue, intestine, tail and meat; camels by paw, hump and meat; and ostriches by palm, kidney and egg. While the menu appears to speak for itself, the conversational rules for buyers and sellers are scripted offstage. Presumably, no experienced seller would advertise illegal wildlife offerings on a posted menu—rather, covert transactions would occur between would-be sellers and buyers, possibly with the connivance of corrupt market officials or police. While some buyers of poached wildlife are undoubtedly local citizens, others are restaurants operating in the guise of lawful business. Such restaurants are usually located away from city centres, thereby to avoid police scrutiny. Most operate as lawful businesses, are family-run and cater to local clientele. At the same time, while not actively advertising their illegal dishes, they can access and supply wildlife products when approached by trusted customers (Wong 2020)

As was also the case with SARS and Ebola, it is well-nigh certain that the host reservoir of COVID-19 was a bat or bats (Zhou *et al.* 2020; and see Zhang *et al.* 2020). It was likely a horseshoe or frugivorous bat who infected a pangolin or a civet cat in the Wuhan market. In turn, that animal then infected a human. Perhaps bats had been entering the Huanan market at night to roost. Perhaps they had been caught in the wild and housed in the market prior to use in tCm.

The intermediate hosts of COVID-19 are most commonly identified as civet cats or, above all, pangolins (*Manis, Phataginus* and *Smutsia*)—arguably the two mammalian species most victimized by wildlife trade worldwide—though bamboo rats, badgers and snakes have not yet been entirely dismissed. In 2016, over 50,000 civets were being raised in China in 200–300 breeding facilities (CAE 2017: 126, 140–41). Their meat is very popular in specialty wildlife restaurants. Their skin is prized as fur and their perianal glands are used in the making of civet perfume; rice wine infused with a civet's penis is said to increase male libido and, when they have been fed coffee cherries, their excreta are the essential ingredient in civet ('weasel') coffee. The meat of the eight pangolin species is in high demand in restaurants, where it is served as a stew. Their skin is covered with keratinized scales, which are churned into powder for use in tCm. While coronavirus has recently been identified as a dominant virus in pangolins, researchers

at South China Agricultural University have reported a coronavirus in pangolins whose metagenomic sequence is 99 per cent identical to persons infected with COVID-19 (Liu *et al.* 2019).

Despite a CITES-mandated zero-export quota for wild-caught Asian pangolins, it is still legal to import African pangolin species and their scales into China—from 2013 to 2017, China imported 99 per cent of all pangolin exports from Burundi, the Democratic Republic of Congo, Congo and Uganda (UNODC 2020: 7). Reports of seizures suggest that legal imports cannot satisfy the demand for pangolin scales in China. In 2019, a single criminal syndicate tried to smuggle 25,500 kg/56,217 lbs of pangolin scales, which were seized by Chinese Customs in Wenzhou, Zhejiang province, after having been transported through South Korea from their point of origin in Nigeria (Ma 2020b). Indeed, Nigeria is the source of 60 per cent of global pangolin scale seizures, with Vietnam being the chief destination (Ngoc and Wyatt 2013; UNODC 2020: 9).

The zoonotic infection in Wuhan probably occurred in the wet market, but it might have occurred elsewhere in the city. Thus, among the first 425 patients confirmed to have COVID-19, it was found that 55 per cent of cases with onset before 1 January 2020 were linked to the Huanan market compared with only 8.6 per cent of subsequent cases (Li *et al.* 2020; and see Zhang *et al.* 2020). This suggests that the virus may have originated elsewhere in Wuhan in a restaurant or other food outlets or from a careless or unlucky transporter, handler, slaughterer or cook—and that its growth was aggravated by the crowded hubbub in the market.

However, given the systematization and globalization of wildlife trade, the intermediate animal host of transmission in Wuhan might have been infected earlier and at any of several locations. That animal might have been infected by a local bat in the Wuhan wet market or at any other point in the vast wildlife trade—in the nearby Chinese regions of Chongqing municipality and Shaanxi, Henan and Anhui provinces or in other countries, near or far, where previously unexploited populations of animals were abducted from their native habitat and forcibly brought into unhygienic contact with a crowded mix of aquatic, amphibian, avian, mammalian and reptile species.

It must be said that the understanding of COVID-19's transmission and dynamic has been hindered as much by the CCP's heavy-handed censorship as it has been by the racialized anti-Chinese slurs and anti-scientific rhetoric of the Trump administration. (Some circles truly are vicious). It should be no surprise, therefore, that knowledge of precisely how, when and where COVID-19 originated is quite flimsy. It might even be unknowable. The paper raises more questions than it answers, doubtless. Even if the host reservoir in Wuhan was a horseshoe or frugivorous bat, then which species, precisely, was the host of transmission? Did the fatal spillover happen in the Huanan wet market or did it emerge, instead, at some other point in the lengthy national and international chain of wildlife trade? Perhaps, the crowded Huanan market only encouraged the virus, once transmitted, to spread.

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On 1 January 2020, local Wuhan authorities issued an emergency measure to close the Huanan wet market for disinfection and renovation. The city of Wuhan was placed on

lockdown on 23 January. In late February, the National People's Congress ordered a temporary ban on the hunting, trade, transportation, consumption and farming of terrestrial wildlife of 'important ecological, scientific and social value'. This decision will likely prompt the revision of much existing legislation in China, including the Wildlife Protection Law, the Husbandry Law, the Fishery Law, the Animal Epidemics Prevention Law and the forthcoming Biosafety Law (You 2020). The authorities have since promised to shut down 20,000 farms raising peacocks, civets, porcupines, ostriches and geese and to enact legislation to make the temporary ban permanent.

