

VOL. 32 NO. 2

2

TRAFFIC

B U L L E T I N

**ONLINE TRADE IN SOUTHEAST ASIAN
AMPHIBIANS**

BIRD SINGING COMPETITIONS UNDER COVID

CONSUMER AWARENESS IN MYANMAR

EVALUATING MARKET INTERVENTIONS

OCTOBER 2020



The journal of TRAFFIC disseminates information
on the trade in wild animal and plant resources

TRAFFIC was established

in 1976 to perform what

remains a unique role as a

global specialist, leading and

supporting efforts to identify

and address conservation

challenges and solutions

linked to trade in wild

animals and plants.



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TRAFFIC's Vision is of a world in which trade in wild plants and animals is managed at sustainable levels without damaging the integrity of ecological systems and in such a manner that it makes a significant contribution to human needs, supports local and national economies and helps to motivate commitments to the conservation of wild species and their habitats.

Trade in wildlife is vital to meeting the needs of a significant proportion of the world's population. Products derived from tens of thousands of species of plants and animals are traded and used for the purposes of, among other things, medicine, food, fuel, building materials, clothing and ornamentation; moreover, this use provides vital income to millions of people.

Most of the trade is legal and much of it sustainable, but a significant proportion is not. As well as threatening these resources, unsustainable trade can also lead to species declining in the wild to the point that they are threatened with extinction. Illegal trade undermines local, national and international efforts to manage wild natural resources sustainably and causes massive economic losses.

The role of TRAFFIC is to seek and activate solutions to the problems created by illegal and/or unsustainable wildlife trade. TRAFFIC's aim is to encourage sustainability by providing government, decision-makers, traders, businesses, consumers and others with an interest in wildlife trade with reliable information about trade volumes, trends, pathways and impacts, along with guidance on how to respond where trade is illegal or unsustainable.

TRAFFIC's reports and advice provide a technical basis for the establishment of effective conservation policies and programmes to ensure that trade in wildlife is maintained within sustainable levels and conducted according to national and international laws and agreements. The journal of TRAFFIC, *TRAFFIC Bulletin*, is the only publication devoted exclusively to issues relating to international trade in wild plants and animals. Provided free of charge to over 4,000 subscribers and freely available from the TRAFFIC website (www.traffic.org), it is a key tool for disseminating knowledge of wildlife trade and an important source of information for those in a position to effect change and improve awareness.



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TRAFFIC welcomes articles on the subject of wildlife trade that will bring new information to the attention of the wider public; guidelines are provided in this issue and online to assist in this process. For more information, please contact the editor: (bulletin@traffic.org).

The TRAFFIC Bulletin is a publication of TRAFFIC, a leading non-governmental organisation working globally on the trade in wild animals and plants in the context of both biodiversity conservation and sustainable development.

The TRAFFIC Bulletin publishes information and original papers on the subject of trade in wildlife, and strives to be a source of accurate and objective information.

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TRAFFIC

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Kim Lochen retires as *TRAFFIC Bulletin* Editor

After 80 issues and approaching 30 years as Editor of TRAFFIC's flagship publication, the *TRAFFIC Bulletin*, Kim Lochen has stepped down from the role and retired in August this year.

The *Bulletin*'s name will always be associated with Kim, who steered the publication from an irregular, typed and photocopied newsletter when she took over as Editor a few years after she joined TRAFFIC in the 1980s, through to the respected peer-reviewed journal it is today.

The history of the *Bulletin* is essentially that of TRAFFIC: readers of the journal will have gone on the same journey as TRAFFIC matured and grew into the fully fledged international organisation it is today.

And after all her efforts helping steer TRAFFIC on this pathway, we are sure you will all wish to join Kim's colleagues and the many thousands of avid *Bulletin* readers and authors in wishing Kim a long and happy retirement.



The United Nations Summit on Biodiversity met in September 2020, hot on the heels of the 75th UN General Assembly in New York. Convened under the theme “Urgent Action on Biodiversity for Sustainable Development”, the meeting aimed to highlight the urgency of action needed at the highest political levels in support of a post-2020 Global Biodiversity Framework that contributes to the 2030 Agenda for Sustainable Development and places the global community on a path towards realising the 2050 Vision for Biodiversity, “Living in harmony with nature.”

EDITORIAL

The post-2020 Global Biodiversity Framework will replace the 20 biodiversity targets that were adopted by Member States of the Convention on Biological Diversity (CBD) in Aichi, Japan, in 2010. A CBD report released earlier in September, the fifth Global Biodiversity Outlook (GBO-5), assessed progress against the nature conservation commitments made by world governments in 2010 and suggested that none of the 20 Aichi Biodiversity Targets will be fully met in 2020. Needless to say, this was a hugely disappointing, if not unexpected finding. Clearly “business as usual” is not an option moving forward. Perhaps the silver lining in the dark cloud of the COVID-19 pandemic is it has forced world leaders to think more carefully about humankind’s impact on the environment and catalyse the high-level political will needed to ensure that, when eventually finalised, the post-2020 Global Biodiversity Framework does provide ambitious and accelerated positive actions that benefit both biodiversity and people, as well as the resources needed to implement the framework effectively. In the lead up to and after the Summit, representatives of some 78 countries, including Germany’s Angela Merkel, Canada’s Justin Trudeau, New Zealand’s Jacinda Ardern and the United Kingdom’s Boris Johnson took a Leader’s Pledge for Nature to preserving biodiversity. The challenge now is to turn such words into action to ensure that the post-2020 Global Biodiversity Framework will indeed prompt the transformative changes needed to reverse the rapid decline in nature.

The current draft of the Framework features, for the first time, a target on wildlife trade, calling on governments to ensure that the harvesting, trade and use of wild species of fauna and flora is legal, at sustainable levels and safe by 2030. A global landmark report from the UN’s Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services (IPBES) in 2019 revealed that the rate of species extinctions is accelerating and identified the direct exploitation of animal and plant species, including harvesting, hunting, fishing and logging, as the second biggest driver of negative impacts on nature, after changes in land and sea use. TRAFFIC believes that the establishment of a wildlife trade focused target within the post-2020 Global Biodiversity Framework is essential to ensure the political commitment and levels of implementation to address this global issue.

Recent years have seen the issue of poaching and illegal wildlife trade at the forefront of global attention. However, not enough consideration has been given to sustainable and legal trade in wild animals and plants and its role in conservation and socio-economic development. TRAFFIC hopes that ongoing negotiations on the Framework give due attention to how sustainable use contributes to species’ long-term conservation and the multiple benefits for people reliant on use and trade of them.

The primary issue that now dominates the world agenda is the COVID-19 pandemic. It has shown how human health and well-being is inextricably linked to biodiversity and planetary health. Efforts by just one sector or one single nation cannot prevent or eliminate the outbreak of future pandemics caused by zoonotic diseases. A well-co-ordinated “One Health” Approach is needed, with the collaboration of many with a range of expertise who are active in different sectors, such as public health, animal health, plant health, wildlife management, economic development, wildlife use and trade, nature conservation, environmental protection and climate change—at the national, regional and international levels—to maximise co-operation, synergies and sharing information and best practices.

In October, TRAFFIC joined other members of the Collaborative Partnership on Sustainable Wildlife Management (CPW) in issuing a statement setting out guiding principles aimed at reducing the risk of future pandemics originating from wild animals while strengthening the conservation of wildlife, and at the same time respecting livelihoods, food security and the culture of diverse groups of people. The CPW is a voluntary partnership of 14 international organisations, including the Secretariats of the CBD, Convention on International Trade in Endangered Species of Wild Fauna and Flora, World Organisation for Animal Health and the Food and Agriculture Organization. The CPW principles stress the importance of maintaining and restoring healthy and resilient ecosystems to reduce risks of zoonotic spill-overs and future pandemics, while recognising the importance of the use of wildlife for many communities, including Indigenous Peoples and Local Communities in policy responses.

Most importantly, the COVID-19 pandemic has demonstrated that now is the time to value and invest in nature by developing integrated socio-economic stimulus packages that address long-term planetary health, food security, poverty alleviation, climate change, biodiversity loss and other aspects of the UN’s Sustainable Development Goals. The set of important multilateral negotiations taking place in the coming months, such as the CBD CoP and the UN Climate Change Conference, present a unique opportunity to integrate these ideas into a strategic vision for biodiversity, climate, and planetary health.

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FairWild goes virtual while pressures mount on wild plant supply chains during COVID-19 pandemic

This year has brought new challenges for the FairWild initiative¹ and work to promote sustainable trade in wild ingredients. The year began with the annual exhibition at the BioFach organic trade fair in Germany, where the event “*Wild plants, wild world!*” highlighted the role that businesses can take to protect biodiversity in a changing world. The topic was chosen in the expectation that 2020 would be a biodiversity “super-year”, with major policy events such as the Convention on Biological Diversity (CBD) CoP15 scheduled to take place. Global affairs have since taken a rather different turn, as the true scale and implications of the COVID-19 crisis have become clear. However, the need for sustainable and equitable production systems has never been greater.

The FairWild Foundation took steps to ensure the FairWild certification scheme could continue to operate amidst the pandemic. A set of COVID-19 auditing guidelines allow for the possibility of “remote audits”—an approach that has become necessary due to travel restrictions worldwide. More flexibility has also been provided around the use of the FairWild Premium fund² to support wild collection operations and communities in adapting to new challenges. As the end of 2020 draws near, FairWild is taking stock to identify what else is needed to respond to the needs of the community and partners in 2021 and beyond.

Meanwhile, FairWild has continued to promote sustainable wild harvest and trade. A well-attended webinar in May 2020 “*Boost your business with FairWild*” was held to encourage new brand manufacturers to become involved with FairWild. Industry interest in sustainability remains strong despite the more immediate issues many companies are facing. This is perhaps in line with a general public desire to keep environmental issues a high priority. A survey by Accenture in April 2020 found that 45% of consumers said they are making more sustainable choices when shopping since COVID-19 and will likely continue to do so.³ With increased capacity provided by the newly established Business Engagement Officer role, FairWild is reaching out to more companies and has been pleased to see more manufacturers come on board as licensees in 2020, despite the practical problems of the pandemic. FairWild has also been featured in the industry press, winning the 2020 sustainability award from the *Nutrition Business Journal*.

However, anecdotal information indicates that demand for wild plant products has increased worldwide—both

as herbal products to prevent and treat COVID-19 and because of more people turning to wild harvesting as an alternative source of income during times of high unemployment and economic crisis. TRAFFIC released the report “*The Invisible Trade: Wild plants and you in the time of COVID-19*” in June highlighting the issue. Its launch coincided with FairWild week—an online event that celebrates wild plants and all that nature can bring to our lives. It brought together the energy of FairWild’s partners and licensees⁴ to highlight the positive benefits of sustainable wild plant harvesting as well as the considerable challenges that these species and landscapes are facing.

With many parts of the world still facing restrictions, more must be done to support the communities hardest hit by the COVID crisis—to help ensure they can continue to manage their wild resources sustainably. A recent webinar encouraged wild collection operations to stay involved with FairWild and seek the support and commitment of their trading partners on their journey to sustainability. Representatives from two FairWild-certified companies, B’Ayoba and Neliax, shared their stories and encouraged others to join in.

In 2021 FairWild will keep moving forward, with more virtual events planned for the first part of the year. Other forthcoming opportunities include the expansion, with assistance from members of the IUCN SSC Fungi Conservation Committee and FairWild advisory panel and several industry partners, of the FairWild certification scheme to fungi products. The Foundation is also working to clarify the eligible certification “grey area” between wild harvest and cultivation, and thus expand the range of certifiable scenarios and resulting biodiversity benefits. As ecosystem restoration is likely to continue gaining emphasis as a future conservation strategy, as well as the mainstreaming of biodiversity in production landscapes, this is an approach in line with the overall direction of the conservation movement.

Please contact the FairWild Secretariat if you would like to work on new opportunities together—including industry involvement in the FairWild certification scheme; engagement in training and capacity building activities and technical work on the Standard; and fundraising and partnership development. A fair deal for people and wild collected plants involves us all!

Bryony Morgan is Executive Officer of the FairWild Foundation Secretariat and manages TRAFFIC’s programme of work with the FairWild Standard.

¹ FairWild Foundation maintains the FairWild Standard and certification scheme for the sustainable and fair trade of wild harvested plants, fungi and lichen ingredients. The FairWild Secretariat is provided by TRAFFIC under the basis of a partnership agreement, and TRAFFIC also supports uptake of the FairWild Standard worldwide through a broader programme of work on sustainable trade.

² The FairWild Premium is a ringfenced amount of funding paid by FairWild buyers on top of the usual sales price for FairWild-certified ingredients, to support social development projects for the wild harvesters and their communities.

³ COVID-19 Increasing Consumers’ Focus on “Ethical Consumption,” Accenture Survey Finds.
<https://newsroom.accenture.com/news/covid-19-increasing-consumers-focus-on-ethical-consumption-accenture-survey-finds.htm>

⁴ Brand manufacturers using FairWild-certified ingredients.

UPDATES FROM THE WILDLIFE TRADE PORTAL

INTRODCUTION

TRAFFIC's Wildlife Trade Portal—the world's most comprehensive open-access online portal of wildlife seizure data—was launched in April 2020 as a means of sharing data and cultivating collaboration with other organisations working in this field. Using information gathered from open sources such as press releases and publicly accessible datasets, the Portal was designed to be used by non-governmental organisations (NGOs), researchers and law enforcement agencies. It was developed with generous funding from Arcadia—a charitable fund of Lisbet Rausing and Peter Baldwin through support to the Reducing Trade Threats to Africa's wild species and ecosystems (ReTTA) project.

Following its launch, the Portal has attracted users from 68 countries around the world who have performed over 6,000 searches and downloaded over 500 datasets. Users of the Portal have access to more than 13,000 wildlife incident records—a number that is growing daily—including information relating to the commodities involved, the trade routes used, the methods

of concealment, and more.

The information contained in the Portal has been used for a variety of applications. For example, a study of pangolin scales seizures in three cities in Cameroon over the last decade demonstrated that although more seizures have been reported involving Yaoundé than Douala, the average weight of consignments associated with Yaoundé was 165 kg—one-sixth of the average 965 kg seen in Douala (Figure 1). One likely explanation is the existence of a seaport in Douala, a target for smugglers aiming to transport large quantities of scales, such as the 5 tonnes seized in 2017 from a Douala-based company run by Chinese nationals.¹

The same study examined trade routes for pangolin scales between Cameroon and Asian and/or other African countries. Datapoints from the Portal were uploaded into TradeMapper (www.trademapper.co.uk) to create maps such as the one displayed below (Figure 2). This map not only highlights Cameroon's role as a consolidation point for pangolin scales trafficked from other African countries prior to onward overseas transport, but also

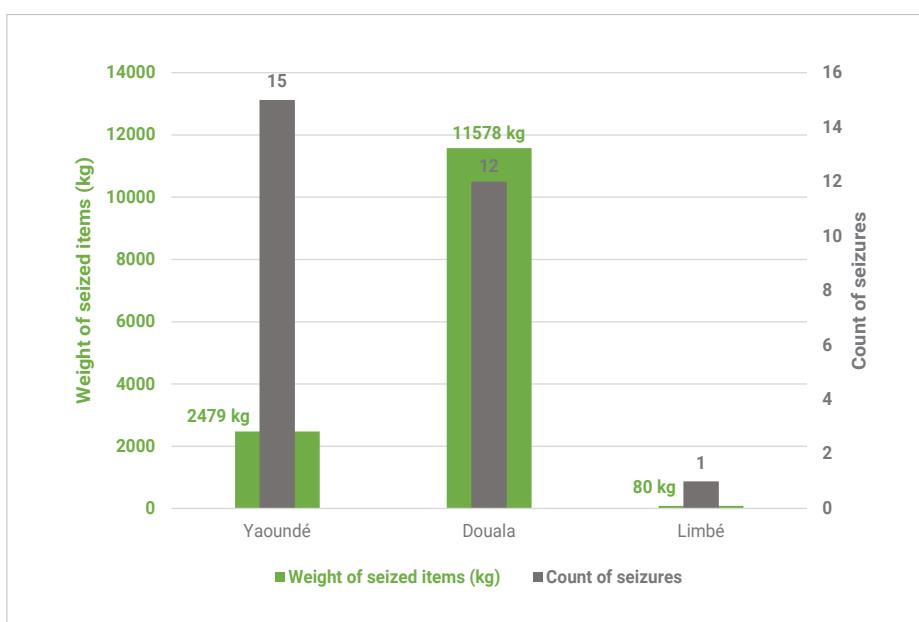


Fig. 1. Weight of items seized (and count of seizures) of pangolin scales involving Yaoundé, Douala and Limbé, 2010 to 2020.

Primary source: Wildlife Trade Portal (TRAFFIC, 2020), with a few additions from The Wildlife Trade Information System (TRAFFIC, 2020).

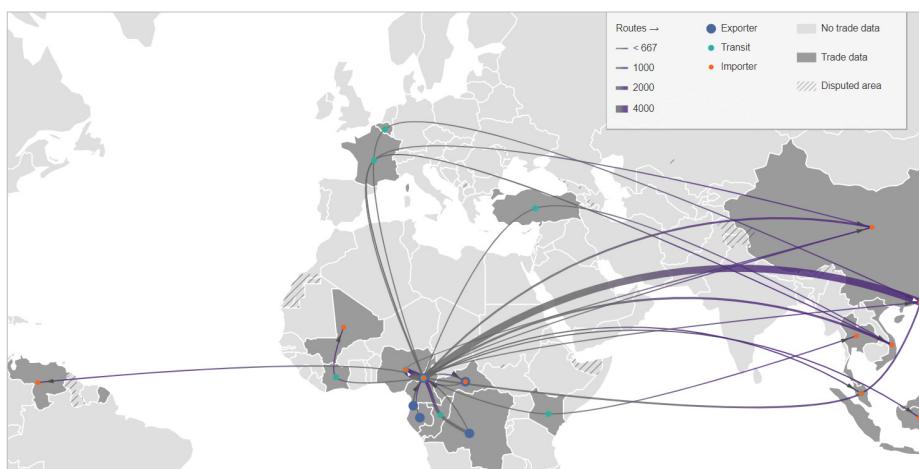


Fig. 2. Trade routes of pangolin scales smuggled between Cameroon and Asian and/or other African countries, 2010 to 2020.

Primary source: Wildlife Trade Portal (TRAFFIC, 2020), with a few additions from The Wildlife Trade Information System (TRAFFIC, 2020). Compiled using TradeMapper (TRAFFIC, 2018).

¹ <https://www.eagle-enforcement.org/news/5-tons-of-pangolin-scales-seized-2-chinese-arrested--A254/>

shows Europe's role as a transit point, revealing the circuitous trade routes employed by traffickers to complicate or delay law enforcement efforts.

Another analysis of Portal data explored the various ivory products being moved along trade routes involving Thailand. Although many such routes involving Thailand are destined for China, the overall weight of ivory in these consignments is relatively small. By comparing the commodity types transported in these trade routes (Figure 3), it is evident that seizures in which the ivory was destined for Thailand appear to consist largely of raw ivory tusks and pieces, whereas seizures in which the ivory transited through Thailand and was destined China appear mainly to involve ivory carvings. This could be indicative of Thailand's role in carving or processing raw ivory for onward export to China and elsewhere.

Recent additions to the Portal include a dataset of timber seizures. Using this, Portal users can analyse the methods of concealment and misdeclaration employed by traffickers attempting to disguise their smuggled goods or thwart law enforcement efforts. A recent analysis into this new dataset showed that over a quarter of all efforts to conceal illegal timber shipments included the use (or claimed use) of legal timber (Table 1). Traffickers also used food, often "wheat flour", to conceal timber shipments. Other shipments were mislabelled as heavy industrial components or materials such as car parts or granite slabs, perhaps in an attempt to add a layer of authenticity to the weight of the shipping container.

The data underlying these various analyses can be downloaded from the Wildlife Trade Portal, available at www.wildlifetradeportal.org. TRAFFIC hopes that the increased understanding afforded by this open-access information will help to broaden global understanding of international wildlife trade and contribute to a solid body of evidence to guide conservation strategy.

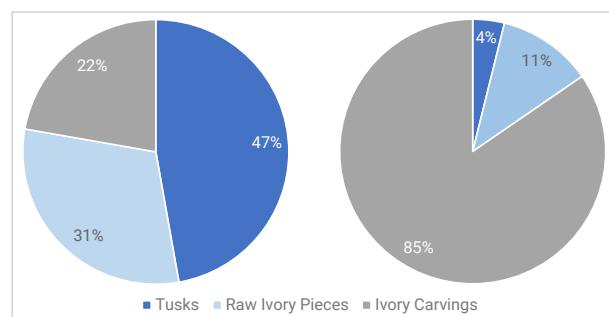


Fig. 3. Percentage frequency distribution of ivory products appearing in trade routes involving Thailand, with Thailand as the final known location (left) and with China as the final known location (right), 2010 to 2020.

Primary source: Wildlife Trade Portal (TRAFFIC, 2020).

Table 1: Methods of concealment or misdeclaration of timber shipments, 2010 to 2020.

Primary source: September 2020 dataset from Wildlife Trade Portal (TRAFFIC, 2020) with a few additions from The Wildlife Trade Information System (TRAFFIC, 2020). Specific methods have been grouped into categories.

Method of concealment or misdeclaration	Percentage frequency
Legal timber	28%
Foodstuffs	17%
Metallic objects/parts	11%
Stone	9%
Cloth/Clothing	7%
Furniture	6%
Building materials	4%
Glassware	4%
Powder	4%
Other	11%

Welcome to the Wildlife Trade Portal

The most comprehensive open-access repository of wildlife seizure data.

