

Illegal Trading in Endangered Animal and Plant Species - an Austrian perspective

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Abstract

Illegal trading in protected animal and plant specimens as well as their products is an important part of organized crime. It is estimated to rank number four in the trading of illegal goods, after drugs, counterfeit products and human trafficking. Austrian statistics on confiscations of contraband between 2011 and 2017 were used in this study in an attempt to estimate the extent of trading of products from protected species. In addition, the seized goods were categorized to get an impression of the possible motivation of the customers.

The controls used for this study were carried out mainly in international air travel and postal transport. The largest confiscations were therefore assigned in the categories 'souvenirs' and 'para-medical products/cosmetics'. As Austria is situated within the EU, most border controls have become obsolete. Thus, larger illegal transports are discovered either by chance or as part of multinational initiatives. A significant reduction in demand for products of protected animals and plants might be achievable by changes in consumer orientation, e.g., using new media. However, increased controls remain indispensable.

Keywords: species protection, CITES, smuggling, confiscations, customs;

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1. Introduction

International trading of certain animals or plants and their products is regulated by the 'Convention on International Trade in Endangered Species of Wild Fauna and Flora' (CITES – in Austria, BGBl 188/1982). Included in this treaty are approximately 5 000 animal and 25 000 plant species. Of these, about 600 animal species and 300 plants are listed in Appendix I (highest threat). Commercial trading of these species is prohibited. The animals and plants that are included in Appendices II and III are protected less stringently. Trading in these species can be permitted by the authorities of the exporting and importing country in individual cases (in Austria according to BGBl 16/2010 - ArtHG 2009). The lists of protected specimens are revised by regular conferences of the partner states (see e.g. UNEP-WCMC, 2004). In addition to this treaty, the common execution of these rules is regulated by the European Convention on the Protection of Species (Artenschutzabkommen - EG 338/97) for the European Community.

As with other controlled goods that are in demand (e.g., weapons, drugs, etc.), there is a considerable black market for protected species and their products (e.g., Mackenzie, 2002). This is a classical 'dark field'. The global volume of such illegal trafficking is estimated to be at least USD 19 billion per year, and would thus rank number four in a (notional) ranking of illegal trading, after drugs, counterfeit products and human trafficking (see Broad, Mullikan & Roe, 2003; Laws, 2017; see also IATA, 2014).

Austria is of relevance for this commerce as a consumer and transit country and, to a lesser extent, for exporting animal and plant species and their products. In international terms, the role of Austria might be regarded as being of minor importance. The main exporter nations in this context are Kenya, Tanzania, South Africa and India. China, Hong Kong, Thailand and Vietnam are the main importers (Patel et al., 2015). This situation is partly reflected by seizures that take place in Austria (see Fig. 3), however, these are largely independent from the involved species. In addition to the aforementioned countries, the USA is also an important exporter to Austria.

As a small, economically prosperous European country, Austria might be a suitable model for estimating illegal trafficking of CITES-protected species and their products in a Western, industrialized country. The statistical data from official sources may allow (limited) conclusions to be drawn on the extent and elements of this illegal market.

Large-scale land use (e.g., industrialized agriculture) and over-exploitation of populations (e.g., by over-fishing) are probably more severe dangers for the diversity of species and the protection of natural resources than collecting, poaching, or smuggling. Still, the high selective pressure to single species that is caused by their aggravated use is a decisive factor in their decrease in numbers, sometimes to extinction, together with continuous

loss of their habitats. The accompanying destruction of biotopes and food chains is often neglected in conservation discourses, as are the connections to organized crime (see e.g., Broad, Mullikan & Roe, 2003).

Several factors hamper the quantification of both legal and illegal trading of endangered animals and plants. The official data on international imports and exports are sometimes inexact due to the often demanding identification of the objects (Blundell & Mascia, 2005). Furthermore, national engagement and political initiative for executing international directives is not equally strong across the various nations. Practical difficulties in enforcing of legal regulations in remote areas, and occasionally unstable local security situations, additionally hinder the detailed assessment of the situation.

In an attempt to obtain an (inherently imprecise) estimation of this criminal domain, the data from official statistics on confiscations of CITES-protected species and their products, as well as requests according to BGBL 16/2010 - ArtHG 2009 for legal trade, were used. In the following text the data are arranged according to the presumed usage of the goods instead of grouping adherent to the biological system. Thus, the possible motivations of consumers may be deduced by a 'purpose-orientated' focus of attention.

2. Method

Data on confiscations by customs services, the postal service and from other controls (police, veterinary, etc.) between 2011 and 2017 were obtained from the Federal Ministry of Sustainability and Tourism – Department for National Parks, Nature Conservation and Species Protection. These were compared with the data on legal imports and exports within that time period.

In Austria, the confiscations carried out by customs control - Federal Ministry of Finance or by the police - Ministry of the Interior are collected in the Federal Ministry of Sustainability and Tourism in a data bank. The files include, among other data, the number or weight of the objects, the species (or genus), the country of (presumed) origin/destination and - if applicable - which product or part was seized (e.g. leather product, cosmetics, souvenir, etc.).

Similar data are recorded by the Federal Ministry of Sustainability and Tourism in processing the requests for legal im- and exports of protected species according to BGBL 16/2010 - ArtHG 2009. Both data sources are processed at the Federal Ministry of Sustainability and Tourism. National reports as well as the internationally agreed regular reports, e.g., to the EC, CITES, UNEP, etc., are based on these records..

The products were organized according to the following categories to determine their relative proportions and to draw conclusions on the possible motivation of the offenders:

- trophies (skins, horns, antlers, skulls, etc.)
- living plants (orchids, cacti, etc.)
- pets (exotic animals, falcons, etc.)
- fashion goods (jewelry, carvings, objects made from the skin of crocodiles or other reptiles, tortoiseshell, feathers, tropical wood, ivory, etc.)
- ethnic- and pseudo-medicine, esoteric goods (including 'food' like caviar, turtle-soup, snake-wine, bush-meat, etc.)
- souvenirs (e.g. corals, seashells, snail-shells, cobras, etc.)

Assignment to these groups was based on criteria of (subjective) plausibility. For objects that could be attributed to multiple groups, maximum consistency of data was preferred. For example, a purse from snake-skin that was purchased as a travel souvenir (small leather product - SML) would be classified as a 'fashion good'.

It must be noted that the data on seized objects are primarily derived from controls at international airports and from postal traffic. This is an important restriction which strongly influences the relative distribution of the goods into the categories. Accordingly, more souvenirs and fewer heavy or large goods can be expected. Furthermore, the relative number of air passengers and postal traffic differs greatly between various regions. Consequently, the data used here are not derived from a homogeneous pool. Additionally, the suitability for smuggling or, conversely, the probability of getting caught differs greatly among various products.

In addition, inquiries have been carried out in pertinent interest groups like e.g., animal protectionists, merchants and owners of exotic pets.

A large 'dark-field' must be assumed for some of the applied categories, especially for the 'professional' trade in living animals, food and pseudo-medical products. For example, reliable data on the trading of turtle or shark-fin soup are lacking (Weissenbacher, 2018²). These products are transported in cans as processed food, and can therefore hardly be discovered by sniffing dogs. However, insider informations indicate that these 'delicacies' are still available in certain shops or restaurants.