Will such promises suffice? Not if history is a good guide. Somewhat similar measures were promised during the earlier SARS epidemic in China but were moribund after only one year. As was also the case in the SARS era, the current ban faces enormous countervailing cultural and economic forces, It is also riddled with loopholes. It permits the continuation of trade in wildlife body parts used in tCm, for instance. Moreover, it will encourage a recategorization of some wild species as livestock or poultry, thereby escaping the ban. A permanent ban will perhaps be just as unenforceable as recent legislative attempts to regulate environmental waste in rural areas (Mao *et al.* 2020). Will financial compensation to poor peasant farmers for the loss of their farmed wildlife inventory be sufficient to persuade them to comply with the ban? If not, then will criminalization and stronger law enforcement do the trick? Even if successful, however, a ban on farmed wildlife will surely lead to an increase in illegal wildlife trade and more therocide or more animals in captivity.

Conclusion

> Being neither the accountants nor the managers of felicity in nature, [we] should be principally concerned with *letting animals be*, keeping human predators out of their affairs, allowing these 'other nations' to carve out their own destiny.
>
> - Tom Regan, The Case for Animal Rights (Regan 1983)

So, what is to be done? First consider the handful of cases, unsystematically and haphazardly reported, where humans sick with COVID-19 are thus far known to have transmitted the virus to animals: several lions and tigers in a Bronx zoo; companion cats and dogs in the United States and Hong Kong and minks on fur farms in Holland, the United States and Spain, where public health authorities have killed at least 1.2 million animals (USDA 2020). Even more, one has to wonder about the incidence of pathogen spillover from unhealthy staff and visitors to animals at the 1,500 or more licensed zoos and parks and animal parks worldwide. How many animals might have been infected by the 7.6 million workers in fur farms in China (CAE 2017: ii)? In a different vein, ponder the hubris of molecular scientists who, trying to find a vaccine against an animal-to-human infection, have redefined the term anthroponosis by intentionally infecting rhesus macaque monkeys, mice and other animals with COVID-19.

If the biosphere and its multispecies inhabitants are ever to survive the grave risks posed by future pathogen spillover events, then an end must be put to humankind's unprecedented domination of nature. Human expansionism and carnism must somehow be made to yield to ecological, species and social justice. Clearly, our

relationships not only with wildlife but also with those countless animal victims held in the animal industrial complex must be fundamentally realigned. Green criminologists are especially well positioned to address some of the major policy issues in this arena, including those to do with our abominable treatment of wildlife. If animal abuse is to be taken seriously, then we must ask why in different times and places some harms to wildlife are defined as criminal, others as abusive but not criminal and still others as neither criminal nor abusive (The spectrum of legality–illegality surely matters not one whit to animals themselves, of course—after all, abduction is abduction and theriocide is theriocide).

Among the most pressing issues, two stand out. First, how can anthropogenic habitat degradation and declining species diversity be reversed? To begin with, there must of necessity be vast reductions in the harms and pollution spawned by anthropogenic carbon emissions, mineral extraction, deforestation and the animal industrial complex. It is no small irony that some of the very governments who are now responding with alacrity to scientific advice about the human havoc wrought by COVID-19 continue to reject warnings about the emergency of anthropogenic climate change. At the same time, direct human contact with wild animals must be minimized. Zones of exclusion must be proclaimed: wilderness reclaimed, nature preserves, conservation areas, national parks and sanctuaries all expanded. Wildlife trade, both legal and illegal and in all jurisdictions, must be abolished. All this must be done with due respect for differently resourced low- and middle-income countries and for the needs of those indigenes who through physical need and customary tradition engage in (non-commodified) subsistence hunting.

If this activist-research agenda is not immense or daunting enough, then pencil in one more fundamental, if presently intractable, issue. How best can we challenge and overcome the master status of wild animals—indeed, of *all* animals—as human and, increasingly, as state-corporate property? Arguably, the *sine qua non* of this quest is the extension to animals of legal personhood. The core elements of legal personhood for animals would be their right to life and their right to bodily liberty.

In this regard, there are several glimmers of hope. One is a recent proposal to the Law Commission of the United Nations that habitat degradation and theriocide should be included within the rubric of ecocide as the fifth crime against peace—the fifth crime, i.e. after genocide, crimes against humanity, war crimes and crimes of aggression. Pitched at an international level in the interests of locationally wild animals, this proposal regrettably seems for the moment to have stalled.

Another promising development, occurring at the level of national legislatures and courts, is the attempt to extend legal personhood to a limited range of captive wild animals—to bonobos, chimpanzees, gorillas, orangutans and elephants. In lawsuits pursued by organizations like the Great Ape Project and the Nonhuman Rights Project, a few national jurisdictions lead the way—notably, in Spain, New Zealand, Argentina, Brazil and Colombia. Might legal personhood be extended only to those individual animals who have habeas corpus writs filed on their behalf? Might legal personhood be extended to all members of an entire species irrespective of its phylogenetic ranking? Will the lucky animals be those who look and act most like us? Difficulties abound, in other words, but so too does hope.

Postscript

On 27th November 2020 there were 50,264,241 confirmed cases of COVID-19 worldwide, including 1,420,306 deaths (WHO COVID-19 Dashboard). There was no mention whatsoever of infected, deceased or destroyed animals.

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