The Wildlife Trade Portal is an interactive tool that displays TRAFFIC's open-source wildlife seizure and incident data. It was developed by TRAFFIC with the generous support of Arcadia, a charitable fund of Lisbet Rausing and Peter Baldwin, via the ReTAA project.

[Learn more](#)

TRAFFIC
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A screen grab of the online portal interface where registered users can log in to access data on wildlife trade.

DISTANCING THE FLOCK: BIRD SINGING COMPETITIONS FLY ONLINE TO AVOID COVID-19

by Olivia H. Armstrong
and Serene C.L. Chng



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White-rumped Shama *Kittacincla malabarica*.

The practice of bird keeping and the popularity of bird singing competitions in Indonesia, particularly on the island of Java, is having a huge impact on wild bird populations (Burivalova *et al.*, 2017; Chng *et al.*, 2015; Chng and Eaton, 2016; Harris *et al.*, 2017; Marshall *et al.*, 2020). Birds are kept as pets to sing in people's homes and to be entered into competitions. This hobby, locally called "Kicaumania" (chirping-mania), has developed into an economically important industry in Indonesia (Burivalova *et al.*, 2017; Jepson and Ladle, 2011; Marshall *et al.*, 2020; Nijman *et al.*, 2017); it is widespread and all levels of society partake in bird singing competitions.

Bird singing competitions are commonplace across Indonesia and particularly prevalent on Java. Often these are held monthly, weekly or even daily in public spaces. The size of the events range from local competitions with up to 500 competing birds to regional events with up to 1,000 birds, and national competitions with up to 2,000 birds (Omkicau, 2019). Bird singing competitions are well organised, usually with entry fees, categories for different species, judging criteria, and prizes. Birds with a wider singing repertoire may fetch higher prizes and, for some species, it is perceived that wild caught birds have a better song quality (Jepson and Ladle, 2005; Burivalova *et al.*, 2017; Marshall *et al.*, 2020). This in turn drives the illegal trapping and trade in wild caught birds. It is estimated that one-third of Java's 36 million households keep 66–84 million cage birds (Marshall *et al.*, 2020) and it is likely that number is still rising, putting extreme pressure on wild populations, particularly some protected species (Jepson and Ladle, 2011; Marshall *et al.*, 2020).

Some of the bird species in the trade are captive bred, although demand appears to be low. The majority are wild caught, which circumvents the difficulties and expense of captive breeding (Burivalova *et al.*, 2017).

In 2020 the COVID-19 pandemic reached Indonesia, and in March the government began implementing social restrictions known as PSBB (Pembatasan Sosial Berskala Besar—Large Scale Social Restrictions). These were implemented to various extents in different parts of the country; generally non-essential public gatherings were not allowed. This meant that bird singing competitions could not take place in person, and indeed there were incidences of bird singing competitions being closed by the police. The bird singing competition communities adapted by launching online competitions, first recorded by TRAFFIC in April 2020; these quickly became popular in Indonesia. This short report documents the new trend of online bird singing competitions and discusses the impact it may have on trade in wild bird populations in Indonesia.

METHODS

Posts advertising both online and offline (i.e. physical, in person competitions) bird singing competitions (hereafter referred to as "posts") taking place were searched for online between April and June 2020. Omkicau.com and Wartahobi.com, two major websites that offer comprehensive lists of compiled competition posts from across Indonesia, were the main focus of searches. Facebook and Google were also searched with keywords in Bahasa Indonesia including Kicaumania and Lomba burung (bird competition). Some data were also collected

by *ad libitum* searching on Facebook, including in Indonesian bird hobbyist groups. The mobile application (app) for online competitions, TicketCS OCO, was frequently shared in Facebook groups, therefore it was downloaded and competitions held on this platform were also recorded. Competition posts were back-searched to January 2020. Data collected included competition dates, platforms used, number of competitors, species competed, entry fees and prizes.

Bird singing competitions include several distinct contests for different species and singing levels, with different entry fees and prizes for each contest. All of the contest details within each competition were recorded.

LEGISLATION

Article 21.2 of Indonesian Law No. 5 1990 Concerning the Conservation of Living Resources and their Ecosystems states that it is illegal to catch, injure, kill, keep, possess, care for, transport, and trade in live and dead protected animals, move protected animals within or outside of Indonesia, and to trade, keep or possess skin, bodies or other parts of a protected animal or goods made of parts of the animal. The maximum penalty for transgression is five years imprisonment and a fine of up to IDR100,000,000 (USD7,000).

Protected species regulation

In July 2018, an updated and revised protected species list was passed after almost 20 years since the previous list (Government Regulation No. 7 of 1999 Concerning the Preservation of Flora and Fauna). Overall this saw more species offered protection, however the list was revised in September 2018 under Government Regulation No. 92 of 2018 (P.92/2018) and five species were removed as a result of strong lobbying from bird hobbyists and traders: White-rumped Shama *Kittacincla malabarica*, Javan Pied Starling *Gracupica jalla*, Straw-headed Bulbul *Pycnonotus zeylanicus*, Sangihe Whistler *Coracornis sangihe* and Little Shrikethrush *Colluricincla megarhyncha*. It is illegal to capture and trade these five species without a government permit as there is no quota for their wild harvest. However, capturing and trading of these wild caught birds is not punishable under Conservation Act (No. 5) of 1990, because they are no longer listed as protected species (Chng *et al.*, 2018). The latest version of the protected species list is the P.106/2018 Second Amendment to the Regulation of the Ministry of Environment and Forestry 2018 Concerning Protected Types of Plants and Animals.

Harvesting quotas

Annual quotas are also set for the capture of wild animals and harvesting of plants—in 2020, through Kuota Pengambilan Tumbuhan Dan Penangkapan Satwa Liar Periode Tahun 2020 of Government Regulation No. 8 of 1999 Concerning the Utilization of Wildlife (KLHK, 2020). The quotas apply to many populations of non-protected species and are renewed each year stating the species, the number of individuals that can be harvested

and from which part of Indonesia, the numbers designated for domestic use or export and what they can be used for. Many birds used in singing competitions have annual harvest quotas (KLHK, 2020).

Regulations relating to bird singing competitions

Currently there is a lack of clarity over the regulations for holding bird singing competitions. However, the KSDAE (Directorate General of Nature Resources and Ecosystem Conservation), the federal agency responsible for wildlife trade regulation, released draft legislation in 2019 that explains in full new regulations for holding bird singing competitions. These are still under review at the time of writing, however they would appear to provide clear and comprehensive guidelines for those organising and taking part in bird singing competitions. They are split into three main sections; implementation, licensing and supervision (KSDAE, 2019).

Under current Indonesian laws, those organising any public event—including bird singing competitions—should prepare:

- A permit from the police for holding a gathering of people (PP No. 60/2017 Procedures For Licensing and Supervision of General Gatherings, Other Community Activities, and Notification of Political Activities).
- A letter of reference from the Department of revenue and tax if tickets are being sold for the event (UU No. 28/2009 Law Concerning Regional Taxes and Retributions).

Event Organisers may also be required to obtain the following:

- A government permit (depending on the scale of the event; local, district or provincial).
- A letter of reference from the relevant government agency (e.g. BKSDA). (Siswosoediro, 2008).

RESULTS

Posts recorded per month

In total 153 posts for bird singing competitions were recorded, including 111 offline and 42 online competitions. The majority (86%, n=96) of offline bird singing competitions recorded were on Java, and of these almost 70% occurred in western Java including the provinces of West Java (39%), DKI Jakarta (18%) and Banten (11%). From January through March 2020 there was an average of 34 offline competitions per month. However, between April to June 2020, when social restrictions were in place in Indonesia, there was an average of less than three live meetings per month. Online competitions started and became regular from April and continued through June with an average of 14 per month (Figure 1).

Social restrictions were in place in various locations throughout Indonesia from 31st March 2020 (Government Regulation No. 21/2020 on the Limitation of Large-Scale Social Interactions to Expedite Countermeasures Against COVID-19).

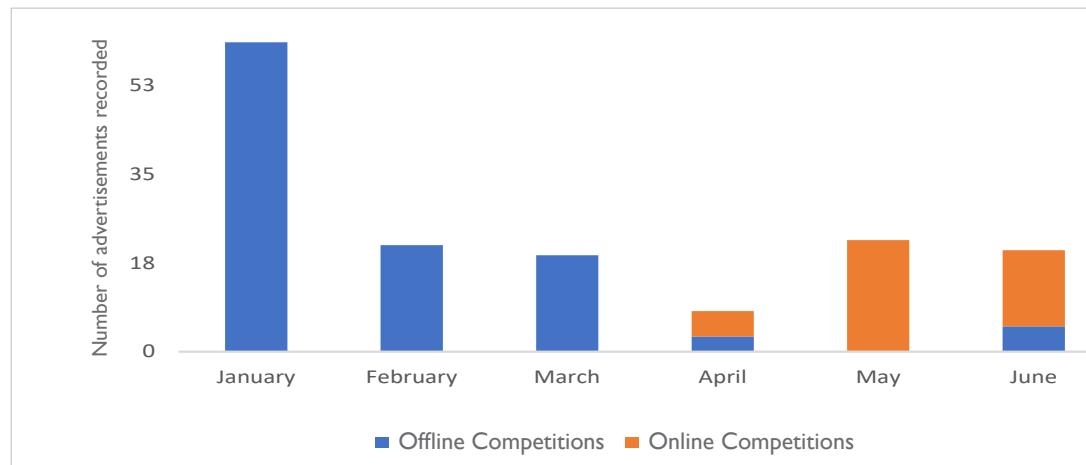


Fig. 1. Number of recorded posts for online and offline bird singing competitions per month in Indonesia.

Bird species

Competitions are usually advertised with lists of contests for different species or taxa and singing levels (Figures 2 and 3). Contests for 22 bird species and taxa (genus or family level) were advertised; all 22 taxa were advertised for offline competitions and 16 of these were advertised for online competitions. Five species made up a large proportion (62%, n=538) of those advertised (Table 1). Species which are protected and potentially protected (where only the taxa was given although some species within the taxa are protected) made up 173 (22%) of offline competitions and 23 (23%) of online competitions (Table 1). Prizes for categories involving protected species were generally higher than commonly wild caught and commonly captive bred species (Figure 4).

Platforms used for online competitions

Four different platforms were recorded hosting online bird singing competitions (Figure 5). The mobile app TicketCS OCO held the most: 35 competitions held between 17th May and 30th June 2020. There was no information available about the number of participants in

each competition, so their size could not be gauged. To date, the TicketCS OCO platform has solely been used for bird singing competitions, although there was a recent post for a “coming soon” Betta fish online contest. This platform may be over represented in the results as it is easy to gather information from this app due to its layout compared with searching on Google, for example.

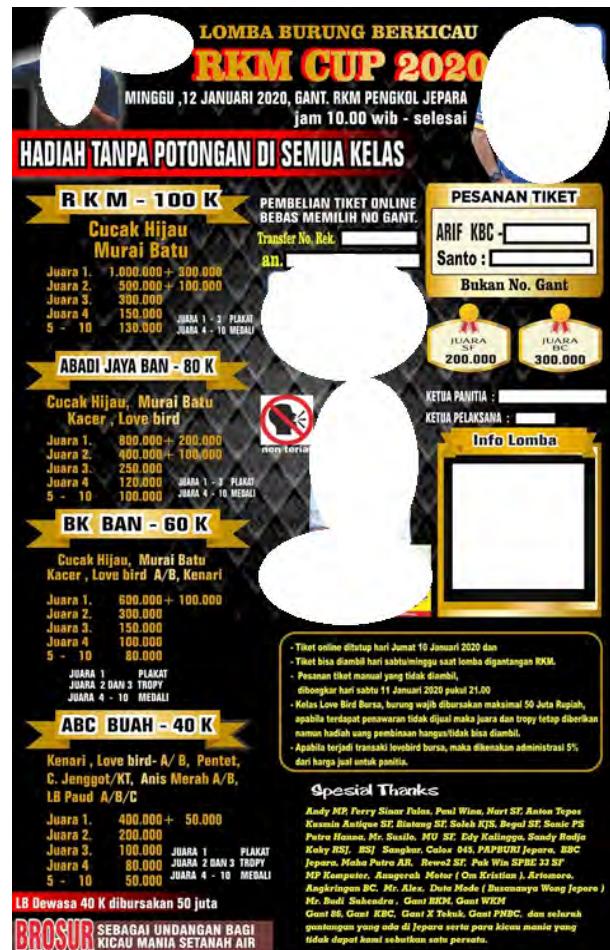


Fig. 2. A post for an online bird singing competition to be held on 13th May 2020 (Wartahobi, 2020). This lists two contests, namely DEC and COVID, with a list of the species to enter each and the “Juara” or prize for each winning place.

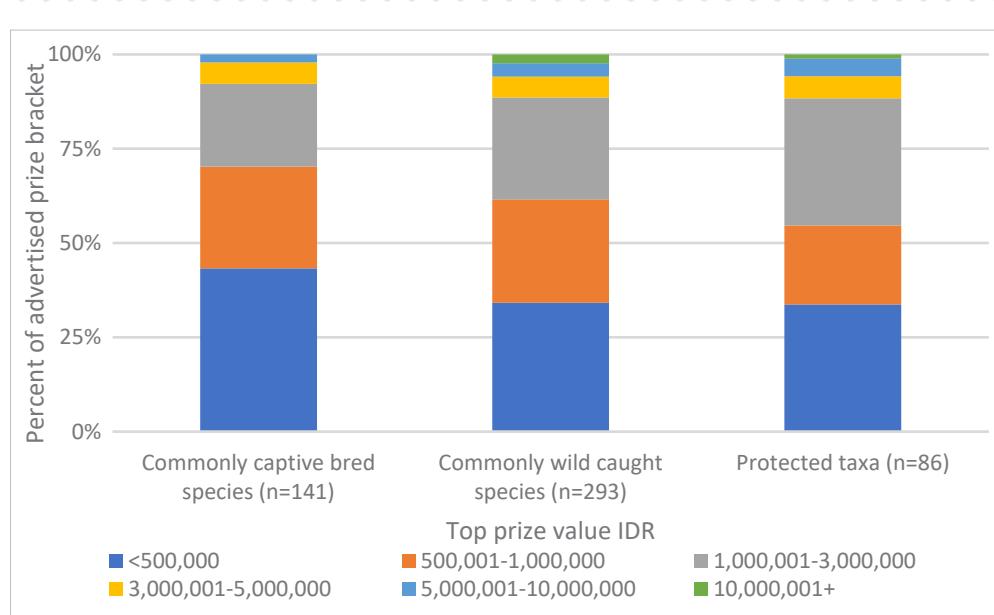
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Fig. 3. A post for an offline bird singing competition to be held on 12th January 2020 (Omkicau, 2020).

Table 1. Bird species listed in advertisements for online and offline competitions.

Some are listed as a genus or family; those taxa that include species on Indonesia's 2018 protected species list are highlighted in orange, species considered to be domesticated are highlighted in green. Note: Jalak Suren can refer to either *Gracupica contra* or *Gracupica jalla*, the posts do not specify which.

Local name	Common name	Scientific name	Offline	Offline %	Online	Online %	Total	Total %
Lovebird (Lb)	Lovebird	<i>Agapornis</i> sp.	98	13%	24	25%	122	14%
Murai batu	White-rumped Shama	<i>Kittacincla malabarica</i>	102	13%	12	12%	114	13%
Kacer	Oriental Magpie-robin	<i>Copsychus saularis</i>	96	12%	8	8%	104	12%
Cucak hijau	Leafbird	<i>Chloropsis</i> sp.	90	12%	9	9%	99	11%
Kenari	Canary	<i>Serinus canaria domestica</i>	89	11%	10	10%	99	11%
Pentet	Long-tailed Shrike	<i>Lanius schach</i>	53	7%	4	4%	57	7%
Anis merah	Orange-headed Thrush	<i>Geokichla citrina</i>	47	6%	6	6%	53	6%
Kolibri	Sunbird	<i>Nectariniidae</i> sp.	42	5%	4	4%	46	5%
Pleci	White-eye	<i>Zosterops</i> sp.	21	3%	8	8%	29	3%
Branjangan	Horsfield's Bushlark	<i>Mirafra javanica</i>	22	3%	4	4%	26	3%
Cucak jenggot	Grey-cheeked Bulbul	<i>Alophoixus tephrogenys</i>	19	2%	2	2%	21	2%
Tledakan	Flycatcher	<i>Cyornis</i> sp..	18	2%	2	2%	20	2%
Anis kembang	Chestnut-capped Thrush	<i>Geokichla interpres</i>	15	2%	1	1%	16	2%
Trucukan	Yellow-vented Bulbul	<i>Pycnonotus goiavier</i>	14	2%	1	1%	15	2%
Hwamei	Chinese Hwamei	<i>Garrulax canorus</i>	14	2%	0	0%	14	2%
Ciblek	Bar-winged Prinia	<i>Prinia familiaris</i>	13	2%	0	0%	13	1%
Jalak suren	Pied Myna	<i>Gracupica contra/jalla</i>	8	1%	1	1%	9	1%
Kapas tembak	Olive-winged Bulbul	<i>Pycnonotus plumosus</i>	9	1%	0	0%	9	1%
Cucak rawa	Straw-headed Bulbul	<i>Pycnonotus zeylanicus</i>	2	0%	1	1%	3	0%
Jalak	Starling	<i>Sturnidae</i> sp.	1	0%	0	0%	1	0%
Poksay	Laughingthrush	<i>Leiothrichidae</i> sp.	1	0%	0	0%	1	0%
Serindit	Hanging parrot	<i>Loriculus</i> sp.	1	0%	0	0%	1	0%
			776	100%	97	100%	873	100%

**Fig. 4.** Groups of bird species (refer to Table 1) and their respective percentage of advertised prize brackets.

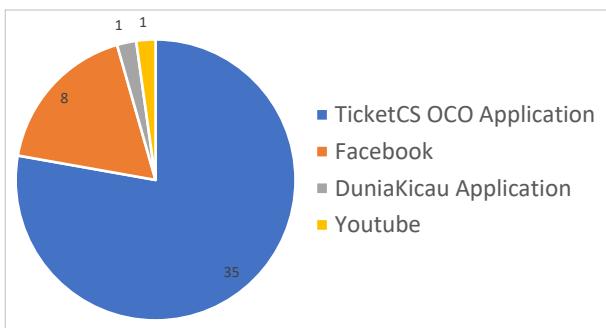


Fig. 5. Platforms used and the number of online bird singing competitions held, April–June 2020.

Entry fees and prizes for online and offline competitions

Entry fees for online competitions are paid by transferring money or buying tickets from a particular app, for example TicketCS. Unfortunately, no data on total revenue or number of attendees for either online or offline competitions were available.

Prizes vary and include, from most to least frequently recorded: certificates (digital or paper), exclusive trophies, cash (see Table 2), cash percent revenue (a percentage of the profits from the competition, ranges from 40–80%), goats, motorcycles, birds, bird cages, fans, TVs, cars, gold, a Rolex watch, a T-shirt, a stove cooker, and often a combination of these.

July and August 2020 update

By 2nd August 2020, regional PSBB restrictions were largely lifted, with only eight regencies in Jakarta and Greater Jakarta officially still implementing PSBB. As the restrictions are being lifted, the bird singing competitions are returning to pre COVID-19 times. From the beginning of July until 23rd August, 441 offline, in person competitions were recorded from our online searches. In July seven online competitions were recorded on the TicketCS OCO app, and none have been recorded for August on any platform. The online competitions app TicketCS OCO has not been updated since 26th July. Therefore, it appears that online competitions are unlikely to continue after the COVID-19 pandemic. Nevertheless, these data and this report demonstrate the resilience of bird singing competitors in Indonesia.

DISCUSSION

Online vs offline competitions

A variety of websites, social media and purpose built apps are being used for bird keepers to compete using recorded videos and live streaming of their birds singing. Many require competitors to purchase an e-ticket to enter and participants compete for prizes including cash, goats, gold, cars, and other prizes.

Since 2012 there have been three known previous endeavours to start online bird singing competitions, however none of them caught on in the same way. These included the SapuRegel Bird Contest System by Omkicau in 2013 (Omkicau, 2013), one Android app Gantangan Burung Online in 2017 (Burungnya, 2020), and the website Duniakicau.com which started in early 2020. The Gantangan Burung Online competitions had prizes where winners would get virtual coins which could be redeemed in local minimarket shops. Duniakicau.com uses live streaming, however only a maximum of four competitors can join at one time. The purpose built applications and more comprehensive video set-ups for the new online bird competitions described here are more sophisticated, making them more attractive for competitors.

Social media and online platforms are very popular in Indonesia (Weiss, 2014), with Indonesians having one of the largest digital audiences in the world (Greenhouse, 2020). On average, Indonesian people spend three hours 26 minutes on social media every day—one hour four minutes above the global average (Greenhouse, 2020); this may make online bird singing competitions particularly attractive to Indonesians. Social media and e-commerce platforms are already established and widely used in the buying and selling of birds and other wildlife in Indonesia (Iqbal, 2015). Despite these factors and several benefits of online competitions such as no travel costs or travel time, participants able to compete with others nationwide, lower entry fees, and lower running costs for organisers, the most recent data from July and August 2020 indicate that this trend is unlikely to continue after social distancing restrictions are lifted. Indeed, the social role that bird singing competitions play in many people's lives may, in this case, be more important than the competition itself. However, online competitions may re-emerge in the future, in the event of circumstances which again restrict social gatherings.