2 Personal communication.

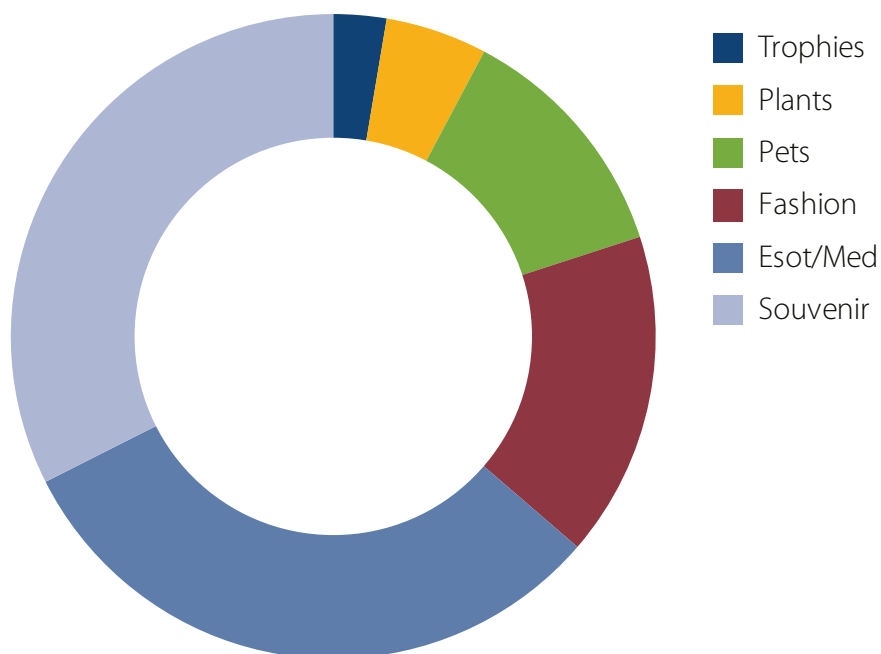
3. Results

In the period 2011-2017, the majority of confiscations can be attributed to the categories 'souvenirs' and 'pseudo-medical/esoteric goods' (Fig. 1). The quantity of individual objects was not used in this analysis since it is rather difficult to acquire in absolute terms, especially for parts of plants, corals or powdered substances.

As stated above, the confiscations were mainly carried out at airports and in postal centers. Seizures from other controls, e.g. traffic controls or house searches, are rare and usually occur by chance. As a consequence, no valid relation between seized quantity and potentially transferred quantity can be deduced for certain goods, e.g. caviar.

Relative to approximately 14.5 million passengers and about 200 000 tons of freight per year at Schwechat airport (VIE) alone, the total number of confiscations - 50 to 100 per year - is rather low. This indicates a considerable 'dark figure' for the transfer of illegal goods.

Fig. 1: Confiscations of (parts of) CITES-protected species, sorted to categories, from 2011 to 2017



3.1. Trophies

Confiscations categorized here as 'trophies' are the smallest group of illegally transferred CITES-protected products, totaling about one to three seizures per year. Specifically, these are probably animals that were bagged above the legal limit on hunting travels. For example, wildcats (*Felis silvestris* – several cases in the relevant time span) are listed in Annex II of the CITES treaty. Legal import of such a trophy would therefore be possible with a pertinent permission. Refusal to make such an application may be a result of dislike for the bureaucratic expenditure. However, it seems more likely that an animal that was shot 'by chance' is brought in without adhering to the legal regulations.

It should be noted in this context that the smuggling of trophies, like the illegal import of living animals, also bears the risk of transmitting diseases since veterinary inspections of the animals are evidently lacking.

Compared with the relatively small amount of confiscations, the legally approved import and export of trophies to/from Austria is relatively high (50-100 per year). This might be due to the fact that the application for permissions is calculated as a part of the total expenditures of a hunting expedition. Additionally, objects that are imported only for taxidermy and then re-exported are counted as well. In an analysis of CITES databases from 2004-2014 (IFAW, 2016), Austria ranks 6th in international trophy trading. However, over 70% of the total global trade in trophies end up in the USA.

Hunting tourism as such may also have positive effects for the conservation of populations of animals, as it provides incentives to local economies to conserve local fauna (as game). However, without continuous, detailed surveillance and sustainable management of the populations, the risk of adverse effects for regional ecosystems and food-chains arises (see e.g., Packer et al., 2009). The argument that commercial exploitation of wildlife improves its conservation is controversial.

3.2. Living Plants

The category of living plants is probably affected by similar motivations as that of living animals. Consumer 'demand' for exotic plants (predominantly orchids and cacti) is supplied by individual collectors as well as commercial dealers. A partial overlap with the 'souvenirs' category seems likely, since offers of living plants are made to tourists in numerous countries without information on the legal issues involved in their purchase (e.g., Viet Nam - see e.g., Bale, 2017; Hinsley et al., 2017; Hinsley, 2018). Consequently, most confiscations are made from travelers from Eastern Asia (Thailand, Singapore, Indonesia and China) for orchids and South and Central American countries (Chile, Argentina, etc.) for cacti. A part of the seizures might be explained by ignorance of the legal issues and by spontaneous purchases.

The threat to the local flora by commercial collectors is often severe due to the high number of collected specimens. It must also be considered in the case of both touristic and commercial imports that the collection of the plants in their native countries naturally takes place near villages and roads. Accordingly, populations that are already threatened are further reduced.

The taxonomic groups that are predominantly confiscated (mainly cacti and orchids) suggest that the risk of transfer of invasive species, plant diseases or parasites for commercially relevant local plants is probably rather low. However, the potential danger from illegal importing of plants should not be ignored.

3.3. Pets

As stated before, the motivation for the illegal trade in living animals is probably similar to that for living plants. It is largely based on the ambition of 'collectors' who – like all collectors – desire (ideally exclusive) possession of objects that are as rare as possible. CITES-protected animals are rare per definition, often difficult to breed and, as living beings, can not be permanently stored. These factors drive a continuous demand, but the animal protectionist doctrine that an animal is best left in its natural habitat seems widely disregarded.

During the time span of this study, the most frequently seized animals were turtles, tortoises, lizards and parakeets, with single confiscations of up to 60 individuals (2016: *Testudo hermanni* – tortoise). The number of confiscations varies strongly year by year: a total of three confiscations of living animals was made in 2014, compared with 168 specimens in 2016. It may therefore be concluded that this high variability is largely due to the chance discovery of illegal specimens and not to fluctuations in demand. Nevertheless, the confiscations internationally are substantial. In 2018, for example, 27 000 reptiles and 4 000 birds were confiscated in a joint action (Operation Thunderstorm, 2018)³.

Austria is an importing country in most offenses of the CITES regulation. However, a certain amount of attempted exports was noted in the category of pets as well. The animals involved are mostly turtles, tortoises, lizards and parakeets. It is possible that Austria serves as a transit country for other EC countries in these cases. One recorded confiscation pertains to a hawk (*Accipiter gentilis*, 2011). A limited illegal trade in birds of prey can be assumed, with countries in the Near and Middle East as targets. However, most of these exports are carried out legally with governmental permits: 124 falcons were exported in 2015, predominantly to the United Arab Emirates (UAE).

³ In addition to concerns over animal and species protection, the illegal import of animals always bears the risk of transferring diseases and parasites due to the lack of veterinary controls. These are not necessarily restricted to the species in question: a certain risk of spreading human diseases also pertains.

