CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES OF WILD FAUNA AND FLORA



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PREVALENCE OF CITES-LISTED TAXA ASSOCIATED WITH ZOONOSES IN LEGAL AND ILLEGAL INTERNATIONAL WILDLIFE TRADE

1. This document has been prepared by the Joint Nature Conservation Committee, United Kingdom of Great Britain and Northern Ireland ^{*}.

2. This document presents supporting information for SC77 item 17 (Role of CITES in reducing risk of future zoonotic disease emergence associated with international wildlife trade).

Wildlife trade has been identified as one of the important potential pathways of zoonotic disease emergence, as well as an activity that plays a role in maintaining existing zoonoses in circulation. In May 2021, JNCC and UNEP-WCMC published a study (JNCC Report No. 678) exploring the zoonotic potential of international trade in CITES-listed species, and subsequently published an <u>addendum</u> to this report focusing on taxa that are associated with a subset of zoonotic diseases that are considered to pose the greatest risk to human health (the World Health Organisation (WHO)'s <u>Research and Development (R&D) Blueprint priority diseases</u>). The addendum additionally included a preliminary analysis of the prevalence of CITES-listed species associated with high risk diseases in illegal wildlife trade. This information document provides a summary of the key findings of these studies.

The initial analysis, published as <u>JNCC Report No. 678</u>, was based on a dataset of <u>documented</u> <u>associations between animals and zoonotic diseases</u>, which was compiled through a systematic review of the scientific literature on this topic. This list of associations considered a wide range of zoonotic diseases, which varied substantially in their severity and their potential to develop into an epidemic or pandemic.

The study found that of the 264 animal families that contain at least one CITES-listed species (hereafter 'CITES families'), 117 families (44%) included at least one taxon associated with a zoonotic disease. Mammals and birds were the two classes containing the highest proportion of CITES families that were associated with at least one zoonotic disease, with over two thirds of families associated with one or more zoonotic diseases in both cases (Figure 1). One of the most important findings of the initial study relates to the trade in live animals, which is generally considered to pose the greatest risk of zoonotic spillover. Analysis revealed that CITES trade in live specimens belonging to families associated with at least one zoonotic disease between 2009 and 2018 involved approximately 26.5 million individual animals, which accounts for 44% of the individual animals traded internationally under CITES as live specimens during this period. The number of individuals traded as live specimens from species that were directly associated with a zoonotic disease was 6.5 million.

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Figure 1: Proportion of animal families containing at least one CITES-listed species (n=264) that are associated with at least one zoonotic disease (red). The outer ring shows the proportion of these families that belong to each taxonomic class.

JNCC and UNEP-WCMC's follow-up analysis, published in an addendum to the initial report in August 2022 (<u>Addendum to JNCC Report No. 678</u>), aimed to begin to address two of the key recommendations made in the initial study, namely: (1) to explore the prevalence in trade of CITES-listed taxa that are associated with pathogens considered to pose a relatively higher risk to human health; and (2) to explore the presence of CITES-listed taxa associated with zoonotic risk in illegal trade.

To address point (1), the follow-up study investigated the prevalence in international trade between 2011 and 2020 of CITES-listed taxa associated with the eleven pathogens designated as R&D Blueprint priority diseases (henceforth referred to as 'priority diseases') by the WHO. This status reflects the potential of these pathogens to cause an epidemic, as well as the absence of sufficient medical countermeasures, such as effective drugs or vaccines, and the pipelines needed to produce them at scale. The analysis revealed that all 11 priority diseases were associated with at least one CITES family. Overall, 31 CITES families (11%) included at least one taxon associated with a priority disease (Figure 2). Priority disease-associated CITES families were particularly concentrated among the even-toed ungulates, carnivores and primates, highlighting the prominent role of these mammalian orders as potential sources of spillover.



Figure 2: Proportion of families containing at least one CITES-listed species (n=270) associated with at least one WHO R&D Blueprint priority disease (red inner ring). The outer rings show the proportion of these families that belong to each taxonomic class or order. Bird and mammal orders containing only one family associated with a priority disease are included within 'Other'. No taxa within any of the CITES amphibian families (n=13) were associated with a priority disease.

Ten of the eleven priority diseases were associated with CITES families found in legal international trade as live animals between 2011 and 2020. The trade in live animals from priority disease-associated CITES families over this ten-year period involved at least 1.12 million individual animals, which equates to 1.7% of all live individual animals traded. While this proportion is low, it still corresponds to a large number of individuals in trade, which may pose a substantial degree of spillover risk. Forty-nine CITES-listed species were directly associated with a priority disease and traded as live specimens 2011-2020. This trade in species with a direct association involved over 575 000 individual animals.