Table 2. Entry fees for online and offline bird singing competitions. Exchange rate from www.xe.com on 18th July 2020 (USD0.000068 = IDR1).

	Number of competitions recorded	Average entry fee (range) IDR	Average entry fee (range) USD	Top prize (range) IDR	Top prize (range) USD
Online	46 (April–June 2020)	25,200 (0–50,000)	1.7 (0–3.5)	289,200 (25,000–3,000,000)	20.3 (1.7–211.3)
Offline	111 (January–June 2020)	176,400 (0–10,000,000)	12.4 (0–704.5)	1,639,900 (40,000–30,000,000)	115.4 (2.8–2,112.7)

Implications for the conservation of protected birds

A total of 22 different taxa were recorded in competition, six of which contain species protected under Indonesian law (P.106/2018). Five species/taxa made up the majority of those in posts—two domesticated (lovebirds and anaries), and three commonly wild caught (White-rumped Shama, Oriental Magpie-robin *Copsychus saularis*, leafbirds *Chloropsis* sp.) (Table 1). While some level of captive breeding occurs for the White-rumped Shama, continued seizures of trafficked birds suggest that some are still sourced from the wild (Leupen *et al.*, 2018), and leafbirds are likely to be wild-sourced illegally; all species within the genus are currently protected. The Orange-headed Thrush *Geokichla citrina*, among the top seven species in this study, is routinely wild sourced and extremely over-harvested in Bali (Kristianto and Jepson, 2011).

Several taxa used in bird singing competitions are also very commonly seized by Indonesian authorities being traded illegally (Indraswari *et al.*, 2020). This is a cyclical problem: as species which are valued for their song are worth more, they are traded more and thus become rarer making them worth even more (Courchamp *et al.*, 2006). Bird singing competitions place a value on a species that directly impacts on this cycle, thereby playing a crucial role in driving the demand that leads to the trapping and trade of wild caught birds. Therefore strict regulation of bird singing competitions would have a direct impact on the conservation of some wild bird populations.

Protected species were advertised in both online and offline bird singing competitions. This is illegal (except for birds already owned prior to and registered after the updated 2018 protected species list was announced) and a direct threat to the conservation of these species. Contests for protected taxa tended to have higher top prize values. It is essential that Indonesian law enforcement agencies assess and take action against competitions involving illegally kept birds, as bird keeping for competitions is one of the main drivers of extinction of wild songbirds (Burivalova *et al.*, 2017; Jepson and Ladle, 2005; Kristianto and Jepson, 2011; Marshall *et al.*, 2020).

The authors are unaware of any seizures of protected birds by law enforcement agencies at bird singing competitions in Indonesia (TRAFFIC, unpublished data). However, competitors joining online competitions may be more motivated to buy endangered and protected species as there is even less risk of being caught with protected birds than in offline competitions. Furthermore, protected species tend to fetch higher prizes. These factors may increase the demand for protected birds. Therefore it is vital that Indonesian law enforcement agencies monitor and take action against online and offline competitions promoting the use of protected bird species. The draft Bird Singing Competitions Regulations released by KSDAE (2019) show that the Indonesian government is serious about ensuring these competitions do not negatively impact on bird conservation. If these new regulations are implemented, it would be a major step

forward in regulating this industry. The draft outlines the phase-out of wild caught birds so that eventually only captive bred birds may be used for competitions, and even touches on protecting species listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (article 9,5). Non-native CITES listed species do not usually receive protection in Indonesia so this would be a huge breakthrough and potentially benefit the conservation of many species. However, the draft regulations make no mention of online bird competitions; if allowed to continue this will be a necessary addition, including ways to ensure captive bred species are from legitimate captive sources and with demonstrable proof of purchase. The continuation of online bird singing contests poses a threat to the conservation of Indonesia's birds. Furthermore, when illegal activity takes place on an internet platform, the platform management also bears some responsibility to address the problem. Therefore the platforms identified during this research should be ready to take action if needed in a collaborative approach with in-country law enforcement agencies.

CONCLUSION

The social restrictions as a result of the COVID-19 pandemic have generally not slowed or reduced bird singing competitions in Indonesia. Online bird singing competitions were, during the initial phases of the pandemic, comparable in frequency, species advertised, entry fees and prizes to offline bird competitions. Even though lockdown restrictions eased and online competitions lost their traction for now, several of the highlighted issues remain pertinent to the use of online platforms for wildlife-related activities, and to offline competitions.

Categories for protected species persist in these competitions, which is a cause for concern as this means there is a continued demand for these species. The extremely low risk of law enforcement action and often higher prizes from competing with protected bird species may increase demand for these species. The implementation of the draft 2019 KSDAE regulations on bird singing competitions would greatly improve regulation of this industry and would have many benefits for the conservation of several species, although it should be updated to include regulation of online competitions before it is implemented. Where the use of captive bred birds is supported, proper enforcement needs to regulate legitimate captive breeding facilities.

Online bird singing competitions will be difficult to police, however each platform management should work with law enforcement agencies and be responsible for shutting down competition activities involving protected species. Indonesian police and other law enforcement agencies should also be aware of, monitor and act against protected species being used in bird singing competitions, both online and offline. The proper regulation of bird singing competitions is vital for the continued survival of Indonesia's wild bird populations.

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NO PAPER NO GO: A BOOST IN INDONESIA'S QUARANTINE LAW TO TACKLE WILDLIFE CRIME

by Ranchithaa Anatory and Drh. Muh. Jumadh M.Si

Indonesia is an important hotspot for wildlife trade in the Southeast Asian region. It has come to be recognised as one of the most significant for wild-sourced animal specimens, supplying both legal and illegal wildlife trade (Nijman and Shepherd, 2015; Janssen and Blanken, 2016; Krishnasamy and Zavagli, 2020).

Being a major archipelago, there are huge challenges in monitoring the country's borders to control the movement of wildlife and wildlife products sourced both domestically and internationally (OECD, 2019). Indonesia's Agriculture Quarantine Agency (BKP) plays a crucial role in preventing numerous attempts at cross-border wildlife trafficking, both international and domestic.

TRAFFIC's data, collected from media and other open and closed sources, show that between 2015 and 2019, there was a total of 1,436 wildlife seizure incidents in Indonesia. Of these, 102 cases (7.1%) involved the participation of the BKP, more than half of them (53 cases) were from 2018 and 2019. At least 43 cases involved protected species.¹ The sheer number of wildlife seized is astonishing. In Lampung, for example, the BKP seized 27,546 songbirds in 2019, and in 2020 alone (as of July), this number stood at an incredible 33,140. Openly available information on successful prosecution and conviction outcomes, however, is rare, but TRAFFIC's current data indicate that of the 102 cases involving the BKP, seven secured convictions in court, four of which involved use of the then current Act No. 16 of 1992 on Animal, Fish, and Plant Quarantine (Act No. 16).

In 2018, Indonesia saw two landmark prosecutions with convictions under Act No. 16 involving crime related to two non-native species: the Radiated Tortoise *Astrochelys radiata* and the Ploughshare Tortoise *Astrochelys yniphora*. Both are endemic to Madagascar, Critically Endangered and prohibited from commercial international trade through their listing in Appendix I of CITES² (TRAFFIC, 2018). This was the first time the quarantine law had been used to overcome a loophole in the primary wildlife law (Act No. 5), which does not have clear provisions to penalise crimes involving



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A globally threatened Javan Myna *Acridotheres javanicus* among a seizure of song birds made by the Lampung Agriculture Quarantine Agency.

species not native to Indonesia. The seriousness of this loophole is evidenced in a 2015 survey which discovered approximately 5,000 individual tortoises and freshwater turtles openly for sale in Jakarta over a four month period, many of which were CITES-listed non-native species and very likely illegally imported (Morgan, 2018).

In October 2019 Act No. 21 was passed, replacing Act No. 16. Act No. 21 is superior to its predecessor, providing clear powers for BKP to tackle wildlife crime more effectively. Shortly afterwards, the new quarantine statute was used in December 2019 during the prosecution of a case involving the trafficking of four African Lion *Panthera leo* cubs, one Leopard *P. pardus* cub and tens of tortoises Testudinidae (Romadloni, 2020). While penalties in the 2018 Malagasy tortoise cases under Act No. 16 were deemed weak, with less than a year's worth of imprisonment (to be served on probation) and fines of between IDR1 million (~USD 66)³ and IDR5 million (~USD 329), this case, whose outcome was announced in July 2020, was significantly tougher, with a cumulative penalty of 11.5 years imprisonment and IDR4 billion in fines (~USD 68,164) on the four persons found guilty. This was made possible through the enhanced penalties provided under Act No. 21. There is no lower limit for the penalty provisions under the new Act, so the severity of the punishment is testament to the seriousness with which the judge and prosecutors treated the crime.

This brief sets out to highlight the strengths under Indonesia's new quarantine law (Act No. 21), as well as opportunities for strengthening the prosecution of wildlife cases. As evidenced by the number of seizures made by BKP, and the provisions within Act No. 21 which permit wildlife-related enforcement and prosecution, it is time this tool is utilised to the fullest in combatting wildlife trafficking in the country.

¹ Number of protected species in seizures prior to August 2018 is based on the protection list of 1999

² CITES is the Convention on International Trade in Endangered Species of Wild Fauna and Flora

Table I: Key differences between Act No. 21 (2019) compared to Act No. 16 (1992) regarding wildlife trade

Subject	Act No. 16	Act No. 21
Newly defined terms.	-	<ul style="list-style-type: none"> · Wild Plants and Animals · Endangered Plants and Animals · Foreign Invasive Type
Requirement to produce documents mandated by other laws.	None, but provision under Article 13 of Regulation 82 includes document requirements by other Ministerial laws.	Articles 33–35 require every person who imports, exports, or moves within Indonesia, animals, and animal products to present not only a health/sanitisation certificate, but also any other documents required under other Ministerial laws, making them an essential border measure in detecting and prosecuting wildlife trafficking.
Penalties.	<p>Penalties divided into two categories. The first is criminal offences (committed intentionally) with maximum penalty of three years imprisonment and IDR150 million (~USD10,200) fine.</p> <p>The second is violations (offence due to negligence) with maximum penalty of one-year imprisonment and IDR50 million (~USD3,400) fine.</p> <p>No minimum penalty limits.</p>	<p>Penalty severity no longer varies by criminal offences and violation, but rather by import, export, movement from area to area, incineration cost, and BKP seal tampering offences.</p> <p>Penalties for BKP seal-tampering and failure to produce health certificate from transit points are new additions.</p> <p>Highest maximum penalty is for import offences—10 years imprisonment and IDR10 billion fine (~USD683,530).</p> <p>No minimum penalty limits.</p>
Quarantine actions on animals for the purpose of exhibition, circus and/or contest.	None.	Article 65 mandates quarantine actions on specimens temporarily entering and exiting Indonesia (or areas within Indonesia) for the purpose of exhibition, circus and/or contest.
Requirements for routine post-entry inspection on wildlife and endangered species.	None, but Article 83 of Regulation 82 mandates routine and continuous post-entry inspection of wildlife.	Article 32 mandates routine and continuous quarantine actions for wildlife and endangered species kept for breeding or under controlled conditions.
Destruction of wildlife and endangered species.	Article 65 of Regulation 82 permits a Minister's consideration of destruction of a protected species (under the law) rejected from its destination country.	Article 49 requires for destruction of wildlife and endangered species to be co-ordinated with the agency in charge of conservation and natural resources.
Grace period to furnish documentation.	Articles 21–24 of Regulation 82 allow <u>between three to seven days</u> to fulfil documentation requirements, depending on missing document(s).	Article 44(3) allows <u>three working days</u> from the day the owner receives a letter that specimens are being held for not fulfilling <u>any documentation requirement</u> .
Time frame for removal of rejected specimens.	Articles 21–24 of Regulation 82 allow <u>between 24 hours to three days</u> for the removal of rejected specimens depending on the type of missing document and type of specimens.	Article 45(4) requires rejected specimens to be removed by the owner <u>within three working days</u> of rejection by the quarantine agency.
Ending an investigation.	Article 30(3)(f) states that an investigator has the power to stop an investigation in the event there is insufficient evidence of a breach in quarantine law.	Article 83(2)(f) simply states that an investigator can stop an investigation with no requirement to prove insufficient evidence.

BRIEF ON INDONESIAN QUARANTINE LAW

Indonesia's quarantine law on animals, fish, and plants provides powers for quarantine actions not only for imports and exports of goods, but also for the movement of goods within the country. As such, all goods under the purview of the quarantine law are required to enter/exit the country or an area⁴ within the country strictly through legally designated entry and exit spots such as seaports, harbour crossings, land ports, airports, and post offices. A suite of supplementary regulations and administrative protocols are applied in tandem to the main quarantine law, covering among others, areas of health, safety, quarantine, documentation, and taking and moving animals and plants.

⁴Defined in Act No. 21 as an administrative area of government, part of an island, an island, or group of islands within a sovereign territory of the Republic of Indonesia

A health certificate (or sanitisation certificate for products of animal origin) is required from not only the country or specific area from which the goods originate but also from each transit country and domestic area. This allows for the tracking of goods' travel routes and potentially the detection of suspicious shipments whose origins are questionable.

Perhaps the biggest strength of the quarantine law in combatting wildlife trafficking, as is the case globally, is that its purview is not selective of species according to legal protection status. The law mandates quarantine actions by BKP on every animal (and products of animal origin) imported from, exported into, and moved within Indonesia.

AMENDED 2019 QUARANTINE STATUTE

In October 2019, the older Act No. 16 of 1992 on Animal, Fish, and Plant Quarantine (Act No. 16) was replaced by Act No. 21 of 2019 on Animal, Fish, and Plant Quarantine (Act No. 21), strengthening the BKP's position to safeguard Indonesia against illicit wildlife movements. Provisions for animal quarantine under the law are further prescribed under Regulation No. 82 of 2000 on Animal Quarantine (Regulation 82) and Regulation No. 17 of 2017 on Animal Quarantine Documentation (Regulation 17). In fact, many of the changes reflected under Act No. 21 appear to be a result of collating provisions under Act No. 16 and Regulation 82.⁵

Act No. 21 explicitly declares the supervision and control of wildlife and endangered animals to be within its scope.⁶ It also explicitly states "the prevention of illegal entry or exit of wild plants and animals, endangered plants and animals, and genetic resources into or from the Republic of Indonesia or movement thereof within the region of the Republic of Indonesia" as an objective of the quarantine law.⁷ This is a significant acknowledgement that the purview of Indonesia's quarantine legislation reaches beyond just combatting the introduction and spread of diseases and pests, but now also serves as a control mechanism against illicit movements of wildlife. Many improvements have been introduced in the new law; some key sections are highlighted in Table 1.

ACT NO. 21: CLOSING THE LOOPHOLE IN ACT NO. 5

As of December 2018, Act No. 5 of 1990 on Conservation of Living Resources and their Ecosystem (Act No. 5), Indonesia's primary wildlife law, provides legal protection status to 904 wildlife species, all of which are native to Indonesia. This renders Act No. 5 ineffective in combatting wildlife offences involving non-native species, despite it being the primary basis of regulation and control over wildlife trade. Act No. 21 makes up for this shortcoming by having under its purview legal mandates for the movement of all animal species both across international borders as well as within the country. The increased maximum penalties for offences under Act No. 21 are also superior compared to penalties provided under Act No. 5: an IDR10 billion (~USD683,530) fine and 10 years imprisonment for undocumented imports compared to an IDR200 million (~USD13,670) fine and 5 years imprisonment for illegal transportation of animals. Act No. 5 does not provide penalties for the illegal possession of non-protected species, except for offences of introducing non-endemic species into sanctuary reserves and national parks' Core Zones.

⁵New supplementary regulations for Act No. 21 are underway and have yet to be established

⁶Refer Act No. 21, Article 4(g) on scopes under quarantine regulations

⁷Refer Act No. 21, Article 7(f) on objectives of quarantine implementation

RECOMMENDATIONS AND CONCLUSION

Although enhanced in many ways, Act No. 21 still has room for improvement. As a standalone, it gives cause to different interpretations in its implementation. While many of the changes reflected under Act No. 21 appear to be a result of collating provisions under Act No. 16 and Regulation 82, there are still provisions which require standardisation with the supplementary regulations. For example, the provisions under Act No. 21 and Regulation 82 on the grace period given to owners to furnish missing documentation and the time period for removal of rejected specimens should be synchronised. The inclusion of newly defined terminologies such as "wild plants and animals" and "endangered plants and animals" into supplementary quarantine regulations is also important to ensure clarity and standardisation in requirements for special documentation and quarantine actions. It is important that the establishment of regulations supplementing Act No. 21 is carried out as soon as possible to avoid any confusion and interruptions in execution of enforcement efforts.

As the BKP has powers to control the movement of any animals into, within and out of the country, it is crucial that Indonesia's quarantine law recognises the definition of threatened species conforming to international standards such as the IUCN⁸ Red List of Threatened Species™, beyond those contained within Act No. 5. This would provide clarity for the regulation on movement of native as well as non-native species which are not protected under Act No. 5.

Unchanged from Act No. 16 is that penalties for offences under Act No. 21 do not have minimum terms and amounts. This essentially means offenders could still get away with light punishments regardless of high maximum penalty provisions. It is also currently only a punishable offence not to carry health/sanitisation certificates. This is inconsistent with the powers vested in the BKP to inspect other documents beyond said certificates.⁹ It is also unclear under Articles 33(1)(a), 34(1)(a), and 35(1)(a) the circumstances under which health/sanitisation certificates can be inspected by the BKP. The provisions simply state that health certificates are required when carrying goods into and out of the country or an area within. There is no clarity on the prosecution for illegal possession at premises, for example, and parameters that qualify goods as having been taken into or out of a country or area. There is also ambiguity on the scope of routine quarantine inspections on wildlife and endangered species in captivity as mandated by Article 32.

Furthermore, it is imperative that Act No. 21 clearly provides the BKP with the powers of arrest, which it currently does not. As reflected by seizure data, the

⁸International Union for Conservation of Nature

⁹Refer Articles 33(2), 34(2) and 35(2) of Act 19 on requirement for other documents mandated by law



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Officials from the BKP releasing seized birds.

BKP continues to be involved in interdicting a growing number of wildlife crimes. Their role in combating wildlife trafficking can only be strengthened with the power to arrest perpetrators to pursue investigations and prosecution.

The addition of provisions for the temporary entry and exit of specimens for exhibitions, circuses and contests should also be clarified. As Act No. 21 requires that movement of specimens should be accompanied by other documents legally mandated by other Ministries, it should clearly define the circumstances and provisions under which specimens for exhibitions, circuses, and contests will be allowed entry or exit. These provisions should be within the parameters of Regulation No. 8 of 1999 on Utilisation of Plants and Wildlife and Decision No. 447/Kpts-II/2003 on Procedures for Taking or Capturing and Circulating Wild Plants and Animals under the purview of the Ministry of Forestry.

Indonesia's recognition of the importance of the quarantine agency in combatting wildlife trafficking shows the progressive nature with which the country is handling the issue. Few others in the region have followed suit. It is fundamental, however, to recognise that legislation is only as effective as the actions and commitment it receives from law enforcement agencies and the courts, among others. While regular seizures provide some deterrence in terms of losses to perpetrators, improved conviction rates are vital in deterring the recurrence of wildlife trafficking. Furthermore, there are currently joint operations and arrests made in wildlife cases involving the BKP and other agencies such as the Police, Directorate General of Environmental and Forestry Law Enforcement (GAKKUM), and Natural Resources and Conservation Center (BKSDA). Capacity building efforts could be beneficial to understand better each organisation's statutes and to recognise the opportunities for multi-law prosecutions. Armed with these initiatives, and with further enhancements to Act No. 21 as illustrated above, Indonesia has the potential to become the gold standard for how quarantine agencies should evolve as a recognised partner internationally in monitoring and controlling wildlife trafficking while upholding health and safety controls.

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WILD ANIMAL CONSUMPTION AND CONSERVATION AWARENESS IN MYANMAR

by Sapai Min



Global species loss during the present human-caused mass extinction far exceeds background rates and is detrimental to human existence (Duckworth *et al.*, 2012). Many Southeast Asian species will become extinct during the next human generation on current trends (Bennett, 2011). Many species are in demand, particularly for consumption, as “strengthening” food, tonics and medicines (Felbab-Brown, 2011; Nijman *et al.*, 2012). Few communities in Asia depend on wild meat for subsistence today, although it may be an important source of income for some rural families, albeit one that is usually illegal under national legislation and often short lived because animal populations quickly succumb to overhunting (Rao *et al.*, 2010). This is the reverse of the situation in many other tropical areas, where wild meat is an important protein source for the urban poor who cannot afford farmed meat (van Vliet *et al.*, 2012). To be successful in curbing poaching of threatened species and ultimately restoring wild animal populations across Southeast Asia, interventions must also target local consumption of wild meat, wildlife products, and wild animals as pets (Milner-Gulland *et al.*, 2003).

Myanmar is one of the most bio-diverse regions in Southeast Asia, home to many rare, threatened and endemic species (NBSAP, 2015–2020). The economy is largely based on agriculture with some 70% of the population residing in rural areas and dependent on forest resources for their livelihoods (Tint *et al.*, 2011, Forestry in Myanmar, 2020). With a rising human population of 50.2 million in the 2014 Myanmar Census and a growing economy, habitats have been degraded, which has resulted in a steady decline in some wildlife species and other natural resources (AIT Research, 2002).