In light of the often cruel transport and concealment methods that are used in animal smuggling, it is clear that love of animals plays a negligible role in this business. The animals are frequently mechanically and/or chemically immobilized, hidden in luggage without food or water, and with little air supply (e.g., DW, 2018; 2019; EC question, 2017). Transport losses – which sometimes even means the death of all the animals being transported – are regrettably calculated as a part of this ‘business model’.

Quantitatively, the legal trade in pets represents a much higher volume with about 200 approved transactions per year compared with approximately ten confiscations. Corals predominate in the legal trade, followed by reptiles.

3.4. Fashion Goods and Cosmetics

Some of the mentioned motivations regarding collectors and the demand for status symbols may also be valid for the smuggling of goods that are listed in this category. Spontaneous or chance purchases of these products is quite improbable as many of the relevant products are also expensive in their countries of origin. It can therefore be assumed that most customers are aware that they are buying illegal products. However, this might be less applicable for some jewelry artifacts (necklaces, bracelets, etc.), carved from tropical wood, mollusks, corals, etc. For purchasing the latter products, the aesthetic or artistic aspect may be predominant. Nevertheless, it can be assumed, that a traveler from a western country who buys e.g., an ivory object is neither naive nor negligent in doing so.

It is important to note that a limited number of certain fashion goods, for example, up to four objects made of crocodile leather from less threatened species, may be imported legally without a permit. Errors probably do occur due to ignorance of these regulations. Also, deceit by local dealers about the species or the protection status of the material can not be excluded, at least for goods in lower price categories.

Fashion goods made from protected animals like fur, reptile leather products, shahtoosh wool, turtle shell, etc., can be obtained in many countries of their origin, either openly or upon request. A further complication arises from local dealers that offer counterfeit export documents for their products. The relevant forms can be downloaded on the internet, and possess no security features. Occasional buyers might not be aware that the documents issued by dealers are invalid. Accordingly, a potential for purchases in ‘good faith’ can not be excluded.

Commercial legal and illegal imports to Austria are often affiliated with jewelry and antique stores, as well as ‘Asia-shops’. As with other illegal products, internet orders and postal delivery form an important mode of distribution. In a study of just four European countries (France, England, Germany, Russia), large amounts of such animal products were

offered (totaling nearly USD 4 billion in value) in addition to a large quantity of living protected animals (IFAW, 2018). The high amount of ivory (approximately 11% of total offers) indicates evasion of the existing trading prohibitions (IFAW, 2018). 'Antique' ivory, i.e., from elephants shot before 1947, can be traded legally. Ivory hunted between 1947 and the inclusion of elephants in CITES Appendix I (highest protection status) in 1990, may be traded legally with an individual permission. Accordingly, ivory articles are assumed to be frequently declared 'old' and thus included in legal trading. This suspicion was confirmed in an analysis of test purchases (AVAAZ, 2018). In addition to the mentioned European states, the USA ranks number one in the trade of CITES-protected animals, representing 70% (China and UK are tied for second place with 8% each; CITES, 2009). The importance of the USA as a home of international trading platforms is one probable reason for this.

In the examined time span, over 50 permissions for elephant tusks and about the same amount for ivory objects or pieces of ivory were issued for Austria. The majority of this material was probably used in the restoration of antiques, e.g., for piano keys. In Austria, the international trend of supplementing elephant ivory with the teeth of hippopotamus or warthogs seems negligible, both in official imports and in seizures. Restoration purposes, seems also to be the usage for imports of tortoiseshell (scales of the hawksbill turtle). However, these reach a much lower extent (14 permissions). Exotic leather is also officially traded, mainly the skins of reptiles, but also the skin of sharks and rays is imported and partly re-exported after processing (e.g., as watch straps). Summarizing, the most frequent legal imports concern reptile leather (alligator, crocodile, monitor lizards, etc.).

3.5. Esoteric, Ethno- and Pseudo-medicine, Food

Many protected animals, and especially plants, go into mixtures that can be considered 'ethnic medicine'. A discussion on the effectiveness of such products is beyond the scope of this study. Furthermore, an in-depth discussion on the common infringement of laws on medical imports, various food and medical compliance standards, licensing and production regulations and the like, exceed the limits of this text.

Components – whether physiologically active or not – that are regulated by laws on the protection of species are part of numerous pseudo-medical medications. Internationally, the most important 'consumer' of protected animals and plants is *traditional Asian medicine* (TAM), which includes *traditional Chinese medicine* (TCM), Ajurvedic healing and smaller ethnic curative systems (see also e.g., Deephak, 2018). In contrast, the amount of such materials used for the production of talismans, fetishes and other 'magical' products is comparatively small, at least considering the relevant populations. While the latter predominantly takes place in Africa, Central America and the Caribbean, the production of pseudo-medical preparations is mainly situated in Asia. Import and distribution of these products is usually carried out by the respective ethnic groups. However, esoterically oriented persons of Austrian origin or those who deny modern medical treatment progres-

sively contribute to the demand for such products (e.g., Presse, 2009; Wildenrath, 2017). Increasing demand for pseudo-medical preparations leads to rising imports of such mixtures and of their ingredients. Illegal imports from Asian countries comprised the majority of entries during the investigated time span. However, the USA also has an important share of this market as an exporter of such articles, probably as an intermediate station.

Differences can be observed in the declaration of illegal components. Ingredients from protected plants, e.g. Hoodia (*Hoodia gordonii*, see Smith & Krygsman, 2014) or the African Cherry (*Prunus africana*, see Bodeker, van 't Klooster & Weisbord, 2014) are often listed as constituents. Ingredients from protected animals like rhinoceros, tiger, pangolin, sea horses, etc. are usually declared under false names or not at all. In marketing such products, slang or code-names are often used, similarly to drug deals. As with pets and numerous fashion articles, the internet/'darknet' plays an important role in trafficking certain substances like tiger or rhinoceros parts (e.g., AVAAZ, 2018; IFAW, 2018; see also CITES, 2009).

Extreme volumes can be reached in international traffic. A single seizure in China yielded over ten tons of pangolin scales (Reuters, 2017). This is the equivalent of about 20 000 killed animals. These large amounts are particularly amazing when one considers that pangolin scales, like the horn of the rhinoceros, consists of ordinary keratin, a substance without any verified pharmacological effect. Several large confiscations in Vietnam (Marex, 2018) indicate that pangolin scales and meat are traded intensely despite all official efforts to curb it. Although consumer demand is practically restricted to Asia, the USA is the most important exchange location for this animal (Heinrich et al., 2016).

The situation for sea-horses (Syngnathidae) is quite similar. Up to four specimens can legally be imported to Austria as souvenirs. In the catching grounds, usually in Asia, the animals are collected in the thousands, dried, pulverized and used in TAM (TCM) mixtures. However, the potential effect might be comparable to that of any other fishmeal. Together with the widespread destruction of habitats, this practice leads to the near extinction of several regional populations.

Import of medicinal drugs and similar products is legal up to three units for personal use. The high number of confiscations is therefore probably not due to orders from final users or occasional customers.

Religious use of CITES-protected species is quantitatively of minor importance when compared with TAM usage. Plant and animal parts are frequently included in the production of amulets, but because of their rarity and high price, only small amounts or cheaper substitutes are used. Additionally, controlling authorities are increasingly effective. For example, the world's largest fetish market in Akodésséwa (Lomé, Togo) is regularly con-

trolled by authorities, allegedly also for the usage of poached animals (cf. brunodeceuk, 2014).