Table 1 shows the priority diseases associated with the most highly traded priority disease-associated CITES families, as determined by the number of (re-)exporter transactions or the quantity of individuals traded between 2011 and 2020.

Table 1: Matrix showing the WHO R&D Blueprint priority diseases associated with the most highly traded priority disease associated CITES families. Highly traded families are those in the top ten most-traded families, as determined by the **number of (re-)exporter-reported transactions** or the **quantity of individuals traded** 2011-2020. Eight families were included in both of the top ten lists; families appearing only in the top ten most-traded families by the number of (re-)exporter-reported transactions are indicated by an asterisk (*), whereas those included only within the top ten by the quantity of individuals traded are indicated by (†). Note that associations between taxa and SARS-CoV, MERS-CoV and SARS-CoV-2 in a number of source papers are based on percentage similarities between animal coronaviruses and human SARS-CoV, MERS-CoV and SARS CoV-2 isolates (see methodology).

			Highly traded CITES families											
			Anatidae (ducks, swans and geese)	Bovidae (bovids)	Bucerotidae [†] (hornbills)	Canidae (canids)	Cebidae (capuchin and squirrel monkeys)	Cercopithecidae (Old World monkeys)	Elephantidae* (elephants)	Felidae (cats)	Mustelidae* (mustelids)	Rhinocerotidae (rhinos)	Threskiornithidae [†] (ibis and spoonbills)	Varanidae (monitor lizards)
	С	OVID-19						+		+	+			
ses	C h	rimean-Congo aemorrhagic fever		+	+	+			+	+		+		
disea	E (E	bola virus disease EVD)		+				+						
Ę	H	lendra virus												
rio	L	assa fever												
t	Ν	larburg virus disease						+						
Bluepri	N S (1	liddle East respiratory yndrome coronavirus MERS-CoV)					+	+						
&D	N	lipah virus				+	+	+		+				
0 R	R	lift Valley fever		+		+		+	+	+		+		
WH	S S	evere Acute Respiratory syndrome (SARS)				+	+	+		+	+			
	Z	ika virus	+	+			+	+	+	+			+	+

An analysis of available illegal trade datasets¹ to address point (2) revealed that the majority (58%) of the priority disease-associated CITES-listed species reported in legal trade were also detected in illegal trade (Figure 3). Primates, and in particular old world monkeys, were well represented within this subset of species. Given the relatively high number of priority diseases (8) associated with species belonging to the family of the old world monkeys, this taxonomic group may be an appropriate candidate for further scrutiny.



Figure 3: Venn diagrams showing the degree of overlap in legal and illegal trade among (A) CITES-listed species belonging to families associated with one or more WHO R&D Blueprint priority diseases (n=350), and (B) CITES-listed species with a direct association with one or more WHO R&D Blueprint priority diseases (n=52), according to the source papers used in the analyses.

It is important to note that these analyses adopted a precautionary approach by considering animaldisease associations where spillover between animals and humans has not yet been confirmed. Given our incomplete understanding of how zoonotic diseases are distributed throughout the animal kingdom, and the continual emergence of new zoonotic diseases, improved surveillance and collation of data on animal-disease associations would help to more accurately gauge the risk that the international wildlife trade poses to human health. The creation of a central repository of animal-disease associations covering the full range of zoonotic pathogens and their associated diseases would be a major step forward in this regard. Such work represents an important area for future collaboration between CITES and other expert authorities, such as the World Organisation for Animal Health (WOAH) and WHO.

Further details of the highly traded families and species associated with zoonotic diseases, the methodology used by the studies, the important caveats relating to this research, as well as recommended areas for future research, can be found in the full text of the reports; these can be accessed using the links below.

JNCC Report No. 678: Zoonotic potential of international trade in CITES listed species

Addendum to JNCC Report No. 678: Prevalence of CITES-listed taxa associated with WHO R&D Blueprint priority diseases in legal and illegal international wildlife trade.

¹ Consisting of (1) seizures of live animals upon import to the United States, as recorded in the United States Fish and Wildlife Service Law Enforcement Management Information System (LEMIS) and submitted for inclusion within the CITES Trade Database (under source I), 2009–2018; (2) seizures of live, unlicenced specimens of species included in the CITES Appendices and/or UK Wildlife Trade Regulations made at the UK border, 2013–2021; and (3) seizures and instances of smuggling/illegal trade of live specimens recorded in TRAFFIC International's Wildlife Trade Portal, 2013–2021.