Nowadays, wildlife is threatened with extinction in the wild due to many reasons such as habitat loss, pollution, human interventions, and commercial use of wildlife and its products. All human societies use wildlife directly and/or indirectly. Animals are caught from the wild for their skins, body parts, and derivatives as wildlife products or traditional medicines; live animals are also traded for pets. A lack of information about the extent of these uses is hampering efforts to conserve the rich biodiversity of Southeast Asia (Min, 2012).

Consumer spending is driving the development of Myanmar’s economy: demand for wildlife products has grown substantially and using wild animals as pets, medicine, health treatments and food has even become a fashionable lifestyle pursued by some people. This has created significant challenges for government agencies and conservation organisations working to combat illegal wildlife trade (Lee *et al.*, 2004). In addition, what limited data exist on wildlife trade are not efficiently shared and utilised between relevant protection and decision-making departments (Zhang *et al.*, 2008). This is the first survey on wild animal consumption attitudes in Myanmar. It is provided as a starting point for improved understanding of the attitudes driving illegal wildlife trade. Reducing

consumer demand for wild animals and the evolution of effective enforcement systems supported by local society and communities may take decades: societal change in beliefs and subsequent behaviour change are needed (Bennett, 2011). As a short-term aim, this study’s results can fulfil the information needs for a law enforcement strategy regarding illegal wild animal trade and document baseline attitudes so that future behavioural changes can be ascertained to understand and eventually stop the illegal wild animal trade in Myanmar.

METHODS

The study was conducted over one year from July 2019 to July 2020 and used a structured questionnaire through face-to-face interviews with respondents in Yangon (16°51'N, 96°11'E), Mandalay (21°58'N, 96°5'E) and Tachileik (20°27'N, 99°53'E) (Map 1). Yangon is Myanmar’s most populous city and its most important commercial centre, for trade, industry, real estate, media, entertainment and tourism. Mandalay is the country’s second-largest city and is the major trading and communications centre for northern and central Myanmar. Much of the external trade from Myanmar to China and India goes through Mandalay. Tachileik is a border town in Shan State of eastern Myanmar and forms Myanmar’s main border crossing with northern Thailand from the Thai town of Mae Sai. All three cities have been linked to road networks facilitating illegal wildlife trade (Clements *et al.*, 2014).

Questionnaires were delivered between August 2019 and March 2020 until at least 70 successful responses were received from each city by local resident field assistants—three assistants each in Mandalay and Tachileik and one in Yangon—who identified themselves as researchers but not specifically with conservation or environmental interests.



Map 1. Map of study sites; Yangon, Mandalay and Tachileik.

SAMPLING

Each visit to each city lasted a seven-day week, when a minimum of 10 questionnaires were undertaken. To obtain a general overview of public attitudes rather than one from specialists working in the field, interviewees were chosen to exclude anyone who worked or had worked for a wildlife law enforcement agency, a conservation group, a market research institute, a market research department of a corporation, or an advertisement design company.

INTERVIEW METHOD

The study used a structured questionnaire, with 40 questions completed face-to-face with each respondent. Four types of recent consumer behaviour were recorded (1) using wild animals as food (16 questions), (2) using medicine or tonic products containing wild animal ingredients (6 questions), (3) wearing ornaments and garments made from wild animals (6 questions), and (4) keeping wild animals as pets (5 questions) were addressed in the questionnaire (Zhang, *et al.*, 2008). Observers' attitudes to wild animals were also collected through open ended questions (7 questions). The interviewers stressed that data would not be used for future sanctions. The questionnaire did not explicitly request the most recent 12-month period: single experiences could be several years in the past. As the frequency of the four types of wild animal consumption were not identical the questionnaire tried also to examine the motivations for consumption, venue, species, frequency, as well as the characteristics of consumer groups.

The survey adopted a multi-stage random sampling method to perform door-to-door interviews. Qualified interviewees were managed strictly according to a selection order of "city; district; community; neighbourhood committee; family; interviewee." Selected interviewees were at least 18 years old. For each interviewee basic information including name, ethnic identity, gender, age, religion and education level was collected. The total sample size was 210 individuals interviewed across Yangon (n=70), Mandalay (n=70) and Tachileik (n=70).

RESULTS

People's attitude to wild animal consumption

Overall some 72% (n=151) of the total 210 respondents preferred eating wild meat (mammals, birds, reptiles—defined as coming from non-captive populations) rather than domestic meat (cow, pig, goat, chicken), the remaining 28% (n=59) preferring domestic meat consumption. Of the 151 who preferred wild meat, 37 (25%) were in Yangon, 50 (33%) in Mandalay and 64 (42%) in Tachileik.

Overall, 59% (n=124) of respondents said they believed in using wild animals and their parts for health reasons. Some 41% (n=85) of respondents appeared to know what species were considered threatened and 39% (n=83) which species were protected. A third of all respondents (33.3% (n=70)), attributed value to wild

animals—within them 58 (83%) an intrinsic value and 14 (17%) an economic value.

Of the 210 total respondents 11% (n=22) hunted for recreation and 11% (n=22) hunted for subsistence uses. A small number also said they hunted for tradition (n=4) and trade (n=3) respectively. Overall 72% (n=152) considered the abundance of wild animals in forests had decreased over the last five years.

CONSUMPTION CATEGORIES

Respondents were divided into five consumer types depending on their use to the four wild animal categories ((1) using wild animals as food, (2) using medicine or tonic products containing wild animal ingredients, (3) wearing ornaments and garments made from wild animals, and (4) keeping wild animals as pets). Those who used none of these were classified as Type 0 consumers, those who used one were classified Type 1 consumers up to Type 4 consumers who used wild animals in all four categories.

Based on this classification, 10% (n=21) were Type 0 consumers, 37% (n=77) Type 1, 45% (n=95) Type 2, 7% (n=14) Type 3 and only 1% (n=3) Type 4 consumers.

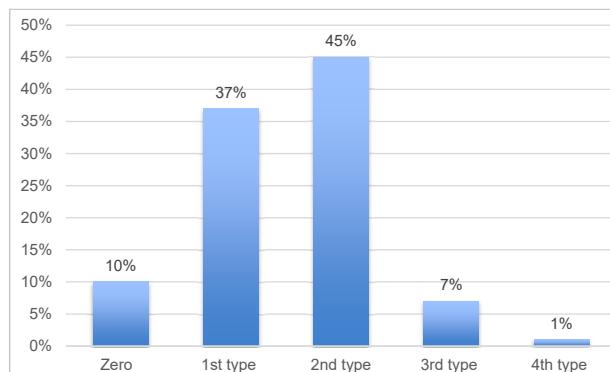


Fig. I. Percentage of respondents engaged in different categories of wild animal consumption.

WILD ANIMALS CONSUMED AS FOOD

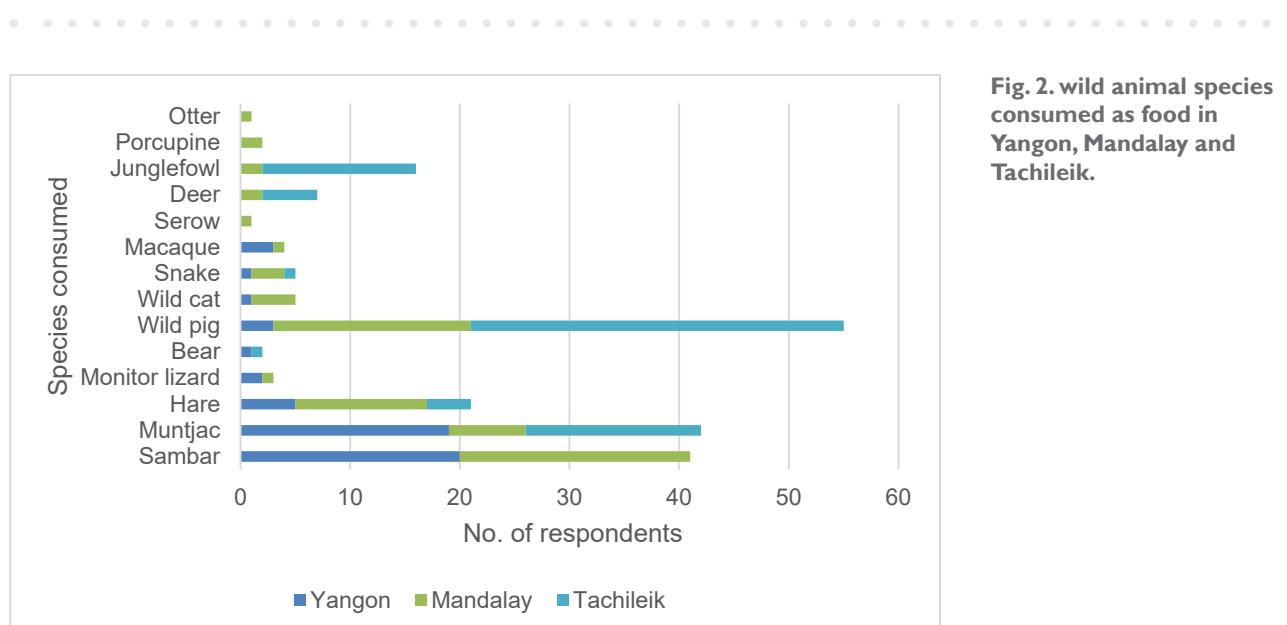
Among the 151 respondents who consumed wild meat, the different species consumed in order of frequency were: Wild Pig *Sus scrofa* (27% of respondents), followed by Muntjac *Muntiacus* spp. (21%), Sambar *Rusa unicolor* (20%), Burmese Hare *Lepus pегuensis* (10%), Red Junglefowl *Gallus gallus* (8%), deer Cervidae spp. (3%), snake *Serpentes* spp. (2%), wild cat Felidae spp. (2%), macaque *Macaca* spp. (2%), monitor lizard *Varanus* spp. (1%), bear Ursidae spp. (1%), serow *Capricornis* spp. (1%), otter Lutrinae spp. (1%) and porcupine *Hystrix* spp. (1%) respectively.

A total of 14 wild animal species, ten of them included in the National Lists of Protected Wildlife Species under the Conservation of Biodiversity and Protected Areas Law were consumed for food in the three cities (Table 1). There were marked differences in consumption of the different species between the three cities. Sambar was the most consumed in Yangon and Mandalay, while

Table 1. Species interview respondents said they consumed as food, traditional medicine, ornaments or clothing, or kept as pets.

Consumed as food	Consumed/used as medicine	Used for ornaments/clothing	Kept as pets
Sambar (<i>Rusa unicolor</i>) P	Serow oil/leg/tongue/hoove CP	Tiger skin CP	Parrot/Parakeet (<i>Psittacula</i> spp.)
Muntjac (<i>Muntiacus</i> spp.) SP	Python gall bladder (<i>Python</i> spp.) CP/P	Tiger canine bracelet CP	Hill Myna (<i>Gracula religiosa</i>) CP
Burmese Hare (<i>Lepus pегuensis</i>) P	Tiger canine/bone/oil (<i>Panthera tigris</i>) CP	Ivory CP	Hornbill (Bucerotidae spp.) CP
Monitor lizard (<i>Varanus</i> spp.) P	Porcupine stomach/intestine/liver	Ivory bracelet CP	Pheasant (<i>Phasianus</i> spp.) CP
Bear (<i>Ursidae</i> spp.) CP	Eld's Deer liver/antler (<i>Rucervus eldii</i>) CP	Ivory bead necklace CP	Peafowl (<i>Pavo</i> spp.) CP
Wild Pig (<i>Sus scrofa</i>)	Macaque faeces/meat P	Ivory pendent CP	Burmese Hare P
Wild cat (<i>Felidae</i> spp.) P	Bear gall bladder CP	Ivory ring CP	Tiger CP
Snake (<i>Serpentes</i> spp.)	Bear oil CP	Elephant tail hair ring CP	Leopard CP
Macaque (<i>Macaca</i> spp.) CP/P	Sambar antler/blood CP	Leather coat made from muntjac skin SP	Macaque CP/P
Serow (<i>Capricornis</i> spp.) P	Viper meat/oil (<i>Viperidae</i> spp.)	Leather bag made from crocodile skin CP	
Deer (<i>Cervidae</i> spp.) CP	Hare bones/tongue/gall bladder P	Leather bag made by from ray fish skin (<i>Batoidea</i> spp.) CP	
Red Junglefowl (<i>Gallus gallus</i>)	Elephant (skin, molar teeth, tusk) (<i>Elephas maximus</i>) CP	Leather shoes (wildlife skins)	
Porcupine (<i>Hystrix</i> spp.)	Pangolin (<i>Manis</i> spp.) CP	Leather wallet (wildlife skins)	
Otter (<i>Lutrinae</i> spp.) P	Wild cat P	Eld's deer antler CP	
	Dolphin oil (<i>Odontoceti</i> spp.) CP	Buffalo horn	
	Bird nests (<i>Apodidae</i> spp.)	Leopard skin (<i>Panthera pardus</i>) CP	
	Honey	Clouded Leopard skin (<i>Neofelis nebulosa</i>) CP	
	Takin (<i>Budorcas taxicolor</i>) CP	Traditional hat band made from Wild Pig tusks	
	Junglefowl egg		
	Otter oil		

Note: CP: Completely Protected species; P: Protected species; SP: Seasonally Protected species under the Conservation of Biodiversity and Protected Areas Law 2018.

**Fig. 2. wild animal species consumed as food in Yangon, Mandalay and Tachileik.**

in Tachileik it was Wild Pig, possibly reflecting the local abundance of these species rather than consumer preference. (Fig. 2).

Of the 151 respondents who consumed wild meat 18% (n=28) had at some time, 28% (n=42) did so at least 1–3 times per year, 7% (n=10) did so 4–6 times per year, while 47% (n=71) did so regularly (>6 times in the past year) (Fig. 3). Wild meat was most frequently consumed in Tachileik—of the 64 respondents who ate wild meat there, 43 (67%) did so regularly (>6 times per year), compared to 20 out of 50 respondents (40%) in Mandalay and eight out of 37 (22%) in Yangon. In the 1–3 times per year category the breakdown was Tachileik 30%; Mandalay 24%; Yangon 30% and in the 4–6 times per year category they were Tachileik 1%; Mandalay 8%; Yangon 13%.

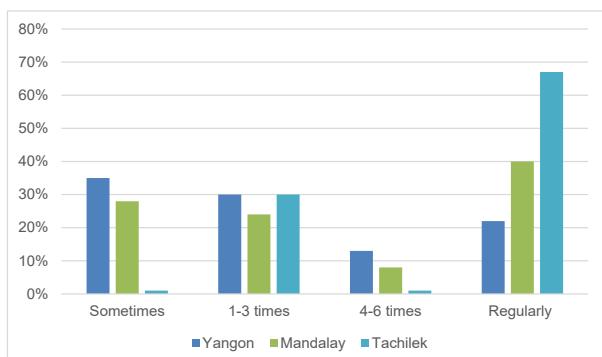


Fig. 3. Frequency of wild meat consumption by respondents.

Respondents said they ate wild meat for several reasons including better taste (49%), simple preference (36%) and for health (15%), while a further 1% said they did so because it was easy to obtain.

The majority (58%, n=88) of wild meat consumers (n=151) were aged between 31–50, those aged 18–30 (31%, n=47) and those aged 51 and above (11%, n=16). The level of education varied considerably between the different age groups: those in the youngest category were almost all medium or high level educated while those in the older categories were mainly low or medium level educated (Fig. 4).

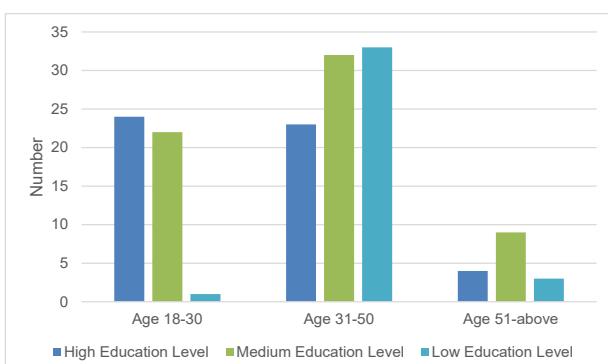


Fig. 4. Comparison of age range and education level of wild meat consumers.

Wild animals consumed as ingredients in traditional medicines

The overwhelming majority (172, 82%) of the 210 interviewees said they had never used wild animal products for medicine, 27 (13%) said they had sometimes while only 11 (5%) said they usually did so. Between cities, Tachileik had the greatest number of non-users (91%, n=64) and Yangon the least (64%, n=45). Yangon also had the highest number of regular users (14%, n=10) compared to Mandalay (1%, n=1) and Tachileik (0) (Fig. 5).

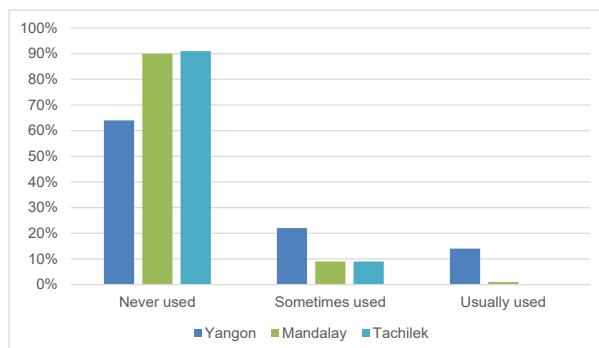


Fig. 5. Users of wild animals for traditional medicine across the three cities city.

A total of 20 wild animal species were said to be used as ingredients in traditional medicines (Table 1). Serows and their parts were the most frequently reported, used to treat joint pain, followed by python gall bladder used for strokes and tiger parts used as a tonic (Fig. 6).

The use of wild animals for medicinal purposes was highest in the low education level and fell as the level of education rose (Fig. 7), while the older the age group, the more regularly wild animals were used as medicine (Fig. 8).

Wild animals used for ornaments or clothing

Some 59% (n=124) of all respondents (n=210) said they liked to wear ornaments or clothing made from wild animal parts. The majority of them (54%, n=67) were aged 31–50, only a third (34%, n=42) were in the 18–30 age range and the remainder (11%, n=14) were aged 51 or older. Those with a medium education level were the most frequent users (40%, n=50) followed by high education level (33%, n=41) and low education level (27%, n=33). Wearing wild animal parts was most popular in Tachileik—favoured by some 79% (n=55) of respondents (n=70 per city), slightly lower at 64% (n=45) in Mandalay and just 34% (n=24) in Yangon (34%). A total of 18 wildlife parts were reported as used for ornaments or clothing (Table 2). Surprisingly, a high percentage of respondents in Tachileik (84%, n=59) and Yangon (74%, n=52) were unable to answer the reason particular items were worn, but the figure was much lower in Mandalay (36%, n=25).

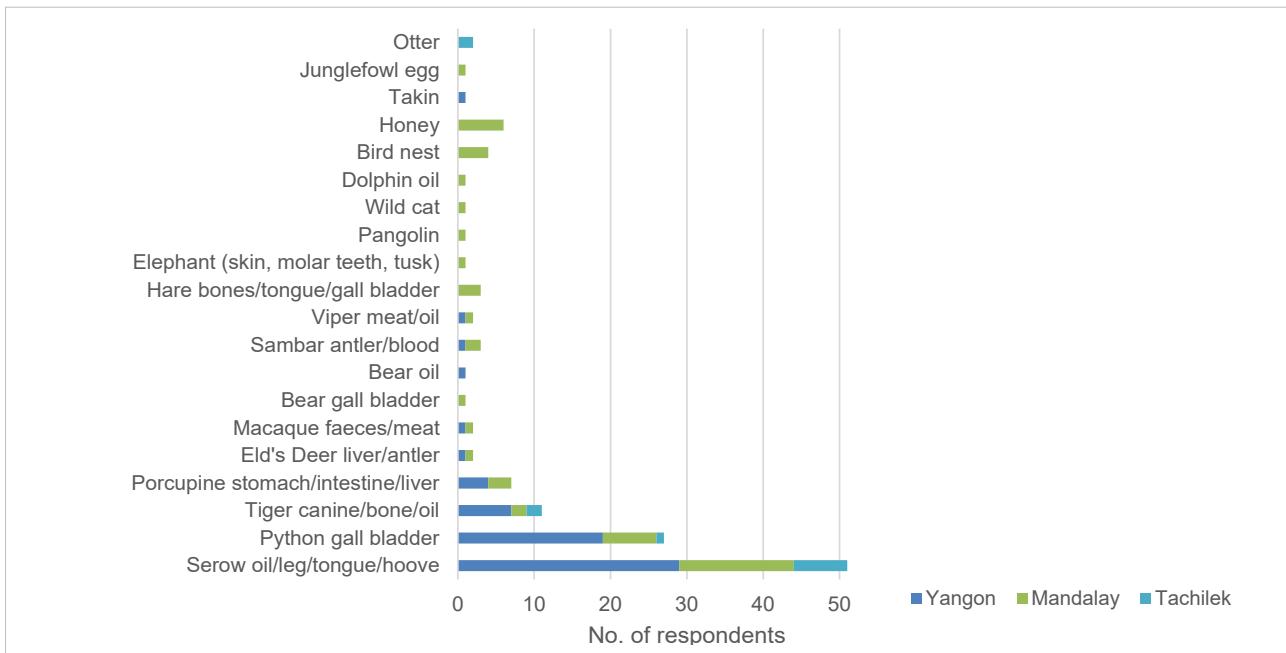


Fig. 6. Wild animal parts used as traditional medicines.