Food

Food products deserve special attention within this group. They are treated as a part of this category because for certain goods, like 'snake-wine', it is difficult to ascertain whether pseudo-medicinal or luxury motivations are dominant. Chinese dietetics is an important part of TAM that promises not only treatment of existing diseases but also protective effects. Additional factors in the use of protected animals and plants as food are often ethnic/cultural traditions (e.g., for 'bush-meat'), and/or also a lack of knowledge of the endangered status of the species and methods of gathering (caviar, shark fins, turtle soup, etc.).

Besides caviar and a few other luxury foods that are also consumed in western societies, Asian countries and ethnic Asians dominate in the importation and consumption of such foodstuffs. For example, shark fin and turtle soup are imported to Austria (in cans) and offered in shops and restaurants (partly upon request - own observations). The main problem of such specialties is that an increased demand results in an over-exploitation of resources. A strong factor for this development is the growing wealth of a larger number of persons – thus making luxury foods purchasable to more individuals.

Catching tunny fish in the Mediterranean is a tradition going back several thousand years. Currently, about 75% of Albacore caught in the Mediterranean (*Thunnus alalunga* – potentially endangered) is exported to Japan (e.g., Swartz, 2004; Fritz, 2010). In addition to negative effects for local fisheries, the highly endangered Bluefin Tuna (*Thunnus thynnus* – on the red list of the IUCN) is incorrectly declared and hidden in these transports. Frequently, only the very valuable belly flaps of the fish are smuggled, thus complicating the identification of the species. The international character of these transactions and the necessary logistics make clear that such smuggler rings are associated with organized crime.

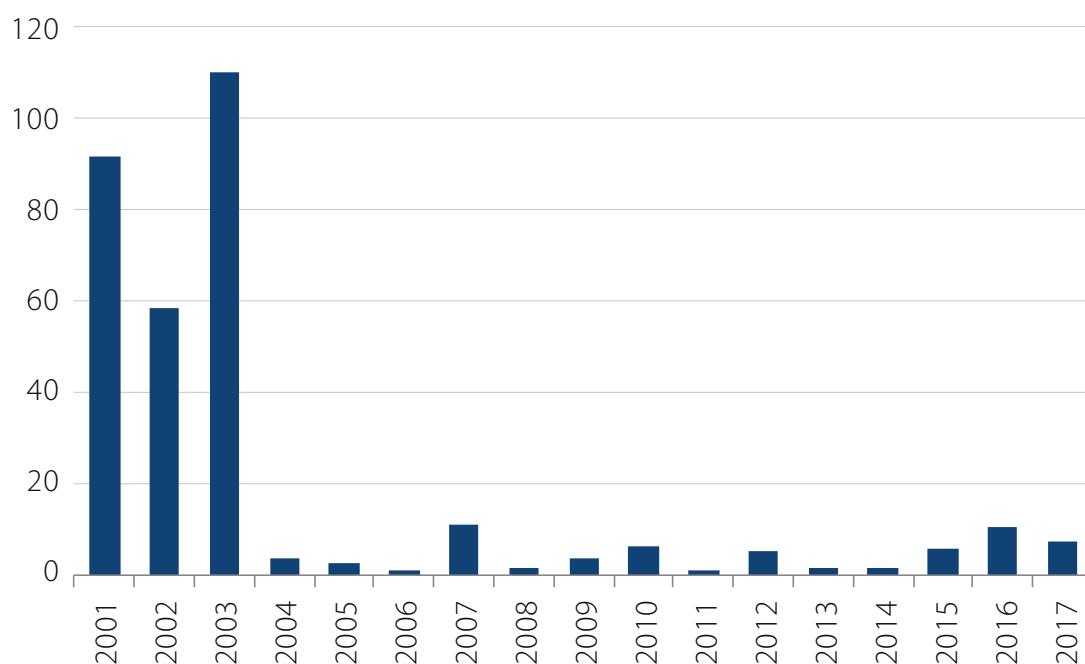
Likewise criminal networks trade species like 'geoducks' (or 'king clam' - *Panopea generosa*) that are collected at the northwestern coasts of the USA and Canada, and which are almost exclusively consumed in Asia (as Sashimi - see e.g., Guardian, 2011). The desired effect, improvement of erectile dysfunction, would probably take place to a comparable extent with other protein rich foods. A similar medical issue influences the consumption of eggs from sea turtles or of 'snake-wine'.

Smuggling of caviar might demonstrate the effectiveness of even random spot checks. Confiscations of caviar that exceed the legal amount of 125g for specific sturgeon species has decreased drastically since 2003 (Fig. 2). The amazing reduction in the year 2004 is

apparently connected to the joining of several of Austria's neighbors with the EC. The dropping of custom controls resulted in a decrease of confiscations from about 100kg to about 4.5kg per year.

This development might indicate that even spot checks are quite effective, and may give a baseline for the actual amount of illegally traded caviar (see Engler & Knapp, 2008; Doukakis et al., 2012).

Fig. 2: Caviar confiscations in kg/year⁴



3.6. Souvenirs

Objects that have been categorized as 'souvenirs' were slightly more often confiscated than those in the previous category in the investigated time span (159 vs. 153 cases; see Fig. 1). The probable reason for this distribution is – as mentioned before – that the data are mainly based on luggage controls at airports and postal traffic. Other (illegal) means of transportation are only discovered by chance. The statistics therefore include hardly any large-scale transports of commercial smugglers.

The goods that are most common in this category are corals, shells and stuffed reptiles (especially Cobras). While the latter are mainly imported as 'snake wine' (and therefore categorized as 'food' in this study), they are also used as decorative objects after taxidermy.

⁴ Data from the Federal Ministry of Sustainability and Tourism – Department for National Parks, Nature Conservation and Species Protection.

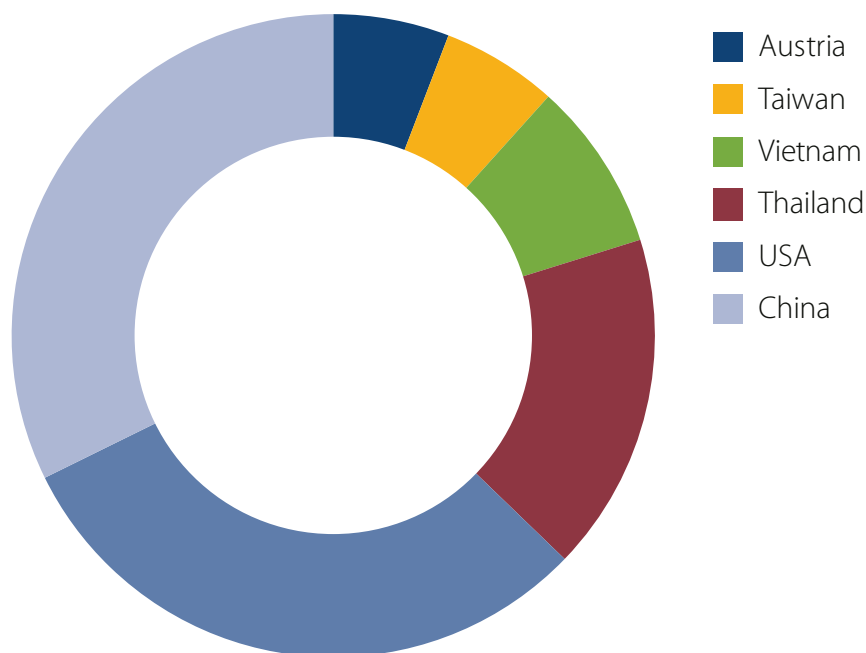
Confiscations of these taxa naturally reflect their countries of origin, i.e., tropical touristic hotspots. However, a considerable amount of tropical corals (sometimes artificially colored) and mollusks is also offered at street markets in Mediterranean countries. These objects do not enter the confiscations statistics since relevant controls for transports within the EC are lacking and the import controls of the countries where these items are sold are, evidently, insufficient.