Wild animals kept as pets

Out of the 210 respondents, slightly over half (51%, n=107) had never kept a pet, some 29% (n=61) preferred to own or owned a domestic pet and 20% (n=42) preferred to own or owned wild animals as pets. Pet ownership/the desire to own a pet was highest among 31–50 year olds (52% of all pet owners, n=54 out of 103), and lowest among those aged 51 and above (11%, n=11). Pet ownership/desire was highest in Mandalay and lowest in Tachileik (Fig. 9).

Among the 42 who kept or preferred wild animals as pets, nine species were named (Table 1), the most popular being Burmese Hare, mentioned by 17 (40%) of respondents, followed by parrot/parakeet (36%, n=15), Hill Myna (8%, n=3), tiger (5%, n=2), hornbill, pheasant, peafowl, leopard, and macaque (all 2%, n=1).

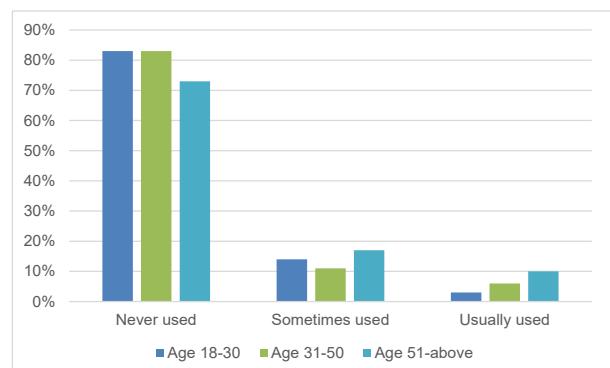


Fig. 8. Wild animal use as medicine by age group.

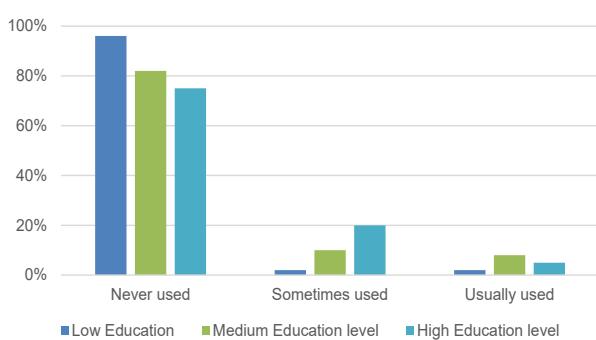


Fig. 7. Use of wild animals as medicine by education level.

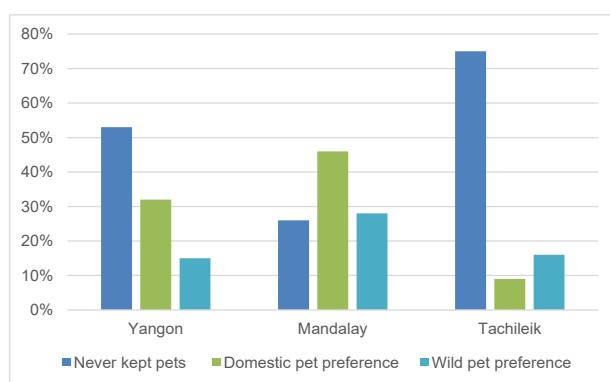


Fig. 9. Pet ownership across the three cities.

Table 2. Wild animal items and their stated purpose as ornaments/clothing.

No..	Item	Stated purpose
1	Tiger skin	Decoration
2	Tiger canine bracelet	Fashion
3	Ivory	Fashion
4	Ivory bracelet	Fashion
5	Ivory bead necklace	Fashion
6	Ivory pendent	Fashion
7	Ivory ring	Fashion
8	Elephant tail hair ring	Tradition (Amulet)
9	Leather coat made from muntjac skin	Fashion
10	Leather bag made from crocodile skin	Fashion
11	Leather bag made from ray fish skin	Fashion
12	Leather shoes (wildlife skins)	Fashion
13	Leather wallet (wildlife skins)	Fashion
14	Eld's Deer antler	Decoration
15	Buffalo horn	Decoration
16	Leopard skin	Decoration
17	Clouded Leopard skin	Decoration
18	Traditional hat band made from Wild Pig tusks	Fashion

DISCUSSION AND CONCLUSIONS

Myanmar is rich in natural resources and is recognised as a source for wildlife products (Nijman and Shepherd, 2014; Shepherd and Nijman, 2016; Zhang *et al.*, 2017). Each year, hundreds of millions of plants and animals are globally harvested from the wild. Live animals are often sold for fresh food, as pets or for zoological exhibits or their body parts may be used for a variety of purposes including as ingredients in medicines, as collectors' trophies, decorations and as luxury items. While some of this trade is legal and sustainable, a worrying proportion is illegal and threatens the survival of many species. Previous work in Myanmar has found wild animals on sale in markets principally intended for use as traditional medicine, for food and as souvenirs while the skins of muntjacs and serows were often used for leather clothing (Min, 2015; 2017).

The present study found only 10% of all respondents claimed not to use wild animals at all (the Type Zero consumers). Given some respondents are likely not to have revealed their actual consumption behaviour (Zhang *et al.*, 2008), the true levels of consumption are likely to be even higher than this survey suggests. The main users of wild animals across the four categories tended to be in the 31–50 age group, i.e. middle-aged adults, although there was a clear bias in medicinal use of wild animals towards the older age category.

The main reason respondents said they used wild animals was as food—some 72% or all respondents said they used for this purpose, followed by 59% who use them for medicinal purposes.

Any use of wild animals should be legal, while there is a need for greater enforcement and awareness efforts in large, commercial towns, as well as in border areas, in addition to an examination into any trade patterns that may be emerging (Martin, 1997; Davidson, 1999).

The most popular species for a variety of uses—and therefore those likely to be in highest demand—are sambar, muntjac and wild pig for food, serow for traditional medicine as well as tiger skins, ivory products and other leather products for ornaments and clothing. Birds are the most popular group of wild animals for pets—some five out of the nine pet species recorded were avian.

Based on surveys in the three cities, people in Tachileik mainly consumed wild animals as food and for ornaments or clothing, those in Yangon mainly in traditional medicine and in Mandalay the main interest was for ornaments and clothing and as pets. People's attitude towards wild animals is likely dependent on where they reside and their lifestyles.

Respondents from Yangon said they bought wild animal products from Kyaittijo Pagoda (Golden Rock), a known centre for traditional medicine supplies. This is indicative of how different cities have different consumption patterns depending on their location and availability of wild animal products.

Perhaps most concerning were the findings from this survey that only two-fifths of respondents said they were aware of threatened and protected species, only a third considered wild animals to have some value while almost three-quarters considered the abundance of wild animals in forest had decreased over the last five years. The latter is a particularly high figure considering the respondents were all city-based, although direct experience of this was limited to those living in Tachileik.

Efforts to raise awareness about the need for protection of wild animals, their value and the need for conservation to prevent resource depletion are priority actions for the authorities in Myanmar, and such efforts need to begin at an early age. As a starting point, education programmes should be developed for basic and/or university students. Authorities and conservation NGOs need to improve co-operation with local communities, both through education (Steinmetz *et al.*, 2006) and development of opportunities for co-benefits from wildlife. Meanwhile the ongoing COVID-19 pandemic has highlighted the very real danger of wild meat consumption and its potential for the spread of zoonotic diseases. This research was predominantly conducted prior to widespread concerns of the pandemic, however wild meat markets will continue to be associated with a threat of zoonotic diseases in the future. Therefore, this study also recommends promoting public awareness to stop wild meat consumption as well as education programmes in both urban and rural areas as part of a long-term wildlife conservation strategy.

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THE INTERNET-BASED SOUTHEAST ASIA AMPHIBIAN PET TRADE

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Amphibians, as a class, are the most threatened vertebrates on the planet, with 41% of species threatened with extinction. Southeast Asian amphibian species in particular have been impacted by a high rate of habitat loss, and overharvesting for consumption, traditional medicine, and the pet trade has placed further pressure on populations. Collection for the pet trade is a threat to many amphibian species but is notoriously difficult to quantify. Here we use internet and social media surveys to quantify online availability and demand for the pet trade of Southeast Asian amphibian species. We found postings for 59 Southeast Asian amphibians, comprised of 53 anurans and six caudates. Of these, only five species are included in a Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix. The geographic origin of postings was more challenging to determine in social media postings than in internet postings. Internet postings came primarily from domains or self-described posts associated with the United Kingdom, the Czech Republic, the United States, Russia, and Germany. We highlight several species groups which would benefit from further conservation action such as CITES listing, to improve monitoring and curb overharvesting.

Amphibians are the most threatened vertebrate class on earth, with an estimated 41% of species threatened with extinction (IUCN, 2019). Major threats include habitat loss and fragmentation, pollution, introduced species, disease, and collection from the wild (Martel *et al.*, 2014; Pratihar *et al.*, 2014; Sy, 2018; IUCN 2019). A known threat to many amphibians is the harvest to supply the global pet trade (IUCN, 2019). For example, the trade in live amphibians and reptiles for the United States from 2001–2009 was estimated to be in the millions of individuals (Herrel and van der Meijden, 2014).

In 2015, the IUCN SSC Amphibian Specialist Group (ASG) updated the Amphibian Conservation Action Plan (ACAP). The ACAP provides a framework for global amphibian conservation, and its thematic working groups have identified priorities and actions to address specific challenges in their respective theme (Wren *et al.*, 2015). The Trade & Policy Working Group of the ASG identified the “Evaluation of the life history and/or reproductive traits of commonly traded ‘captive bred’ species to determine whether commercial-scale breeding is likely” as a priority, which helped guide the development of this study.

Southeast Asia has the planet’s highest deforestation rates, and habitat loss continues to be the greatest threat facing amphibians in this region (Sodhi *et al.*, 2004; Miettinen *et al.*, 2011; Coleman *et al.*, 2019). Deforestation, climate change, pollution, and harvesting for the pet, meat, and traditional medicine trades have created an impending crisis for this species group (Rowley *et al.*, 2010; Pratihar *et al.*, 2014). Furthermore, amphibian species richness in Southeast Asia is greatly underestimated, and there are likely undescribed threatened species (Diesmos *et al.*, 2004; Stuart *et al.*, 2006; Mahony *et al.*, 2018). Trade-focused research has centred on frogs and frog legs for human consumption (Warkentin *et al.*, 2009; Gratwicke *et al.*, 2010; Altherr *et al.*, 2011); however, the potential threat of the pet trade to Southeast Asian amphibians has garnered little attention (Herrel and van der Meijden, 2014; Rowley *et al.*, 2016; Yuan *et al.*, 2018), despite being largely unregulated and a known driver of population declines in a number of species (IUCN, 2019).

Lack of trade data is challenging, especially for species that are not listed in the Appendices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), as their trade is unregulated in their countries of origin. Country-level export data are generally non-existent or not publicly available for Southeast Asian countries, although some countries (e.g. Indonesia) do have quota systems. However, internet-based e-commerce has been documented for numerous taxa, including amphibians (e.g. Auliya, *et al.*, 2016; Kaczmarski and Kolenda, 2018; Sung and Fong, 2018; Sy, 2018), and internet surveys can be used to quantify availability and demand (Tapley *et al.*, 2011; Rowley *et al.*, 2016; Phassaraudomsak and Krishnasamy, 2018).

Using the internet and social media, this study sought to investigate 1) the identity and number of Southeast Asian amphibian species in the online wildlife trade, 2) where possible, their geographical provenance and origin (wild or captive-bred), and 3) their life histories.

METHODS

Web surveys have been used to quantify amphibians in the pet trade (United Nations Environment Programme/World Conservation Monitoring Centre (UNEP-WCMC), 2008; Tapley *et al.*, 2011; Rowley *et al.*, 2016). For this study, 20 websites for dealers or groups specialising in herpetofauna in the United States and Europe and relevant posts on a large social media website were surveyed (see Table 1). Surveys were conducted using standard English and scientific terms and the Google search engine. Scientific names of popular Southeast Asian species combined with the keywords “buy” or “sale” were used as search criteria. A first reference list was compiled from the “Review of Non-CITES Amphibia Species that are Known or Likely to be in International Trade” (UNEP-WCMC, 2008) and through communication with hobbyists and researchers. Some websites were no longer available in the period between compiling the first reference list and our surveys, highlighting the ephemeral nature of the online trade. Posts on the social media website were found through searches using the scientific names of amphibians popular in mainland Southeast Asia and through communication with hobbyists and researchers. *Amphibian Species of the World* (Frost, 2019) was used as a taxonomic reference.

Posts could include a standing list, or one or more individuals. Evidence of availability (sale offers) and demand (“in search of” or “ISO” posts) of Southeast Asian amphibians was collated for two time periods: (1) posting dates from 1st January 2015 to 30th June 2016, collected April–July 2016, and (2) posting dates from 1st January 2017 to 30th June 2018 collected October–November, 2018. Both supply and demand were understood as evidence for demand for the amphibian species in question, as wildlife trade supply is driven and counterbalanced by demand.

Assessment of evidence of Captive Breeding (following the CITES definition of animal specimens produced in a controlled environment and having produced a second generation (F2) or subsequent generation (F3, F4, etc.) in a controlled environment; and being demonstrably managed reliably to produce second-generation offspring in a controlled environment) was based on advertisements listing animals as “CB” (captive bred) and announcements/documentation of successful reproduction in social media posts. It must be noted, however, that collecting conclusive evidence of captive breeding was challenging because of the difficulty in verifying such claims. Surveys tracked species, not individual animals.

Table 1. List of websites surveyed for posts 1st January 2015–30th June 2016 and 1st January 2017–30th June 2018.

No.	Website	Domain location	Status	
			2015–2016	2018
1	WWW.EUROFAUNA.COM	Europe	active	active
2	WWW.SALAMANDERLAND.AT	Austria	inactive	inactive
3	WWW.ANIMALFARM.CZ	Czech Republic	active	active
4	WWW.LAFERMETROPICALE.COM	France	active	inactive
5	WWW.REPTILICA.DE	Germany	active	inactive
6	WWW.TERRARISTIK.COM	Germany	active	active
7	WWW.AZIENDANATURAVIVA.COM	Italy	active	active
8	WWW.CAUDATA.NL	Netherlands	redirects	redirects
9	WWW.TERRARIUMONLINE.COM	Spain	inactive	inactive
10	WWW.DRAGOREPTILE.COM	Spain	inactive	inactive
11	WWW.AMPHIBIAN.CO.UK	UK	inactive	active
12	WWW.EXOTIC-PETS.CO.UK	UK	active	active
13	WWW.EXOTICPETS.CO.UK	UK	active	active
14	WWW.REPTILESPLUS.CO.UK	UK	?	active
15	WWW.DARTFROG.CO.UK	UK	active	active
16	WWW.KINGSNAKE.COM	USA	active	active
17	WWW.BACKWATERREPTILES.COM	USA	active	active
18	WWW.NATUREBOXPETEMPORIUM.COM	USA	active	active
19	WWW.JOSHSFROGS.COM	USA	active	active
20	WWW.LLLREPTILE.COM	USA	active	active

CITES (2016) and The IUCN Red List of Threatened Species (“IUCN Red List”, IUCN, 2019) were searched to determine the international legal framework and the global extinction risk of species identified in internet surveys.

Life history traits influencing reproductive modes (arboreal, terrestrial, fossorial, aquatic) were evaluated and each species was assigned a number representative of its reproductive mode as per Haddad and Prado (2005).

LEGISLATION

Legislation and trade controls for the live export of amphibians vary among countries in the region, with the exception of species listed in the CITES appendices. Country-specific regulations are not easily accessible, and few species of amphibian native to the region are listed in the CITES appendices: only *Hoplobatrachus tigerinus*, which occurs in parts of Myanmar, and newts in the genus *Paramesotriton* and *Tylototriton*. However, it is important to note that both *Paramesotriton* and *Tylototriton* are recent additions to CITES and perhaps because of this, and their importation ban in the United States (U.S. Fish & Wildlife Service, 2016), there are no records of their legal trade in the CITES database.

Hoplobatrachus tigerinus is harvested for food and is an unlikely (non-charismatic) target species for the pet trade.



The most frequently posted amphibian species on the internet trade, *Theloderma corticale*.

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The internet-based Southeast Asian amphibian pet trade

Table 2. Southeast Asian amphibian species in the internet pet trade in Europe and the United States; study period: 1st January 2015–30th June 2016 and 1st January 2017–30th June 2018.

Anura		Offers/requests: Internet		Offers/requests: Social media		IUCN status	Mode*	Captive breeding evidence	CITES listing
Genus	Species	2015–16	2017–18	2015–16	2017–18				
Bombina	<i>microdeladigitora</i>		3		2	Not Evaluated	I	No	No
Duttaphrynus	<i>melanostictus</i>	3	6			Least Concern	I	No	No
Fejervarya	<i>limnocharis</i>	I	I			Least Concern	2	No	No
Glyphoglossus	<i>guttulatus</i>	I	2			Least Concern	I	No	No
Hoplobatrachus	<i>rugulosus</i>		I			Least Concern	I	No	No
Hyla	<i>chinensis</i>	I	2			Least Concern	I	No	No
Hylarana	<i>erythraea</i>	2	I			Least Concern	I	No	No
Hylarana	<i>picturata</i>		I			Least Concern	2	No	No
Hylarana	<i>signata</i>	I	I			Least Concern	2	No	No
Hylarana	spp.	I	I			Varies	Varies	No	No
Ingerophrynus	<i>galeatus</i>		I			Least Concern	2	No	No
Kaloula	<i>baleata</i>	I	I			Least Concern	I	No	No
Kaloula	<i>pulchra</i>	3	4			Least Concern	I	No	No
Kurixalus	<i>appendiculatus</i>				I	Least Concern	26	Yes	No
Leptobrachium	<i>guangxiense</i>	I				Not Evaluated	I	No	No
Leptobrachium	<i>hasseltii</i>	I	I			Least Concern	2	No	No
Limnonectes	<i>malesianus</i>	I	I			Near Threatened	I	No	No
Megophrys	<i>montana</i>	I	I			Least Concern	24	No	No
Megophrys	<i>nasuta</i>	3	6	11	8	Least Concern	24	Yes	No
Microhyla	<i>annamensis</i>		I			Vulnerable	I	No	No
Microhyla	<i>berdmorei</i>		I			Least Concern	I	No	No
Microhyla	<i>butleri</i>		I			Least Concern	I	No	No
Microhyla	<i>fissipes</i>		I	I		Least Concern	I	No	No
Microhyla	<i>pulchra</i>	I	I			Least Concern	I	No	No
Micryletta	<i>inornata</i>		I			Least Concern	I	No	No
Nyctixalus	<i>pictus</i>	I	2	2	2	Near Threatened	26	No	No
Occidozyga	<i>lima</i>	I	2			Least Concern	I	No	No
Odorrrana	<i>livida</i>		I			Data Deficient	2	No	No
Phrynobatrachus	<i>asper</i>	I	2	I		Least Concern	I	No	No
Polypedates	<i>leucomystax</i>	3	7		6	Least Concern	33	Yes	No
Polypedates	<i>otilophus</i>	4	9	5	24	Least Concern	33	Yes	No
Pulchrana	<i>signata</i>		I			Least Concern	2	No	No
Rentapia	<i>hosii</i>	3	3	3		Least Concern	2	Yes	No
Rhacophorus	<i>annamensis</i>	3	I		I	Least Concern	33	Yes	No
Rhacophorus	<i>dennysi</i>	2	2	2	8	Least Concern	33	No	No
Rhacophorus	<i>feae</i>	2	2		I	Least Concern	33	No	No
Rhacophorus	<i>nigropalmatus</i>			I		Least Concern	33	No	No
Rhacophorus	<i>norhayati</i>		I			Not Evaluated	33	No	No
Rhacophorus	<i>pardalis</i>	I	I			Least Concern	33	No	No
Rhacophorus	<i>prominanus</i>		I		4	Least Concern	33	Yes	No
Rhacophorus	<i>reinwardtii</i>	2	4		I	Near Threatened	33	No	No
Staurois	<i>guttatus</i>	I	2			Least Concern	I	No	No
Theloderma	<i>asperum</i>	4	4	I	I	Least Concern	26	Yes	No
Theloderma	<i>bicolor</i>	2	2	I		Endangered	26	Yes	No
Theloderma	<i>corticale</i>	4	20	2	4	Least Concern	26	Yes	No
Theloderma	<i>gordoni</i>	2	I			Least Concern	26	Yes	No
Theloderma	<i>horridum</i>				6	Least Concern	26	Yes	No
Theloderma	<i>laeve</i>	2	I			Data Deficient	26	No	No
Theloderma	<i>licin</i>			I		Least Concern	26	No	No
Theloderma	<i>palliatum</i>	2	I		I	Endangered	26	Yes	No
Theloderma	<i>rhododiscus</i>	2				Near Threatened	26	No	No
Theloderma	<i>ryabovi</i>	2	I		4	Endangered	26	Yes	No
Theloderma	<i>stellatum</i>	3	I		5	Least Concern	26	Yes	No

Table 2 (continued). Southeast Asian amphibian species in the internet pet trade in Europe and the United States; study period: 1st January 2015–30th June 2016 and 1st January 2017–30th June 2018.

Caudata		Offers/requests: Internet		Offers/requests: Social media		IUCN status	Mode*	Captive breeding evidence	CITES listing
Genus	Species	2015–16	2017–18	2015–16	2017–18				
<i>Laotriton</i>	<i>laoensis</i>	I		5	15	Endangered	I	Yes	No
<i>Paramesotriton</i>	<i>deloustali</i>				I	Least Concern	2	No	II
<i>Tylototriton</i>	<i>asperrimus</i>	3	I		2	Near Threatened	4	No	II
<i>Tylototriton</i>	<i>shanorum</i>		I		3	Vulnerable	I	No	II
<i>Tylototriton</i>	<i>verrucosus</i>		I	2	18	Least Concern	I	No	II
<i>Tylototriton</i>	spp.		I	2	I	Varies	Varies	No	II

* Mode = Reproductive mode as per Haddad and Prado (2005).