Ignorance of legal regulations and/or a lack of insight into the problem of buying products from protected species can be assumed for many travelers. In addition to this factor, local dealers often exert a considerable pressure. While controls of returning travelers can partly punish individual transgressions, a more efficient strategy against souvenirs from protected animals or plants can probably be exerted by the local authorities.

3.7. Geographical Distribution

Asian countries have a dominant position in trading protected species as estimated from the confiscations in Austria (Fig. 3). Four of the six countries with the highest seizures are in Asia. Attempted illegal imports from these countries account for 65% of total confiscated goods. The high proportion of confiscations from the USA is probably partly due to the central position of this country in internet trading. For example, many TAM products can be obtained by mail-order from the USA.

Fig. 3: Confiscations per country of origin from 2011-2017. Only the six countries with most entries are shown. The values for Austria represent attempted illegal export or transit/re-export.



The relatively high proportion of souvenirs, especially corals, and the comparatively low number of trophies is conspicuous in Austria. As mentioned before, this effect partly results from the assignment of the products to the categories used here and to the focus of the data pool to controls at airports and postal centers. The high number of corals is probably also affected by ignorance of the legal regulations and by spontaneous purchases from local dealers who pretend to sell legal souvenirs. The CITES-status of corals is sometimes disputed (see e.g., Green & Hendry, 1999). Corals are used as building blocks in many countries and the destruction of reefs is mainly caused by factors that do not underlie species protection agreements.

Confiscations of pseudo-medical and esoteric products were nearly as frequent than goods listed as souvenirs during the investigated period. Asian countries (together with the USA) are central for these goods in the international market, either as consumers, in processing, or in re-exporting (e.g. Rosen, 2010; Patel et al., 2015; Heinrich et al., 2016).

The (trivial) fact that decreased controls result in fewer seizures can generally be stated. For caviar, as an example, the confiscations decreased from about 100kg/year to approximately 5kg from 2004 on. The reason for this phenomenon is likely not a reduction in demand but the loosening of customs controls after the joining of the EC by several neighboring countries. Increased controls of CITES-regulations instead, might have an advantageous effect for preservation of the involved fish species (Doukakis et al., 2012). These controls should be coordinated with the relevant origin and transit countries, but mainly be aimed at internet trade and the traffic of some related companies.

Illegal exchange of CITES-protected goods, as far as can be deduced from the confiscations, is far below the trade volumes of legally approved merchandise. In 2017, for example, 1 891 permissions for crocodile, alligator and caiman products were issued. Import of living corals was granted in 381 cases, and the import for ivory or ivory-derived products was granted in 49 cases. However, there were only four confiscations of crocodile leather products, 12 corals (living or dead) and two ivory products. As mentioned before, it may be assumed that the quantitative proportion of illegal imports can only be roughly estimated from these numbers.

4. Discussion

The rules and effectiveness of CITES are frequently criticized (e.g., Blundell & Mascia, 2005; Sollund, 2013). Still, it can be assumed that its positive effects for preserving endangered wildlife prevail (e.g. Doukakis et al., 2012). However, pressure from destruction of their biotopes is probably the most important peril for most species (UNEP-WCMC, 2004; UNEP-WCMC, 2010; Estrada et al., 2018; Strindberg et al., 2018; Kock et al., 2018; see also Lenzen et

al., 2014). It should also be kept in mind that the CITES treaties pertain specifically to international trading. National rules for the protection of threatened species differ markedly in the various countries. In addition, such rules are not executed rigorously by all states.

Trading in protected species is inherently an international issue. However, the highest threats facing many species, like e.g., over-exploitation and biotope loss, are predominantly local or national problems. It can therefore not be expected that preservation of a threatened species is warranted, even if illegal consumption could fully be abolished. Also, evaluating the effectiveness of protection measures is very complicated. The desired ecological effects are happening slowly, and their documentation is costly and requires qualified personnel (Gibbs & Currie, 2012).

In addition to the aspects of species conservation, serious risks result from the lack of import controls. The possible danger by invasive species and transmission of infectious diseases from illegally imported animals and plants is rarely discussed in Austria. Nevertheless, possible transfer of invasive animal and plant species involves severe problems. In Austria, several of these species have spread in recent decades, frequently with negative consequences for the ecosystem or economy. Examples are ragweed (*Ambrosia sp.*), the Zebra or Wandering Mussel (*Dreissena polymorpha*), and the spread of Pond Slider Turtles in domestic rivers and ponds.

The lack of veterinary controls of illegal imports bears the risk of transferring infections to the local fauna and flora. If domestic animals are affected, this may cause serious financial losses (e.g., rabies, bird flu, etc.).

Indisputably, 'bush-meat' – game – has always been an important source of protein for the local population in tropical countries. However, the extent of hunting, particularly when supplying growing urban populations, along with biotope loss (clearing), often endangers the survival of the local populations (see e.g. Estrada et al., 2018). As a consequence of lacking sanitary controls, the illegal import of bush-meat might also transfer human pathogens, eventually even Ebola.

Several studies indicate the considerable international differences in the usage of protected species. An analysis on the trade of several typical illegally traded animal species and their products (tiger, rhinoceros, elephant, etc.) shows that the majority of issues is contributed from only a few countries (Patel et al., 2015). Export is naturally conducted predominantly by African states (South Africa, Kenya, Mozambique, etc.) while import is mainly undertaken by East Asian countries (Vietnam, Thailand, Malaysia, Cambodia, and especially China/Hong Kong). Significant improvements in these countries would have a substantial impact. For example, according to the mentioned study, blockage of illegal

trade by only six states would stop 98.1% of trafficking in tiger products. Similar success was calculated for the other species in this study as well (Patel et al., 2015).

The production of (pseudo-)medical preparations is an important motive in the request for protected species (see e.g., Deephak, 2018). Extrapolations from the quantities of seized objects indicate that the production of TAM preparations severely aggravates problems of species conservation.

The oft-criticized 'western' medicine abandoned most ineffective constituents like bear bile, rhinoceros powder, snake oil, etc., in the last centuries. Nevertheless, products of 'alternative' or 'holistic' medicine, homeopathy, Bach flowers and the like, are increasingly in demand. The reasons for this phenomenon are complex and beyond the scope of this text. Nevertheless, it should be noted that the motivation of many Asian consumers of TAM products, in addition to cultural reasons, also stems from unavailability or high prices of western medications. However, the European market is primarily prompted by esoteric and pseudo-scientific factors (e.g., Presse, 2009; Wildenrath, 2017). This expansion of the market to non-Asian consumers aggravates the connected problems. This refers not just to the quantitative aspects, since western/European consumption is still comparatively small. Instead, an attitude of tolerance and acceptance of pseudo-medical therapy is formed or fostered. Ironically, this trend is strongest in consumers who are often positively inclined toward questions of environmental and animal protection. Better information on the components of several 'natural' preparations might therefore raise consciousness of these problems. This refers mainly to the usage of protected plants, since their over-exploitation and protection status is often unknown to consumers. This may less often be the case for endangered animal products, as users of tiger, rhinoceros or pangolin components are probably well aware of the state of these species. The fact that more than a third of the global population uses TAM products (WWF, 2008) suggests a deeply negative prospect for the involved animals and plants.