RESULTS

A total of 59 Southeast Asian amphibian species comprising 53 anurans and six caudates were identified in the pet trade (Table 2). Eleven species (18.6%) are listed by the IUCN Red List as Endangered (EN), Vulnerable (VU) or Near Threatened (NT); five are either Not Evaluated (NE) or Data Deficient (DD) and all others are assessed as Least Concern (LC). However, many LC species comprise species complexes (i.e. phylogenetically close taxa that are morphologically nearly indistinguishable), requiring updated conservation assessments (Tapley *et al.*, 2018). Of all species found in our surveys, only five (all Caudata) were listed in CITES, all in Appendix II.

Species were identified to genus only for *Hylarana*, *Paramesotriton* and *Tylototriton* on some websites. There was an increase in the number of species and individuals in the genera *Microhyla*, *Paramesotriton*, *Theloderma* and *Tylototriton* between the two study periods (Table 2).

Potential instances of captive breeding were identified for 16 of the 59 species (27.1%). Species claimed to be captive bred were *Kurixalus appendiculatus*, *Megophrys nasuta*, *Rentapia hosii*, *Polypedates leucomystax*, *Polypedates otilophus*, *Rhacophorus annamensis*, *Rhacophorus prominanus*, *Theloderma asperum*, *Theloderma bicolor*, *Theloderma corticale*, *Theloderma gordoni*, *Theloderma horridum*, *Theloderma palliatum*, *Theloderma ryabovi* and *Theloderma stellatum*. *Laotriton laoensis* was also identified as being captive bred.

In many cases captive breeding was partially supported on social media as posted photographs documenting breeding facilities, adults in amplexus, eggs, and juveniles (with the caveat that they would need in-situ verification to be corroborated).

Of the 20 websites that were surveyed four were no longer active, one changed websites, one redirected to a nuisance site in both 2016 and 2018, one had no amphibians and another one had no Southeast Asian amphibians. Of the remaining websites, one was a classifieds site and the others companies with internet domains corresponding to the United States, United Kingdom, and the Czech Republic.

A total of 189 website posts were recorded for Southeast Asian amphibians. Countries with the greater number of posts (with the exception of the classifieds site, which showed postings from different countries, other domains were assumed to represent country of registration) were the United Kingdom (n=45), Czech Republic (n=33), United States (n=25), Russia (n=12) and Germany (n=10). Only one website reported country of origin, with Viet Nam, Indonesia, and China listed as places of origin for the website's listings.

The most frequently posted species were *Theloderma corticale* (n=24), *Polypedates otilophus* (n=13), *P. leucomystax* (n=10), *Megophrys nasuta* (n=9) and *Theloderma asperum* (n=8).

A total of 160 posts were recorded on the social media website. However, because of the cryptic nature of the site it was challenging to gauge origin of supply and demand for the majority of posts, so these were not particularly informative in this regard.

Six reproductive modes were recorded, with the most common being Mode 1 (eggs and exotrophic tadpoles in lentic water, n=22), followed by Mode 26 (eggs and exotrophic tadpoles that develop in water-filled cavities, n=13) and Mode 33 (arboreal foam nest; hatchling tadpoles drop into ponds or streams, n=10).

DISCUSSION AND CONCLUSIONS

The transitory nature of many websites and social media posts means that these surveys are only a snapshot in time. Although Southeast Asian amphibians are neither the most colourful nor the most popular species, their trade may still pose a threat to wild populations.

Over a tenth of listings were Asian newts. Demand for Caudata did not appear to be coming from a single country. For example, posts from the internet survey came from the Czech Republic, Germany, Italy, United Kingdom and the United States; however, it is difficult to tell whether this might also reflect a site bias. Posts on the social media site did not, for the most part, advertise country of origin. Large numbers of Asian newts are known to be collected for the pet trade, presenting a major threat to wild populations (Rowley *et al.*, 2016).

Particularly worrisome are the morphologically cryptic genera *Paramesotriton* and *Tylototriton*, making identification challenging (Rowley *et al.*, 2016). The demand for these species appears to be increasing over time (Table 2). Demand for the Lao Newt, *Laotriton laoensis*, threatened primarily by collection for the pet trade (IUCN SSC Amphibian Specialist Group, 2017a), increased three-fold in the social media website, which could reflect a decrease in the availability of this species and/or greater demand.

Rhacophorid frogs were common in the pet trade, particularly the genus *Theloderma*: 11 species were recorded, representing over 42% of known species in this genus. Of note, *Theloderma bicolor*, *T. palliatum* and *T. ryabovi* are all globally Endangered (van Dijk *et al.*, 2004; Rowley *et al.*, 2010; IUCN SSC Amphibian Specialist Group, 2017a,b,c). These results echo the findings of Altherr *et al.* (2020), where *Theloderma asperum*, *T. corticale* and *T. ryabovi* were found to be among the 100 most traded amphibians in Germany, in addition to other frequently posted rhacophorids such as *Polyptedetes otilophus* and *P. leucomystax*.

While some posts announced captive breeding, based on the information provided it was very difficult to determine if laundering was taking place. Declarations of Captive Bred animals supported by photos documenting one or more aspects of breeding (amplexus, eggs, tadpoles) were assumed to be legitimate, but still difficult to verify.

There were six reproductive modes represented in our sample, with three common modes: eggs and tadpoles developing in lentic water, eggs and tadpoles developing in water-filled cavities, and arboreal foam nests where

tadpoles drop into bodies of water. Presumed evidence of captive breeding was most often recorded for *Theloderma* spp., all of which have eggs and tadpoles developing in water-filled cavities. This reproductive mode, requiring small bodies of still water, is easier to facilitate under captive conditions, potentially leading to greater success at captive reproduction.

With increased globalisation there is also increased movement and subsequent threat of wildlife diseases, as evidenced by the COVID-19 pandemic. Amphibian populations worldwide have been severely affected by the amphibian chytrid fungus, *Batrachochytrium dendrobatidis* (*Bd*) (Daszak *et al.*, 2003; Olson *et al.*, 2013). First identified in the late 1990s, *Bd* spread has been linked to the amphibian pet trade (Fisher and Garner, 2007; Garner *et al.*, 2009; Peel *et al.*, 2012). Research suggests that *Bd* originated in East Asia and that intercontinental transmission is ongoing (O'Hanlon *et al.*, 2018). The more recently discovered salamander chytrid fungus, *Batrachochytrium salamandivorans* (*Bsal*), also appears to have originated in East Asia and has spread through Europe via the pet trade, driving declines in wild Fire Salamander *Salamandra salamandra* populations (Martel *et al.*, 2014; Spitsen-van der Sluijs *et al.*, 2016). *Bsal* has so far only been known to cause disease in salamander populations, but has been found on Small-webbed Fire-bellied Toads *Bombina microdeladigitora* imported into Germany from Viet Nam, meaning it could be vectored by anurans (Nguyen *et al.*, 2017). Other pathogens have been documented in widely traded amphibian species, including Mycobacteria and ranavirus (e.g. Suykerbuyk *et al.*, 2007; Gilbert *et al.*, 2013).



***Tylototriton verrucosus*, one of the more regularly encountered salamander species appearing in online posts in this study.**

RECOMMENDATIONS

- Based on the results and insights gained over the course of this study, the following recommendations are offered:
1. In order to reduce pet trade pressures on wild amphibian populations, trade regulations and monitoring must be improved, inclusive of monitoring of the online trade. Ideally, trade movements of all amphibian species would be documented internationally, which would help control the spread of pathogens such as fungi, viruses and bacteria, and help protect the living communities of other ecosystems.
 2. Implementing a global process such as that recommended above would take time, so in the shorter to medium term we suggest that governments who allow the importation of amphibians create a process that allows reporting of number and species involved. CITES listings would allow for better regulation of the Southeast Asian amphibian trade, especially for the most traded species. Except for species in the genus *Tylototriton* (Appendix II listing), none of the other frequently posted species are listed in any of the CITES appendices.
 3. Determining the legality of trade at the regional level was challenging. The development of legal frameworks and publicly available mechanisms (e.g. databases) that allow for the identification of illegally taken wildlife within the region would help the monitoring process.
 4. For every amphibian that makes it to the pet trade, there are many more that do not. From the point of harvest to the commercial point of sale there are several steps in between (including temporary housing and various transportation routes and conditions), all multiple stressors that can take an enormous toll on individual animals, to the point of mortality. Although this aspect was outside the scope of our study, we consider that documenting mortality through the supply chain is something that needs the consideration of authorities and responsible providers and hobbyists alike.
 5. Identification by experts is key, so forging formal agreements between government agencies and institutions capable of assisting with identification would be beneficial.
 6. Given the overriding threat of the pet trade to the monotypic and highly endemic Lao Newt *Laotriton laoensis* (Phimmachak *et al.*, 2012; IUCN SSC Amphibian Specialist Group, 2017a; Stuart *et al.*, 2014; Rowley *et al.*, 2016), and the continued demand for the species detected on social media, we recommend an assessment for a CITES listing for the species.
 7. Standardised biosecurity protocols, which could include screening and quarantine for imported amphibians, would help reduce disease spread. Such monitoring would allow a greater understanding of the nature and scale of amphibian trade, as well as identifying species in need of CITES listing. In

instances where species are highly threatened and endemic to one country, detailed studies and/or an Appendix III listing may warrant consideration. IT-based approaches also show promise in increasing the range and scope of monitoring efforts in online trade (Di Minin *et al.*, 2018).

8. All relevant parties, including lawmakers and hobbyists, need to be educated on the dangers posed by pathogens and the need for sustainable options for legal trade while limiting or eliminating trade in species which cannot support it. Development of documentation spelling out pet trade consumer responsibility would help inform the hobbyist community of the impacts of their choices. Globally-scoped umbrella organisations could create outreach programmes via social media and support for species study and monitoring. Smaller organisations can be engaged on a regional or local scale.
9. Based on the nature of internet posts, the verification of countries of posting, origin, and claims of captive breeding was challenging. We recommend further investigation to identify mechanisms that may allow such claims to be verified.

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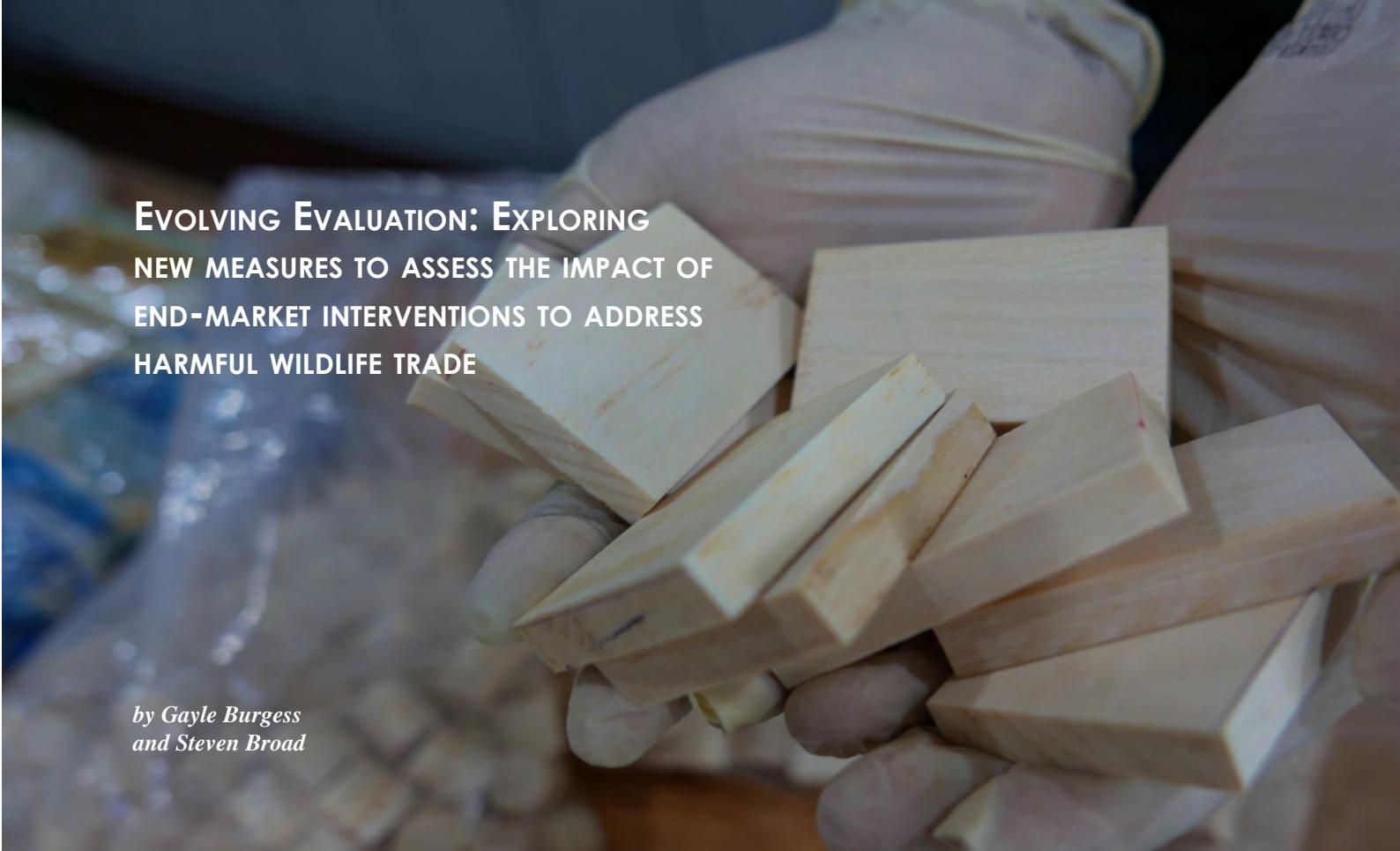
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***Hyla chinensis*, a species of tree frog, was encountered in trade, although there was no evidence of captive breeding.**



EVOLVING EVALUATION: EXPLORING NEW MEASURES TO ASSESS THE IMPACT OF END-MARKET INTERVENTIONS TO ADDRESS HARMFUL WILDLIFE TRADE

by Gayle Burgess
and Steven Broad

There is an urgent imperative to improve insights into the impacts of end market interventions aimed to reduce illicit trade in wild fauna and flora. Based on a value chain approach to the representation of wildlife trade flows, participating actors and potential interventions aimed to reduce harms and increasing benefits, a range of possible reference points for monitoring and evaluation can be identified. Sixteen datapoints specifically relevant to evaluation of the impact of end market interventions have been assessed in terms of utility and viability, with four of them emerging as the most important. These include consumer opinion indicators (self-reported past purchase rates and predicted future purchase intention) and retail observation indicators (product sales volume trend, and retail price).

The use of these and other indicators in assessment of intervention impacts within the largely legal diamond industry and the illegal cocaine trade is reviewed to gain insights into both utility and viability. Based on the insights derived from this comparison, opportunities and challenges in relation to further development of these evaluation approaches for assessment of wildlife trade interventions in end markets are reviewed.

ORIENTATION AND OVERVIEW

Trade in wild animals and plants for a wide range of market uses is a major driver of the over-exploitation of wild species, the second most significant cause of global biodiversity loss (IPBES, 2019). Efforts to address this conservation threat through local and international action have increased steadily over the past 50 years, particularly under the auspices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). However, during this same period there has been a massive increase in market access and demand for many wildlife commodities, as a result of globalisation, population and economic growth (UNODC, 2020).

Recognition of this situation has stimulated a surge in conservation action to tackle over-exploitation, especially in the past decade, but even with some increase in available resources hard choices still have to be made about the application of finite funding and effort across interventions to reduce harmful wildlife trade. The importance of robust methods to gain insight into market trends and evaluate the impact of social and behaviour change interventions within this frame is recognised as fundamental yet challenging. With considerable regulatory pressure on many components of wildlife trade a sizeable proportion of the business operates illegally and out of sight. This is compounded by the markets for many species being complicated with multiple potential sources

of supply, complex transport, storage, and processing routes, and differentiated end uses. Intervention impact assessments are especially challenged by poor access to market info and multifaceted dynamics.

Value Chain Analysis (VCA) is a useful tool through which to address such challenges. It can help characterise trade flows for different wildlife commodities; understand diverse roles and connections between participating actors; identify new approaches to reducing harms and increasing benefits; improve evaluation methods and maximise intervention impacts (Fasse *et al.*, 2009). As part of a wider effort to enhance the application of value chain thinking in the wildlife trade field, this paper focuses on how VCA might strengthen end-market insight, “demand reduction” (DR) impact assessment, and the effectiveness of efforts to influence consumption behaviour.

TRADITION AND NEW TRACTION

In line with strategies to combat other illicit commodity markets—such as narcotics, weapons, or counterfeit products—traditional conservation approaches to addressing harmful wildlife trade have focused on supply disruption and mitigation (e.g. UNODC, 2016; Burgess *et al.*, 2018). Effort has been made to enact trade restrictions and then ensure such laws were better enforced and carried stronger penalties and deterrents, whilst information has been gathered on trade routes and smuggling methods to increase interdictions and seizures. Public engagement has featured less prominently and focused on mobilising public sympathy for endangered animals, calling for policy changes or raising awareness of laws (Burgess, 2016).

More recent initiatives in wildlife end-markets have started also to focus on complementary actions, aiming to reduce consumer desire for illegally traded products. The theory of change is that by reducing consumer desire for illegal wildlife products such incentives for traders diminish, while parallel efforts to increase the effort and effectiveness of law enforcement will increase the costs to e.g. conceal contraband and avoid detection along smuggling routes. Strong consumer desire and lucrative values for pachyderm, pangolin, big cat, reptile and tropical hardwood products, combined with the potential campaign appeal for “charismatic species”, has catalysed an early focus on these taxa in DR efforts.

The skillset—and to some extent mindset—required to gather behavioural insight, target communications accurately and measure the impact of such communications, is quite new. Recent emphasis by donors and in policy priorities such as the CITES Resolution on Demand Reduction (Resolution Conf. 17.4) is successfully encouraging practitioners to diversify and complement classic public awareness campaigns with more nuanced social and behaviour change communications and actions. These seek to promote specific changes in purchasing preferences and buyer desires. Ensuring these employ the best evidence around wildlife end-market trade volumes and flows, commodity prices and consumer motivations, is critical

to building further success and impact. As a precursor to explaining how VCA can help meet this requirement, this paper first considers DR current practice and some perspectives and commentary around it.

PERSPECTIVES ON CURRENT PRACTICE

Early efforts to gain insight into consumer buying behaviour and motivations in wildlife end-markets have used social surveys. These surveys have typically incorporated qualitative and quantitative components across nationally representative samples—up to 2,000 people in selected urban centres in China, for example. Surveys of this type can provide useful socio-economic and psycho-demographic evidence to underpin baseline and formative assessment. Data of this type have so far been gathered around pachyderm, pangolin and big cat product consumption in China, Thailand and Viet Nam, with smaller datasets for species such as saiga antelopes, sharks, orchids and exotic pets.

While these surveys have provided valuable consumer insight of great use to designing behaviour change interventions, limitations are recognised in their applicability to DR initiative impact assessments and broader understanding of market dynamics. Extensive commentary has been published on this topic, including in Roberton, 2014; TRAFFIC, 2017; U.S GAO, 2017; Olmedo, *et al.*, 2017; CITES, 2017; Burgess *et al.*, 2018; Verissimo and Wan, 2018. A synthesis of the key point is that self-reporting of past purchase and future purchase intention can be unreliable. For example, in research conducted by IPSOS Viet Nam in 2013, 5% of survey respondents reported previously consuming rhino horn, and in 2017, only 2% did. In the same 2013 study, 16% indicated they were considering purchasing rhino horn in the future, and in 2017, the figure was 9%. While at face value, the latter could be a positive sign of progress in reducing demand for rhino horn in Viet Nam, the literature calls into question how practitioners and donors can rely on such data if surveys aren’t designed using appropriate methods, or without triangulating what people claim against more observable/less subjective insights. While constructive criticism is important for progress, some commentary has led to scepticism over whether DR is a worthwhile investment for efforts to combat wildlife trafficking at all (see Holden *et al.*, 2018, for further discussion on this matter).

Experience from other fields of social survey application support the need for caution (e.g. MacFarlane *et al.*, 2020). In medicine, the risks associated with over-relying on such “opinion-based” data as a measure of impact, are well documented. Illustrative was one study on arthroscopic knee surgeries, which demonstrated that the amount of pain relief described by patients was consistent irrespective of whether they received a real or “sham” treatment (either saline wash, or simply an incision with no further surgical intervention) (Moseley *et al.*, 2002). This illustrates the placebo effect (Althubaiti, 2016), but also potentially an “illusion of causality” and “causal inference” (Matute, 2015), which all surveys should design for adequately.

SENSITIVE SURVEY SUBJECTS

Shortcomings such as this are exacerbated around topics that are sensitive, illicit, or subject to social (or legal) sanction. Human nature suggests people report being morally more wholesome or upstanding than their actual behaviour might justify. Compounding this, respondents may deliberately misreport information on sensitive subjects, to maintain their reputation or abide by relevant norms (Gilens *et al.*, 1998; Rosenfield, *et al.*, 2016). Cognitive dissonance (when an individual holds contrasting beliefs, attitudes or values: Festinger, 1957), may also factor.