In addition to the aspects of endangered species preservation, the production of TAM and other pseudo-medical preparations often does not conform to the standards of hygiene, homogeneity and purity that are required for production of medical or even nutritional products.

'Alternative' medicine products are not just often ineffective and therefore delay or inhibit evidence-based therapy and treatment of the underlying disease. Some of them can be directly unhealthy. One example is the frequently confiscated Hoodia-preparations (*Hoodia gordonii*) that are marketed for losing weight. According to control studies, the effect of weight reduction is the result of an intestinal inflammation that is caused by consumption of the drug (see Smith & Krygsman, 2014).

Increased efforts from several governments and also some producers to manufacture products without using endangered species, or substituting them with cultivated constituents, has shown positive effects for several species in the last years (e.g., Meijer et al., 2017). Increased law enforcement initiatives were often successful. However, a large amount of illegal trade remains where the legal initiatives are apparently insufficient.

Still, it must be acknowledged that not all ethnic medicine is based on quackery or superstition. Newer (traditional) Chinese medicine attempts to identify the active components of traditional formulations and study these (normally plant-based) drugs with scientific methods. Youyou Tu was awarded the Nobel Prize for medicine⁵ in 2015 for identifying an agent that was used in ethnic medicine. The fact that pharmacologically active substances are contained in some of the over 1 500 animal and 5 000 plant species that are used in TAM is not surprising. Many components are usually present in traditional formulations, and psychological factors – especially placebo-effect and suggestion – influence the subjective effectiveness of the medications so a perceived ‘healing’ is often felt. The same licensing tests should therefore be required as are conducted for conventional medical products. This also refers to western pseudo-medicine like homeopathy, Bach flowers, etc.

5. General Aspects & Conclusion

Smuggling of protected animals or plants is practically absent from the public perception of ‘threats’, notwithstanding its close relations to organized crime and the financing of terror organizations. As mentioned before, it is estimated that the total volume of such goods ranks fourth in illegal trade, after drugs, counterfeit products and human trafficking (e.g., IATA, 2014; Laws, 2017). Local poachers or producers of artifacts hardly obtain a noteworthy profit. Instead, terror groups and militias (especially in Africa), organized crime (see Mackenzie, 2002; Rose & Smith, 2010; Tyler & Sheikh, 2013; Patel et al., 2015; Avis, 2017) and corrupt officials reap most of the the gains. Local conflicts between poachers and gamekeepers can reach an intensity that is comparable to civil wars (e.g., Lang, 2017; Vira, 2017; see also Guardian, 2012). The few existing investigations on the opinion of the local population indicate that they are well aware of the problems resulting from poaching, over-exploitation and biotope deterioration, and that they agree with (or are open to) actions for preserving the ecology of their environment (e.g., Gore et al., 2016).

Frequently, attempts are made to counter illegal trade networks with stronger ‘policing’ (controls, task forces, etc.). For example, several INTERPOL projects (INTERPOL, 2017a) analyze targets and connections of trade networks that are searched then by the local

⁵ for the isolation of the anti-malaria agent Artemisinin from the Sweet Sagewort/Wormwood (*Artemisia annua*) used in ethnic medicine.

authorities within internationally coordinated operations (e.g., Operation Thunderbird – INTERPOL, 2017b). The confiscations from such large operations can only deliver a single, momentary insight into the problem, but provide an indication of the real volumes that are traded in the 'dark field'. However, sustainability of such concentrated measures is difficult to obtain in some countries (see e.g., Kaaria & Muchiri, 2011; Basu, 2014).

Like in other fields of organized crime, a considerable problem is posed by corruption of those authorities that are in charge of executing local laws and international agreements. Similar difficulties persist for the exploitation of other natural resources, as in the support of international fishery agreements or logging. Execution of the pertinent rules is strongly dependent on the political situation and technical infrastructure of the specific country. For example, an investigation on law enforcement in the Arusha wildlife preserve in Tanzania showed that only 16% of accusations resulted in a sentence. This is probably due to deficits in forensic evidence (Salum et al., 2017). It would therefore be useful to improve and extend multilateral assistance, like e.g., the INTERPOL campaigns. In addition, targeted international support, like improvements of park rangers equipment and especially fighting corruption, could provide help in fighting criminal networks. Furthermore, certain administrative means like better security measures for export / import certificates, might additionally be useful.

While improvements in law enforcement in the exporting countries (see e.g., Salum et al., 2017) and the fighting of international trafficking networks (see Moreto & Lemieux, 2015; Moreto, Cowan & Burton, 2017) are important factors, a sustainable improvement in the protection of animal and plant species can probably not be reached in a predominantly 'supply sided' approach, but more likely from the side of the consumers – i.e., by a reduction in demand. Systematic investigations on the motivations of consumers would be important in this respect. Presumably, consumption that is largely motivated by prestige and collecting might even be boosted by decreasing resources and effective repression measures as these factors make their desired objects more valuable. Conversely, consumers who form the market for 'alternative' goods and are determined by civilization-critique, may respond to directed information campaigns by shifting to products that can be produced without components from endangered species. Targets for such campaigns could probably be found in the segment of cosmetics and health products, but improved information on hunting or collection methods (e.g. 'finning' for shark-fin soup) could also reduce the demand for certain other goods.

Enhanced information on the real status of endangered populations (e.g., Courchamp et al., 2018), the ecological consequences to the collecting regions, and the inefficiency of pseudo-medical products may induce a paradigm change and lead to improved consciousness in consumers of such products. This may ideally result in an improved conservation status for many protected species in the middle term (see also Offord-Wool-

ley, 2017). It seems promising to provide this information to consumers in a manner that is adjusted to their specific state and culture (e.g., by 'micro-targeting'). By using 'new media', it might be possible to change the minds of western-minded as well as more traditionally oriented customers. This is not necessarily a futile effort. As an example, the attitude towards using pelts of big cats has changed in practically all western countries. Analogous campaigning might also change the attractiveness of other products.

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References

- AVAAZ, (2018) Illegal ivory openly sold across Europe: study.
<https://phys.org/news/2018-07-illegal-ivory-openly-sold-europe.html> [Accessed 13th July 2018].
- Avis, R. W. (2017) Criminal networks and illicit wildlife trade. K4D Helpdesk Report 150. Brighton, UK, Institute of Development Studies, 1-16.
- Bale, R. (2017) Are Traders and Traffickers Winning the Orchid Battle?
<https://news.nationalgeographic.com/2017/11/wildlife-watch-illegal-orchid-trade-ornamental-food-medicine/> [Accessed 26th July 2018].
- Basu, G. (2014) Combating illicit trade and transnational smuggling: key challenges for customs and border control agencies. *World Customs Journal* 8, 15-26.
- BGBL 188/1982, (1982) Übereinkommen über den internationalen Handel mit gefährdeten Arten freilebender Tiere und Pflanzen (Washingtoner Artenschutzabkommen). BGBL. Nr. 188/1982, 1-9.
- BGBL 16/2010, (2010) Bundesgesetz über die Überwachung des Handels mit Exemplaren wildlebender Tier- und Pflanzenarten (Artenhandelsgesetz- ArthHG 2009) BGBL Nr. 16/2010, 1-7.
- Blundell, A. & Mascia, M. B. (2005) Discrepancies in reported levels of international wildlife trade. *Conservation Biology* 19, 2020-2025.
- Bodeker, G., van 't Klooster, C. & Weisbord, E. (2014) *Prunus africana* (Hook.f.) Kalkman: The overexploitation of a medicinal plant species and its legal context. *Journal of Alternative and Complimentary Medicine* 20, 810–822.

- Broad, S., Mullikan, T. & Roe, D. (2003) The nature and extent of legal and illegal trade in wildlife. In: The trade in wildlife: Regulation and conservation. (ed. S. Oldfield) London, UK, Earthscan Publications Ltd., 3–22.
- brunodeceuk, (2014) Interesting experience. In: Marche aux Fetiches - Tripadvisor.
https://www.tripadvisor.at/ShowUserReviews-g293839-d2328884-r200198014-Marche_aux_Fetiches-Lome_Maritime_Region.html [Accessed 5th July 2018].
- CITES, (2009) Investigating the Internet Wildlife Trade.
<https://www.cites.org/eng/news/world/19/7.php> [Accessed 19th July 2018].
- Courchamp, F., Jaric, I., Albert, C., Meinard, Y., Ripple, W. J. & Chapron, G. (2018) The paradoxical extinction of the most charismatic animals. *PLoS Biology* 16, 1-13.
- Deephak, G. (2018) Traditional Chinese Medicine is Killing The World's Animals.
<https://www.yogi.press/home/traditional-chinese-medicine-killing-world-animals> [Accessed 29th November 2018].
- Doukakis, P., Pikitch, E. K., Rothschild, A., DeSalle, R., Amato, G. & Kolokotronis, S. O. (2012) Testing the Effectiveness of an International Conservation Agreement: Marketplace Forensics and CITES Caviar Trade Regulation. *PLoS ONE* 7, 1-9.
- Doyle, J. (1995) Black Marked Orchids / A global underground smuggling network may drive some rare species into extinction.
<https://www.sfgate.com/crime/article/Black-Market-Orchids-A-global-underground-3048840.php> [Accessed 29th July 2018].
- DW, (2018) Manila airport finds 1,500 live turtles in suitcases.
<https://www.dw.com/en/manila-airport-finds-1500-live-turtles-in-suitcases/a-47764151> [Accessed 21st July 2019].
- DW, (2019) Malaysian officials find 5,255 turtles packed in suitcases.
<https://www.dw.com/en/malaysian-officials-find-5255-turtles-packed-in-suitcases/a-49363300-0> [Accessed 21st July 2019].
- EC question, (2017) Parliamentary question 30th October 2017 - Subject: Illegal animal smuggling.
https://www.europarl.europa.eu/doceo/document/E-8-2017-006744_EN.html [Accessed 27th June 2018].
- EG 338/97, Übereinkommen über den internationalen Handel mit gefährdeten Arten freilebender Tiere und Pflanzen (Übereinkommen von Washington). Verordnung (EG) Nr. 338/97 des Rates vom 9. Dezember 1996 über den Schutz von Exemplaren wildlebender Tier- und Pflanzenarten durch Überwachung des Handels. pp 2107-2193.
- Engler, M. & Knapp, A. (2008) Briefing on the evolution of the Caviar trade and range state implementation of resolution conf. 12.7 (Rev. Cop 14). A TRAFFIC Europe Report for the European Commission, Brussels, Belgium.
<http://ec.europa.eu/environment/cites/pdf/reports/caviar.pdf> [Accessed 26th July 2018].
- Estrada, A., Garber, P. A., Mittermeier, R. A., Wich, S., Gouveia, S., Dobrovolski, R., Nekaris, K. A. I., Nijman, V., Rylands, A. B., Maisels, F., Williamson, E. A., Bicca-Marques, J., Fuentes, A., Jerusalinsky, L., Johnson, S., de Melo, F. R., Oliveira, L., Schwitzer, C., Roos, C.; Cheyne, S. M., Martins-Kierulff, M. C., Raharivololona, B., Talebi, M., Ratsimbazafy, J., Supriatna, J., Boonratana, R., Wedana, M. & Setiawan, A. (2018) Primates in peril: the significance of Brazil, Madagascar, Indonesia and the Democratic Republic of the Congo for global primate conservation. *PeerJ* 6, 1-57.
- Fritz, M. (2010) Gourmets gegen Naturschützer.
<https://www.fr.de/panorama/gourmets-gegen-naturschuetzer-11693758.html> [Accessed 21. 7. 2019].

- Gibbs, K. E. & Currie, D. J. (2012) Protecting Endangered Species: Do the Main Legislative Tools Work? PLoS ONE 7(5), e35730.
- Gore, M. L., Ratsimbazafy, J., Rajaonson, A., Lewis, A. & Kahler, J. (2016) Public perceptions of poaching risks in a biodiversity hotspot: Implications for wildlife trafficking interventions. *Journal of Trafficking, Organized Crime and Security* 2, 1–20.
- Green, E. & Hendry, H. (1999) Is CITES an effective tool for monitoring trade in corals? *Coral Reefs* 18, 403–407.
- Guardian, (2011) Shell games: Rogues, Smugglers and the hunt for nature's bounty - review. <https://www.theguardian.com/science/punctuated-equilibrium/2011/jun/30/3> [Accessed 27th July 2018].
- Guardian, (2012) Indian state to let forest guards shoot poachers on sight. <https://www.theguardian.com/environment/2012/may/23/indian-state-forest-guards-poachers> [Accessed 27th July 2018].
- Heinrich S., Wittmann, T. A., Prowse, T. A., Ross, J. V., Delean, S., Shepherd, C. R. & Casseya, P. (2016) Where did all the pangolins go? International CITES trade in pangolin species. *Global Ecology and Conservation* 8, 241–253.
- Hinsley, A. (2018) The Role of Online Platforms in the Illegal Orchid Trade., Geneva, Switzerland, The Global Initiative against Organized Crime, 4–8.
- Hinsley, A., Nuno A., Ridout, M., StJohn, F. A. V. & Roberts, D. L. (2017) Estimating the Extent of CITES Noncompliance among Traders and End-Consumers; Lessons from the Global Orchid Trade. *Conservation Letters* 10, 602–609.
- IATA, (2014) Combatting Illegal Trade in Wildlife. <https://www.iata.org/policy/environment/pages/wildlife-trafficking.aspx> [Accessed. 13th April 2018]
- IFAW, (2016) Killing for Trophies: An analysis of global trophy hunting trade. <https://www.ifaw.org/united-kingdom/resource-centre/killing-trophies-analysis-global-trophy-hunting-trade> [Accessed 27th June 2018].
- IFAW, (2018) Disrupt: Wildlife Cybercrime. <https://www.ifaw.org/united-states/online-wildlife-trade-2018> [Accessed 27th June 2018].
- INTERPOL, (2017a) Environmental Crime. Interpol Fact Sheet COM/FS/2017-03/PST03. https://www.interpol.int/content/download/19249/170126/version/17/file/23_PST03_03_2017_EN_web.pdf [Accessed 6th. October 2017].
- INTERPOL, (2017b) Anti-wildlife trafficking operation results in global arrests and seizures. N2017-022 <https://www.interpol.int/News-and-media/News/2017/N2017-022> [Accessed 6th. October 2017].
- Kaaria, B. I. & Muchiri, N. L. (2011) Enforcement challenges across borders: Detecting and prosecuting illegal wildlife trafficking. 9th International Conference for Environmental Compliance, British Columbia, Canada, INECE - International Network for Environmental Compliance and Enforcement, 1–9.
- Kock, R. A., Orynbayev, M., Robinson, S., Zuther, S., Singh, N. J., Beauvais, W., Morgan, E. R., Kerimbayev, A., Khomenko, S., Martineau, H. M., Rystaeva, R., Omarova, Z., Wolfs, S., Hawotte, F., Radoux, J. & Milner-Gulland, E. J. (2018) Saigas on the brink: Multidisciplinary analysis of the factors influencing mass mortality events. *Science Advances* 4, 1–10.
- Lang, C. (2017) More than 100 rangers die every year in the conservation war. <http://www.conservation-watch.org/2017/03/07/more-than-100-rangers-die-every-year-in-the-conservation-war/> [Accessed 3rd June 2018].