By way of illustration: Most survey respondents would claim climate change, biodiversity loss and animal cruelty are a concern and influence their purchasing decisions (Burgess *et al.*, 2018). But when confronted with a product sold in a luxury retail environment, sanitised from any such impacts arising from product sourcing, processing, manufacture and distribution, a mental justification is made that e.g. an ivory product is distant from the elephant poaching crisis. Further complications occur through a perceived lack of personal agency (a behavioural science term for a person's belief of their influence, contribution or control around the outcome) around the problem ("my behaviour doesn't really make a difference to the elephant poaching crisis anyway, so why shouldn't I buy that beautiful ivory bangle. I deserve/desire it as a treat/souvenir/memento from my holiday").

Beyond such common-sense considerations around "denial" and the influence of shame and illegality on what people say or predict about their behaviour in social surveys, additional psycho-social factors (that influence what people believe they will do, thus compounding any response bias) are also worth noting. Examples include preference falsification (the tendency for people to conceal what's in their head); hedonism trumping values (the fun of the moment outweighing usual moral or ethical reservations, so what people say at the time of engaging in the survey may not be what they do in the moment); and hyperbolic discounting (the prospect of current gains outweighing fear of future losses). Kormos and Gifford (2014) explore elements such as these further.

MORE APPROPRIATE METHODS?

Methodological approaches are available to help reduce the impact of such factors in social surveys. Sensitive questioning techniques, question phrasing, timing, order and the use of proxies are all relevant and discussed further in TRAFFIC, 2017; MacFarlane, 2019 and Walsh and Vogt, 2018. However, an adequate amount of funding, time, knowledge, and skills are required to implement these approaches adequately. This confluence of challenges in the use of social surveys for DR impact assessment specifically has led to a paucity of reliable data. Current measures tend to focus on a mix of self-reported past 3-, 6- and 12-month purchase practice plus expressed future intention—if data have been gathered at all—and there is no comparison between treatment

and control groups. More typical types of "evaluation" include outreach and pledges.

In their meta-analysis of 236 DR initiatives, Verissimo and Wan (2018) observed that:

"37% reported some information on their inputs, 98% on strategies (tactics and approaches adopted to achieve change), 70% on outcomes (defined as changes in the target audience) and 9% on impacts (biological changes or threat reduction). Information on outcomes and impacts was largely anecdotal or based on research designs that are at a high risk of bias, such as pre-post comparisons. At present, it is challenging to know whether demand reduction campaigns are having a direct behavioural or biological impact." (see Figure 1).

Despite consensus and excoriating commentary around these challenges for DR initiative insight and impact measurement, plus the broader implications for wildlife end-market evidence, surprisingly little has been put forward by way of solutions. Looking to value chain analysis in other fields of commodity trade, end-market interventions are often appraised against a wider set of indicators, including retail sales information as well as consumer surveys. Opinion-based data are also typically triangulated with those from observation and contextualised against wider market analytics. The paper thus next delves into these aspects deeper.

DISCERNING "DEMAND" DATAPoints

Figure 2 below illustrates a simplified wildlife commodity value chain, while Figure 3 summarises the datapoints associated with these components and clusters them according to whether they are opinion or observation based, and further details on each appears in Table 1. All datapoints would be equally relevant to any taxa, geography, or wildlife trade type. Interlinkages between the datapoints exist but are set-aside for now, as are additional options falling outside this classification (e.g. social listening/public norm narratives).

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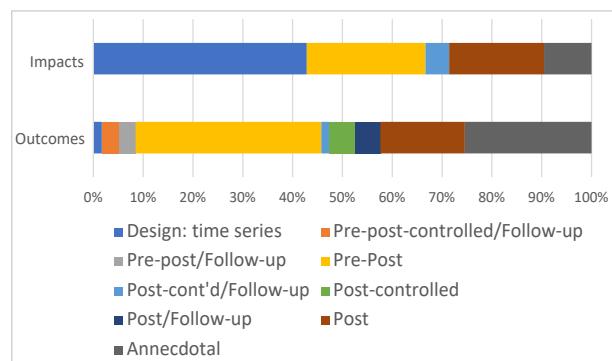


Fig. 1: Research design of wildlife DR initiatives mapped by outcomes and impact. Source: based on Verissimo and Wan, 2018, reproduced with permission.

RATIONALISING FOR PRACTICALITIES

Collecting research data from all 16 datapoints in Figure 3 and Table 1 is infeasible, considering DR practitioners are still building the skillset required to gather behavioural insight, target communications accurately and adequately measure their impact. Some prioritisation of the most crucial elements for those aiming to reduce harmful wildlife trade in end markets therefore needs to be prepared. The three 2x2 analyses illustrated by Figures 4–6 thus aim to inform considerations around that, with further discussion around the key points as follows:

1) Considering the data that are technically most useful in terms of the quality of insight

Figure 4 proposes priorities from among the initial 16 datapoints according to which datapoints offer the potential for unique insight and something technically useful, in the authors' experience and opinions. Three datapoints from consumer opinion data remain following this initial filter, whilst two datapoints from all other clusters are removed/remain. Unifying features for the resultant nine datapoints include direct measurement of the commercial transaction between retailer and consumer in the opinion data, with more indirect measures against which these can be triangulated in the

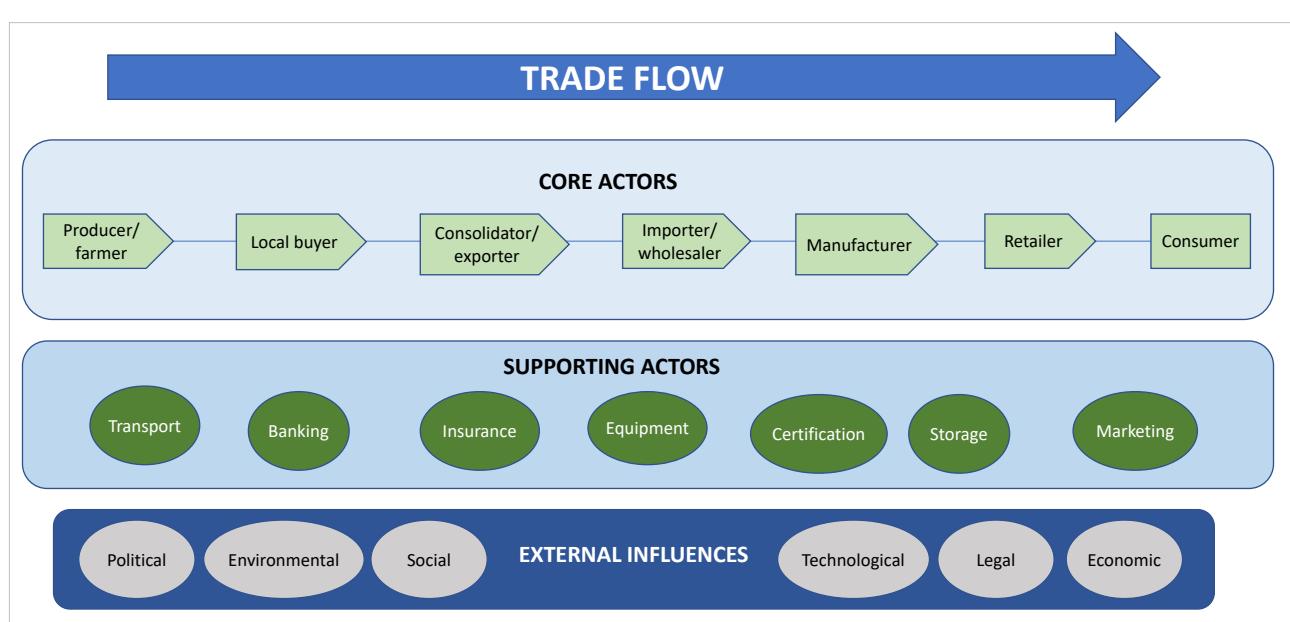


Fig. 2: A simplified Value Chain.

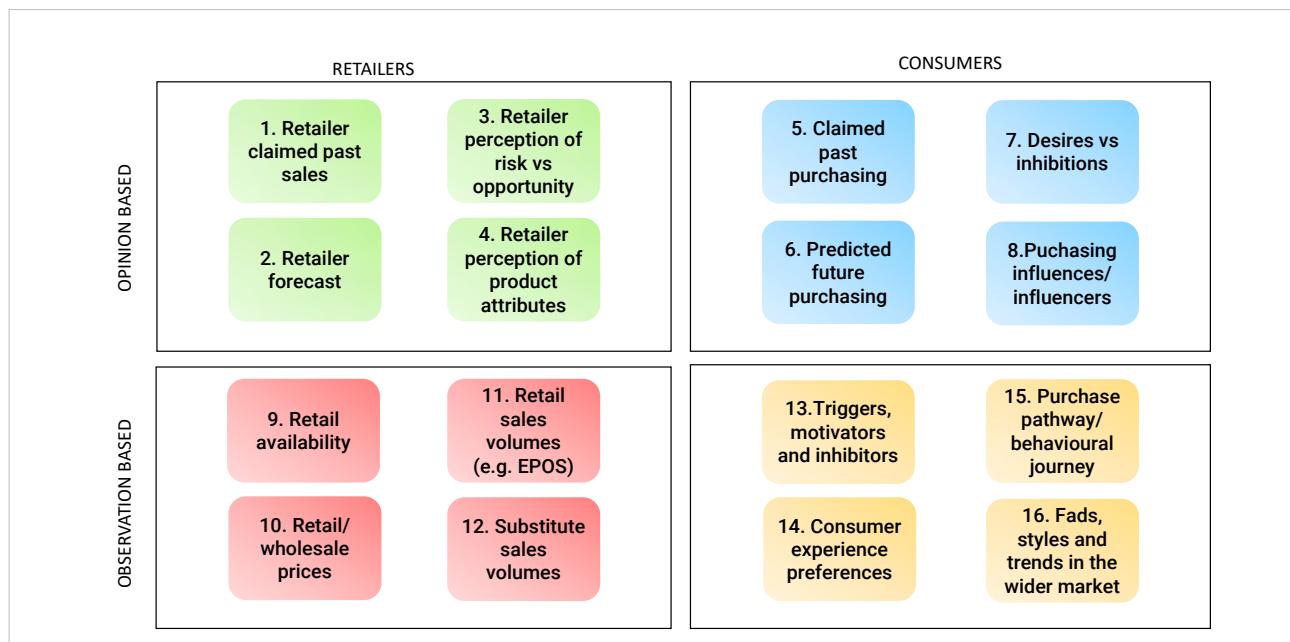


Fig. 3: Potential datapoints for end markets for illegal wildlife trade.

Table I. Potential datapoints for end markets for illegal wildlife trade.

No.	Datapoint	Data source	Examples/further explanations
1	Retailer claimed past sales	Retailer opinion data	Qualitative data providing insight into the retailer experience of consumer demand, ideally factors such as how “easy” product is to acquire, supply time lag, overheads for illegality, how they sell products, etc.
2	Retailer forecast		Insight into how retailers predict future demand, what factors they consider, how far in advance they forecast and if they stockpile.
3	Retailer perception of risk vs opportunity		Qualitative assessments of how retailers weigh-up the risks and benefits of trading in illegal wildlife products: influences might include perception of laws, penalties and effectiveness of enforcement efforts.
4	Retailer perception of product attributes		Understanding on the categories of use retailers bracket the illegal wildlife product into: examples include health products, luxury goods, furniture, fuel, food or others.
5	Claimed past purchasing	Consumer opinion data	How frequently (and ideally in what quantity) self-confessed “buyers” report purchasing the target wildlife commodity over the past 3/6 or 12 months, 3 years or “ever.”
6	Predicted future purchasing		The proportion of respondents in the survey, predicting their intention to buy the target wildlife commodity in the future. Usually on a Likert scale e.g. “very likely; likely; neither likely, nor unlikely; unlikely; very unlikely.”
7	Desires vs inhibitions		Consumer expressions around the illegal wildlife products (or their equivalents) they desire, and the factors dissuading/encouraging that desire.
8	Purchasing influences/influencers		Information from consumers (actual buyers, whether lapsed or not, and “intenders”) about who their “social referents” are: the public figures, family members, friends, peers and others, that influence their behaviour, plus outreach channels.
9	Retail availability	Retailer observation data	Market monitoring data for the number of illegal products in adverts for sale, and number of offers for sale, in how many outlets, of what type: measured routinely over time (e.g. monthly in virtual markets/bi-annually in physical markets).
10	Retail/wholesale prices		Retail price easier to obtain than wholesale, although both should be gathered routinely and applicable to a weight category e.g. USD4.70 per gramme for ivory in 2017.
11	Retail sales volumes		Identifying trend data around how much (i.e. what volume) of product is being sold through retail outlets over time. Identified through sampling, Electronic Point of Sale (EPOS) records.
12	Substitute sales volumes		Where substitute products are identified, understanding how much of these are being sold through retail outlets over a fixed period (e.g. 50 kg per year). Hard to acquire.
13	Triggers, motivators and inhibitors	Consumer observation data	Insight from in depth ethnographic studies, such as social listening, consumer forum discussions or transaction observations, to understand what situational triggers prompt consumers to buy products at that place/ on that day; for example, looking at the narratives around their queries to understand what they seek to determine the best buying experience and quality product; looking at the tagwords associated with their choice of purchase.
14	Consumer experience preferences		Insight from similar sources to those above, around how consumers determine quality of product, whether they would prefer e.g. wild sourced or farmed, product from Africa or Asia, the elements they value in their purchase experience, etc. Examples include exclusivity, privacy, price competitiveness, trust in receiving an authentic product, etc.
15	Purchase pathway/behavioural journey		How consumers progress from one-off or occasional purchases of illegal wildlife products, to those more routine or habitual. Methods of collecting and compiling data would include in-depth ethnographic analysis and observation with a few representative test subjects with whom trust is built over time to acquire a more “natural”/honest insight.
16	Fads, styles and trends in the market		Social listening (monitoring specific social media channels for mentions of keywords, hashtags or other indicators associated with consumption of the wildlife product in question) and consumer forum data to understand which illegal wildlife products are more susceptible to ebbs and peaks in demand, and what factors drive those.

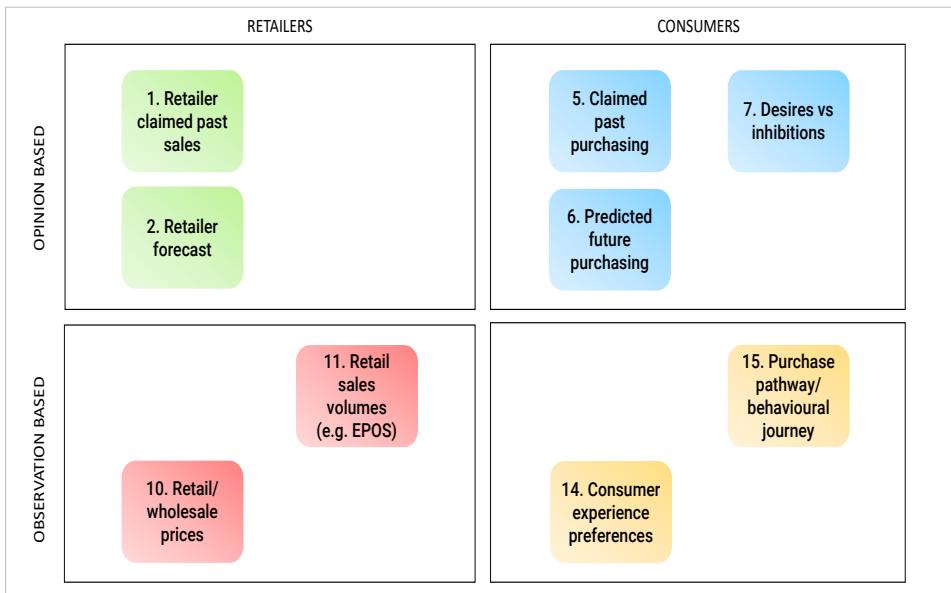


Fig. 4: Initial shortlist of the datapoints offering insight that is unique and potentially useful.

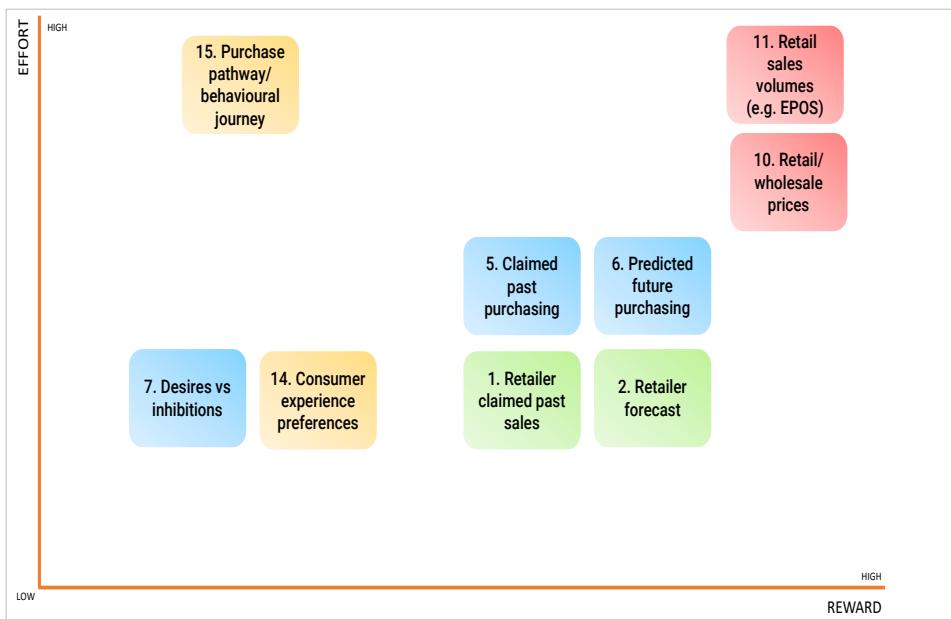


Fig. 5: Rough assessment of how much effort is involved in gathering the data and reward (i.e. how useful the insight arising might be).

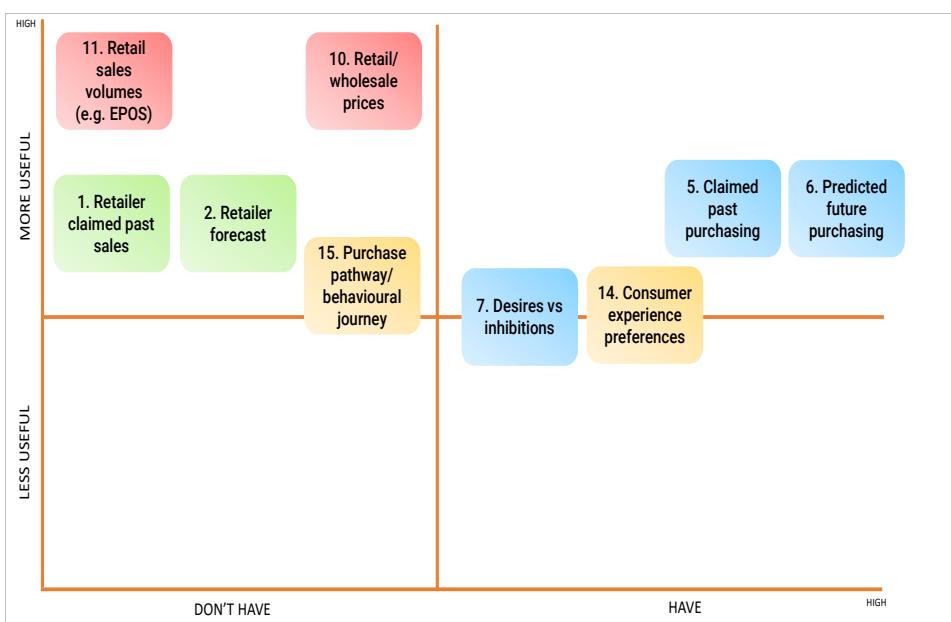


Fig. 6: Mapping data utility against current availability.

observation data. This reflects difficulties in directly observing the actual purchase of illegal wildlife products and emphasises the importance of social survey methods that can adequately ensure the veracity of the opinions retailers and consumers reveal.

2) Considering effort vs reward in gathering these data

Building on this initial “quality” assessment, Figure 5 then considers the effort involved in securing the data. Despite the aforementioned challenges, the process of gathering opinion data through social surveys is generally easier, but not necessarily less expensive, than the equivalent process for gathering observation data; this is due largely to the inherently clandestine nature of IWT and the difficulty of systematically observing trade transactions. The increasing predominance of IWT online suggests companies, including partners in the “Global Coalition to End Wildlife Trafficking Online”, might be able to help address this, in turn improving the return on effort invested to gain the retail observation data of wildlife product throughput/“flow” and price.

Any price data at all are helpful, although wholesale price may reflect more transitions in value along the trade route, rather than retail price which may fluctuate more with local factors. The consumer observation data associated with behavioural journey mapping are another clear outlier in Figure 5, being difficult to generate and less useful than other data in determining shifts in demand and equivalent dynamics. By comparison, claimed past purchase rates and predicted future intention by retailers and consumers cost markedly less effort for better returns.