- Laws, E. (2017) The political economy of the illegal wildlife trade. K4D helpdesk report, Brighton, UK; Institute of Development Studies, 1-11.
- Lenzen, M., Moran, D., Kanemoto, K., Foran, B., Lobefaro, L. & Geschke, A. (2012) International trade drives biodiversity threats in developing nations. *Nature* 486, 109-112.
- Mackenzie, S. (2002) Organised crime and common transit networks. In: Trends and Issues in Crime and Criminal Justice Series. Canberra, Australia, Australian Institute of Criminology, 1-6.
- Marex (2018) Over three tons of Pangolin scales seized in Vietnam.
<https://www.maritime-executive.com/article/over-three-tons-of-pangolin-scales-seized-in-vietnam#gs.ubDUeAA>
 [Accessed 19th July 2018].
- Meijer, W., Scheer, S., Whan, E., Wu, D., Yang, C. & Kritski, E. (2017) Demand under the Ban – China Ivory Consumption. Research. TRAFFIC and WWF, Beijing, China.
- Moreto, W. D. & Lemieux, A. M. (2015) From CRAVED to CAPTURED: Introducing a Product-Based Framework to Examine Illegal Wildlife Markets. *European Journal Criminal Policy and Research* 21, 303-320.
- Moreto, W. D., Cowan, D. & Burton, C. (2017) Towards an Intelligence-Led Approach to Address Wildlife Crime in Uganda. *Policing* 42, 108-122.
- Offord-Woolley, S. (2017) The Chi initiative: A behaviour change initiative to reduce the demand for rhino horn in Viet Nam. *Pachyderm* 58, 144-147.
- Operation Thunderstorm, (2018) Wildlife crime: European seizures and arrests in global Operation Thunderstorm.
<https://www.europol.europa.eu/newsroom/news/wildlife-crime-european-seizures-and-arrests-in-global-operation-thunderstorm> [Accessed 5th July 2018].
- Patel, N. G., Rorres, C., Joly, D. O., Brownstein, J. S., Boston, R., Levy, M. Z., & Smith, G. (2015) Quantitative methods of identifying the key nodes in the illegal wildlife trade network. *Proceedings of the National Academy of Science* 112, 7948-7953.
- Packer, C., Kosmala, M., Cooley, H. S., Brink, H., Pineta, L., Garshelis, D., Purchase, G., Strauss, M., Swanson, A., Balme, G., Hunter, L. & Nowell, K. (2009) Sport hunting, predator control and conservation of large carnivores. *PLoS ONE* 4, 1-8.
- Presse, (2009) 'Voodoo-Medizin' auf dem Vormarsch.
<https://diepresse.com/home/panorama/gesundheit/459686/VoodoowbrMedizin-auf-dem-Vormarsch> [Accessed 6th October 2017].
- Reuters, (2017) China makes its biggest seizure of endangered pangolin scales: state media.
<https://www.reuters.com/article/us-china-pangolins/china-makes-its-biggest-seizure-of-endangered-pangolin-scales-state-media-idUSKBN1DT1KG> [Accessed 18th July 2018].
- Rosen, G. E. & Smith, K. F. (2010) Summarizing the evidence on the international trade in illegal wildlife. *EcoHealth* 7, 24–32.
- Salum, J., Eustace, A., Malata, P. F. & Mbangwa, O. F. (2017) Wildlife crime promoted by weak governance. *African Journal of Ecology* 56, 101–108.
- Smith, C. & Krygsman, A. (2014) Hoodia gordonii: To eat, or not to eat. *Journal of Ethnopharmacology* 155, 987-991.

- Sollund, R. (2013) Animal trafficking and trade: animal abuse and species injustice. In Westerhuis, D., Walters, R. & Wyatt, T. (eds.) *Emerging Issues in Green Criminology: Exploring power, justice and harm*. London, UK, Palgrave, MacMillan. pp. 72-92.
- Strindberg, S., Maisels, F., Williamson, E. A., Blake, S., Stokes, E., J., Aba'a, R., Abitsi, G., Agbor, A., Ambahe, R.D., Bakabana, P., Bechem, M., Berlemont, A., de Semboli, B. B., Boundja, P. R., Bout, N., Breuer, T., Campbell, G., De Wachter, P., Akou, M. E., Mba, F. E., Feistner, A. T. C., Fosso, B., Fotso, R., Greer, D., Inkamba-Nkulu, C., Iyenguet, C. F., Jeffery K. J., Kokangoye, M., Kühl, H. S., Latour, S., Madzoke, B., Makoumbou, C., Malanda, G.-A. F., Malonga, R., Mbolu, V., Morgan, D.B., Motsaba, P., Moukala, G., Mowawa, B. S., Murai, M., Ndzai, C., Nishihara, T., Nzooh, Z., Pintea, L., Pokempner, A., Rainey, H. J., Rayden, T., Ruffler, H., Sanz, C. M., Todd, A., Vanleeuwe, H., Vosper, A., Warren, Y. & Wilkie, D. S. (2018) Guns, germs, and trees determine density and distribution of gorillas and chimpanzees in Western Equatorial Africa. *Science Advances* 4, 1-14.
- Swartz, W. K. (2004) *Global Maps of the Growth of Japanese marine Fisheries and Fish Consumption*. Thesis, University of Columbia, pp. 14-39.
<https://open.library.ubc.ca/collections/ubctheses/831/items/1.0074898> [Accessed 14th September 2018].
- UNEP-WCMC, (2004) Review of significant trade. Analysis of trade trends with notes on the conservation status of selected species. United Nations Environment Programme – World Conservation Monitoring Centre, AC20 Doc. 8. 5. pp. 9-206.
- UNEP-WCMC (2010) Review of Significant Trade: Species selected by the CITES Plants Committee following CoP14. United Nations Environment Programme – World Conservation Monitoring Centre, PC19 Doc. 12. 3. pp. 3-243.
- Vira, B. (2017) Kaziranga's ruthless rangers have reduced rhino poaching by simply gunning down poachers at sight.
<https://qz.com/908867/kaziranga-s-ruthless-rangers-have-reduced-rhino-poaching-by-simply-gunning-down-poachers-at-sight/> [Accessed 15th February 2017].
- Wildenrath, C. (2017) Lebensenergie im Fluss.
<https://ptaforum.pharmazeutische-zeitung.de/ausgabe-212017/lebensenergie-im-fluss/> [Accessed 27th June 2018].
- WWF, (2008) Traditionelle chinesische Medizin. Hintergrundinformation 26. März 2008, Frankfurt, WWF Deutschland.
- Wyler, L. S. & Sheikh, P.A. (2013) International illegal trade in wildlife: Threats and U.S. policy. CRS Report for Congress, Congressional Research Service 7-5700, 1-22.