3) Considering data needs and availability

Figure 6 finally considers the datasets that are held against those the previous two filters have indicated would provide the greatest reward or utility. Assessments of what is available are based on the authors’ direct experience, as well as data provided by the Social and Behaviour Change Community (using www.changewildlifeconsumers.org), and systematic reviews such as those in Verissimo and Wan, 2018. Five datapoints are clustered in this quadrant overall. The remaining four datapoints are all deemed available and relate to consumer data specifically. Two of these (claimed past purchasing and future predicted purchasing) are both desirable and opinion oriented. The final two (desires vs inhibitions to purchase, and consumer experience preferences) are a mix of opinion and observation data (respectively) but straddle the divide between data desired and undesired. This reflects the analysis in Figure 5, where these two datasets seemed to show the least “reward” for the effort involved.

ESTABLISHING PRIORITIES

Based on the preceding observations, four datapoints emerge as potentially having the greatest utility. Two are consumer and opinion focused (claimed past and future purchase intention); and another two are retailer and

observation focused (retail sales volumes/trends in flows and price). The two consumer opinion-based indicators, unsurprisingly in light of preceding commentary, are judged to require less effort and to have better existing data availability than the retail-based indicators. However the retail observation indicators offer a premium in terms of potential analytical reward.

Beyond these four priorities, the two retail opinion-based indicators of claimed past and predicted future sales are judged to offer lower reward and worse existing data availability. The consumer opinion indicators of “desires vs inhibitions” are judged to have quite different levels of required effort, but overall lower reward and limited data availability.

The result of this analyses therefore suggests that of the original 16 datapoints covering retailer and consumer actions and perspectives in wildlife end markets, the following offer the greatest utility and potential return on investment:

- **Consumer opinion indicators:**
- 5. **Claimed past purchasing**
- 6. **Predicted future purchasing**

- **Retail observation indicators:**
- 10. **Wholesale/retail price**
- 11. **Retail sales volumes**

In light of this finding, the paper next explores case studies in end-markets for non-wildlife products, to discern how these datapoints—summarised hereafter as consumer desire, product flow and price—can provide insight into demand dynamics and support DR impact and other types of evaluation in end markets.

DATAPOLYNS AND DIAMONDS

Like some other precious stones (such as jade), diamonds can provide a useful proxy for some wildlife products being consumed for similar motivations. Jewellery containing diamonds is bought for tradition (in engagement/wedding rings), auspiciousness, financial and aesthetic value, art, auction, collection, and investment, or simply as an overt display of wealth or status. These motivations are also true for those buying red corals or elephant ivory earrings, pendants, bracelets, and bangles. In research into Chinese ivory buyers conducted in 2019 by Globescan, 24% of all social survey respondents identified diamonds as a “suitable alternative to ivory products”, whilst at the same time eliminating mammoth ivory despite its structural and aesthetic similarities (Globescan, 2019).

Although the diamond industry value chain is more straightforward than many for wildlife commodities being vertically integrated, useful insights arise from this corollary of motivations as it is one of the most heavily analysed chains globally due to its economic significance yet vulnerability to market volatility. Over the past 50 years various psychosocial, macroeconomic, and geopolitical shocks have either disrupted, diluted, or

diverted consumers' discretionary spending on diamonds. Ethical concerns over human rights abuses in the supply chain and desire to avoid so called "blood diamonds," have also driven substantial changes to mining industry practices and "pipeline" transparency. Buyer desire for "conflict-free" diamonds has stimulated a market for lab-grown synthetic products (analogous to what has been tried with synthetic rhino horn products), which after a decade long development period are now finally starting to compete with mined "natural" products on price—last year, almost 20% of polished diamonds purchased globally had been grown in a Chinese or Indian lab.

The Antwerp World Diamond Centre (AWDC) commissioned Bain & Company to collaborate with them in producing a "Global Diamond Industry" report for 2019. This reinforced the central role that data for consumer desire, product flow and price play in characterising insight and "impact" in vibrant end-markets for this non-wildlife commodity. For example:

"Near record-high rough diamond production in the beginning of 2019 was followed by lower-than expected demand for polished diamonds, causing a ripple effect through the supply chain. The softer demand for polished diamonds was driven by two major factors: geopolitical and macroeconomic tension lowered consumer confidence and thus demand, and an increase in e-commerce created efficiencies in the supply chain that decreased the need for inventory on hand ... softer demand for polished diamonds led to a 3% drop in polished prices and is expected to lead to 10% to 15% lower revenues for midstream players. The slowdown resulted in some of the lowest profit margins experienced in years, as well as high inventory levels, which have been accumulating since 2017."

Of particular note in Bain's comprehensive analysis is the clarity of the relationship between fluctuations in consumer demand; the knock-on effects to the volume of diamonds held by "mid-stream" actors as inventory or flowing from producers through the pipeline to retailers; and volume or price adaptation strategies made by wholesalers/brand managers to protect profit margins.

Per Figure 7: Bain identified a 2% reduction in consumer demand for diamonds globally in 2019, linked primarily to changes in the two main markets of China and the US. Reduced consumer confidence and this "softening of demand" was attributed to a range of psychosocial and geopolitical factors, including increased concern about social and environmental issues and reduced tourism by Chinese consumers. This led to a reduction in luxury product spending, exacerbated by the US-China trade war in which a 15% tariff had been applied to all Chinese jewellery imported into the US.

Consequent adaptations by value chain actors featured technological innovation to adjust for social and environmental factors, and blockchain modelling to increase traceability. Producers also reduced the

flow of diamonds into the market by 25%, while rough diamond prices fell by 7%, and by 3% for their polished equivalents. Mining companies applied a "volume rather than price" strategy, and either withheld supply/stockpiled raw materials or reduced resource extraction.

Of additional interest in this review was coverage of the most catastrophic economic "crises" punctuating diamond trading during the past 50 years. Per Figure 8, insight and impacts were once again largely characterised through a focus on consumer desire, product flow and price. The 2008/9 global financial crisis was illustrative, described as causing a 10% drop in consumer demand, in turn catalysing a 13% drop in rough diamond prices and 2% drop in the price of their polished equivalents. Producers subsequently reduced end-market flow by 50% and manufacturing by 25%. Within 6 months prices started to recover and within 2 years these restored to pre-crisis levels.

While this synthesis of Bain's expansive study is relatively superficial, it reinforces the insight available through a VCA focused on the four datapoints emerging as priorities from the 2x2 analyses—those around consumer past purchase rates, predicted future intention, product flow and price. As data in these domains are clearly tightly woven, easily quantifiable and causal in this legal trade example, it suggests an equivalent effort should be undertaken to triangulate the same data in end-markets for illegal trade e.g. in illegal wildlife products. Doing so could significantly enhance understanding around consumer and retailer actions and perspectives, and boost efforts to identify the factors influencing a safe, sustainable, and traceable supply of wildlife products. The impact DR initiatives can have in influencing those factors could also be revealed. To explore further how, this paper turns next to an illicit commodity: cocaine.

COCAINE COMMODITY CHAINS

According to the 2017 World Drug Report (WDR: UNODC, 2017), more than 5% of the global population aged 15–64 consumed a narcotic in 2015. Drugs represent the largest illicit commodity market globally, worth between USD426–652 billion in 2014 (GFI, 2017)—about one-third of the total retail value of all 11 transnational crimes studied. Cocaine was then the second most trafficked drug (after cannabis and before opiates), but this was prior to a 25% increase in production recorded in 2015/6, which took total output to 1,976 tonnes of pure product. Coca source countries are concentrated in South America, but end-markets are evident everywhere.

As the GFI for 2017 highlights: "*Transnational crime is a business, and business is very good. Money is the primary motivation for these illegal activities. The revenues generated from the 11 crimes covered in this report—estimated between USD1.6–2.2 trillion per year—not only line the pockets of the perpetrators but also finance violence, corruption, and other abuses.*

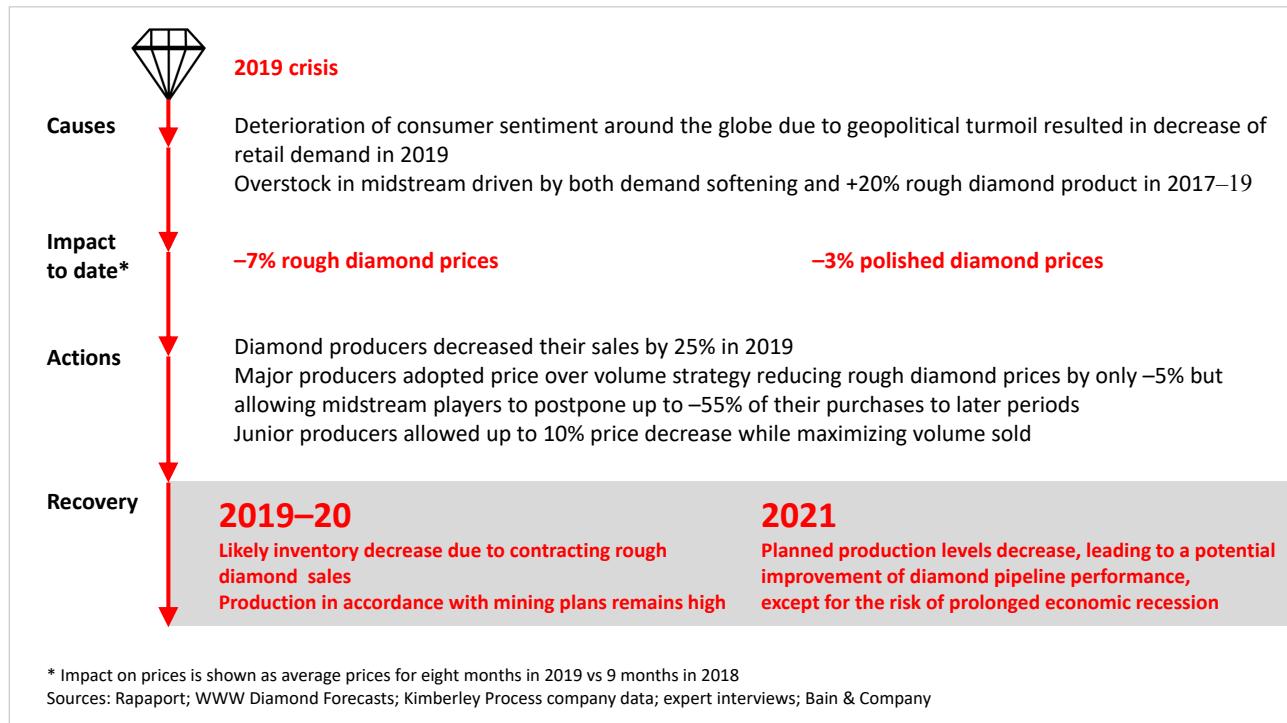


Fig. 7: Graphic Illustrating Bain & Company's Diamond 2019 Value Chain Analysis, the Relationship Between Demand Dynamics and Datapoints in End Markets. Source: Used with permission from Bain & Company, 2019: <https://www.bain.com/insights/global-diamond-industry-report-2019/>

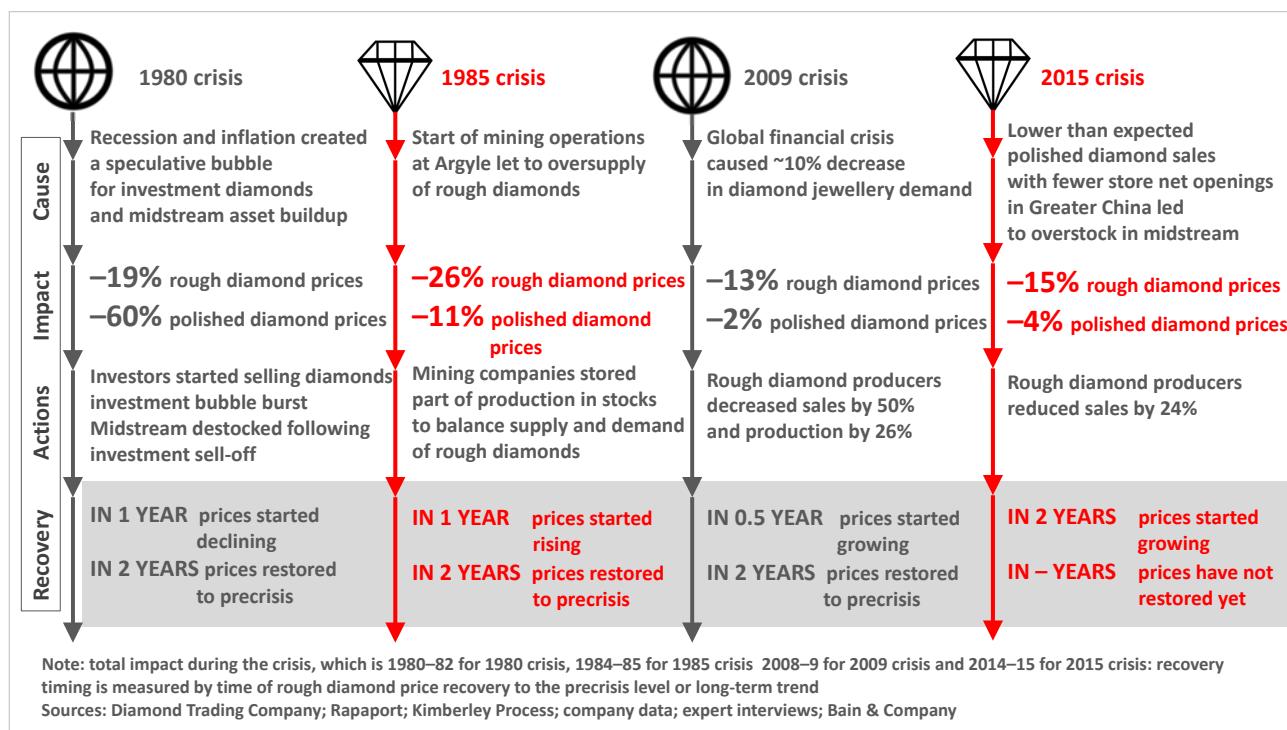


Fig. 8: Graphic Illustrating Bain & Company's Diamond Historic Value Chain Analysis, the Relationship Between Demand Dynamics and Datapoints in End Markets. Source: Used with permission from Bain & Company, 2019: <https://www.bain.com/insights/global-diamond-industry-report-2019/>

These crimes undermine local and national economies, destroy the environment, and jeopardize the health and wellbeing of the public. Transnational crime will continue to grow until the paradigm of high profits and low risks is challenged.”

In the same manner that situational crime prevention models are shaping much current counter-wildlife trafficking effort, efforts to reduce the rewards criminals perceive for engaging in cocaine smuggling, also of high fiscal return for low risk, are a core strategy for tackling this pernicious trade harming 35 million people each year (UNODC, 2019). It is thus important to consider what is known of consumer desire, product flow and price for cocaine and how data in these domains are gathered.

For the past two decades cocaine “buyer desire” and data for claimed past/future predicted purchase, has been gathered as part of the annual “Global Drug Survey” (GDS). This monumental piece of research is conducted by an independent company providing data for the WDR. In 2015, the last year for which data are available at no cost, GDS’s social survey was translated into 10 languages and distributed in 30 countries, attaining a sample size of more than 100,000 people. Unsurprisingly, it is the world’s largest study on drug use and users. Consumer opinion data are gathered anonymously online for a wide range of direct and related topics.

Retail observation data are, by contrast, much harder to attain. Caulkins *et al.*, 2016 is illuminating:

“No level of the drug supply chain is easy to study, but there is ongoing data collection about users (e.g., from household surveys and studies of treatment populations) and production (e.g., from satellite imagery). Retailing can be studied by asking users to describe their purchases or by interviewing retailers directly; the nature of their trade requires them to be fairly visible.”

Researchers from the United Nations Interrogational Crime and Justice Research Institute (UNICJRI) showed in this paper how they adapted their efforts accordingly, when they attempted to model end-markets and transactions between those selling cocaine in Italy using opinion rather than observation data. While limitations arising were acknowledged, valuable insights were nevertheless identified for drug demand and distribution dynamics. Semi-structured interviews conducted with 116 incarcerated volunteers identified how much cocaine they bought to sell, how frequently and at roughly what cost.

A similar approach was evident in Johnson and Golub, 2007, who conducted primarily ethnographic studies and street surveys with those selling and buying heroin, crack and marijuana in New York City, to measure accurately the “Behavioral and Economic Dimensions of Consumption, Prices, and Markets for Illegal Drugs.”

ADAPTED APPROACHES

In light of these adaptations in other illicit commodity markets therefore, should a similar approach be adopted in end markets for harmful wildlife trade? Retailer opinion data already featured in four of the original 16 end-market datapoints, but as the results for sales volume specifically were deemed less reliable, they were discarded in the “quality” oriented 2x2 assessment (Figure 4). Offender surveys are however already being conducted with “producers” [poachers] in wildlife value chains (Moneron *et al.*, 2020)—can similar techniques be applied at the “demand” end as well?

As discussed in the diamond industry case study, it would be prudent to ensure if such opinion data are gathered, they are triangulated against those acquired using objectively verifiable methods. The effort vs reward ratios underpinning Figure 5 emphasise the potential for the “Global Coalition to End Wildlife Trafficking Online” to help meet this ambition. The precision tracking and targeting capabilities of all 34 global e- and m-commerce and social media companies is unparalleled and could significantly improve the return on effort invested. Further discussion is thus required to explore this accordingly.

Overall, the cocaine case study provides useful pointers as to how the four datapoints prioritised in the three 2x2 analyses could actually be gathered, considering the clandestine nature of some wildlife commodity end-markets. A final point worth emphasising however, is from a study on “Understanding Drug Markets and How to Influence Them” (Wilson and Stevens, 2007). This reinforces the need to triangulate behavioural and market insight, segueing to the next section:

“This review of studies examining the behaviour of drug dealers shows that they do (sometimes unconsciously) adjust their operations in response to law enforcement strategies and actions, but to a large degree continue to pursue the same principles as any legitimate commodity business—setting of margins, and management of risk. Much greater analysis and understanding of market behaviour is needed if the international law enforcement community is to increase its effectiveness in reducing the harms associated with the illegal market in controlled drugs.”

EVOLUTIONS IN EVALUATING END-MARKETS?

The 2x2 analyses and legal and illegal commodity case studies have illustrated the potential for applying VCA to help improve insight and impact assessments in wildlife product end-markets. The VCA datapoints assessed [by the authors] as the most desirable, viable and feasible were clarified as those focused on consumer desire, product flow and price. The means of acquiring data in these domains was identified as involving opinion- and observation-based measures, but specifically which methods would be involved in these measures requires additional expert, stakeholder and donor engagement and discussion.

Table 2. Potential methods to identify wildlife end market consumer desire, product flow and price.

Datapoint	Potential Measures and Method
Consumer desire (self-reported past purchase and predicted future intention) (opinion)	Ethnographic techniques Sensitive questioning techniques in social surveys Identification of [legal] proxies or “equivalent” products Private sector research techniques e.g. Brand attachment & Unmatched count technique (UCT) Social listening and e.g. Google search string trend data
Product throughput (observation)	Specifically observing transactions in market monitoring Acquiring any equivalent to EPOS (Electronic Point of Sale) data Analysing CCTV footage to identify products people walk out of shops with (only available in relation to physical markets) Engaging Global Coalition to End Wildlife Trafficking Online members in identifying solutions through big data analytics
Price (wholesale if possible) (observation)	Ensuring data are gathered systematically as a complement to online market monitoring, and tracked in key indicator markets.

As recognised earlier, the shortcomings of current consumer opinion-focused social survey methods are well documented. Some of the approaches available to help address these shortcomings were identified as including sensitive questioning techniques, the use of proxies and randomised controlled trials (RCTs). The case studies revealed however that while adequate methods in this domain are certainly critical, consumer opinion data alone provide a relatively simplistic snapshot of what are inevitably complex, multi-faceted and ever-changing demand dynamics and trade environments.

To adjust for this, both case studies triangulated data for consumer desire against those for product throughput and price. In the illegal commodity case study specifically, the challenges and adaptations required to gain robust insight in these latter two fields was clear. Table 2 thus aims to provide some initial ideas of methods that might be adopted across all datapoints in end markets for harmful wildlife trade.

Building on this, an additional opportunity exists to evolve evaluations in wildlife end markets by using series data juxtaposing fluctuations in consumer desire, product flow and price, over time. Based on the VCAs studied so far, it is postulated this could help crystallise any statistical relationships or significance between correlative elements, whilst also discerning demand outliers. In turn this could help test the veracity of contributory elements; that is, identify whether consumer opinion data gathered through social surveys for claimed past/predicted future purchasing (using appropriate methods), reconcile adequately or within expected parameters, to retail observation data around product flow/price.

The barriers to delivering this are admittedly substantial. Illustrative are efforts to understand demand dynamics in China’s domestic market for elephant ivory since their landmark December 2017 ban. Despite being one of the most studied wildlife end-markets, significant gaps still exist in the evidence for two of the preferred four datapoints—consumer opinion data have been gathered annually to assess ban impact on claimed

past/future predicted purchasing, but few systematic assessments have been conducted for companion data on retail observations around ivory flow (rather than seizures or availability/offers for sale) or price.

The reasons for this are twofold: First, how challenging it is to gather retail observation data for illegal wildlife end-markets at all (as highlighted above). Second, how willing those implementing DR initiatives are to invest the time, energy and resources required to gather such data. To some extent this circles back to the realities that the conservation community is still building the skillset—and mindset—required to gather behavioural insight, target communications accurately and adequately measure their impact. However, as both the diamond and cocaine case studies have reinforced, successfully addressing the shortfalls and excoriating commentary around DR impact measurement will require urgent efforts to address these evidence gaps and data shortfalls. This must occur if the hard choices that have to be made about the application of finite funding and effort across interventions to reduce harmful wildlife trade are to be adequately, accurately and appropriately informed.

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