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Crime script analysis of the illegal sales of spiny-tailed lizards on YouTube

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Abstract

The oil derived from the spiny-tailed lizards (STLs) is illegally sold as an alternative medicinal aphrodisiac that is claimed to cure male sexual dysfunction in addition to other bodily ailments. The high demand generated from this illegal trade is rapidly depleting the species from its natural habitat. The goal of this research is to uncover the process of cyber-enabled illegal trade in STLs. To achieve this goal, this research uses data from a total of 127 videos and 4608 comments associated with these videos and the crime script analysis technique to outline and detail the steps taken to poach, prepare, and sell oil derived from spiny-tailed lizards (STL) and other protected wild animals on YouTube. The results indicate that sellers, operating primarily from Pakistan, employ a variety of techniques to attract buyers, such as preparing the oil by dissecting alive STL while being captured in the video to show the authenticity of the product. In addition to YouTube, sellers use other social media platforms, including WhatsApp, Facebook, Instagram, and Twitter/X, to communicate with potential buyers and to advertise their products. These products are shipped around the world using international courier services, such as DHL and TCS, with primary markets in South Asia and the Middle East. The sellers accept money transactions from Western Union, MoneyGram, and PayPal. They also seem to operate without any major restrictions from local authorities or host social media platforms. Based on these findings, this research proposed various recommendations for policy and practice.

Keywords Sanda oil, Spiny-tailed lizard, Crime script analysis, Cyber enabled illegal wildlife trade, YouTube

Introduction

Southwest Asia, the Arabian Peninsula, and the African Sahara are home to 20 different species of spiny-tailed lizards (STL) (Dutta & Jhala, 2007). The majority of these lizards belong to the *Uromastix* genus, while three species fall under the *Saara* genus, including the

Indian spiny-tailed lizard. Unfortunately, some of these species are facing extinction, with five of these classified as 'Near Threatened', and three as 'Vulnerable' by the International Union for the Conservation of Nature. The Convention on the international Trade in Endangered Species (CITES) has listed the entire *Uromastix* genus in Appendix. Some of the serious threats faced by the genus are climate change; illegal poaching; and trade for meat, medicine, and the pet industry (Gondhali & Petrossian, 2023). spiny-tailed lizards are especially susceptible to adverse climate change effects due to their specific habitat preferences and limited mobility: up to 75% of these species are at risk due to this threat (Kechnebbou et al., 2021). Habitat loss, poaching, and illegal trade have added additional pressures on the species and contributed to their population declines (Ali et al., 2020),

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highlighting the urgent need for increased conservation efforts to protect the species (Khalil et al., 2022).

Eating STL meat and the use of their oil are common practices in some countries of the Arabian Peninsula and South Asia. For example, for many years, spiny-tailed lizards, known locally as 'Dhab', has been consumed in South Asia and is considered 'Halal' in accordance with Islamic tradition (Sutriyono, 2020). There is also significant demand for their oil that has been traditionally used to treat various body ailments, including muscular and joint pain, blood circulation, and male sexual dysfunctions. These practices stimulate the demand for its oil not only within the local market but also on a global scale. Despite regional and international regulations aiming to protect the species, illegal poaching remains rampant in Pakistan (Gondhali & Petrossian, 2023).

Sellers of STL oil in South Asia have been using social media as a platform to reach a wide customer base and generate more demand through videos that claim the oil's alleged medicinal properties. Gondhali and Petrossian (2023) investigated the operations of these sellers who used YouTube to further the illegal trade of STL oil via this online platform. Their study revealed some important broader insights into the trade dynamics and patterns. Drawing from these insights, the current research engages in more in-depth investigation into the key players and their roles, the different stages of the species removal from the wild, the trade in STL oil (which involve both offline and online aspects), and the patterns of interaction with sellers. In order to gain this critical information on the procedures involved in the illegal trade in spiny-tailed lizards using YouTube, this research employs crime script analysis.

Theoretical framework: crime script analysis

Using crime script analysis to examine criminal activity is becoming an increasingly popular method in both research and practice (Chainey & Berbotto, 2022). This analytical technique is based on the theoretical underpinnings of the rational choice perspective (Cornish & Clarke, 1986), which emphasizes the importance of considering offender decision-making at each phase of the crime, where offenders make decisions when presented with the opportunity to commit a crime. These decisions involve not only estimating the costs and benefits of crime but also assessing the circumstances, opportunities, and situations, as well as strains (e.g. time, skill, accessibility) within which they operate.

In essence, if rational decision-making is at the core of offending, then, according to Cornish (1994), one can express the commission of a crime in a set of steps and procedures involved in constructing the crime from

the point of preparation to the point of completion. Carefully scrutinizing the sequential steps involved in criminal activity through this lens allows not only for the identification of specific anchor points of intervention at each phase of the crime continuum, but also the design of tailored crime prevention efforts that can be implemented at each phase. Understanding the process involved in committing a crime and using proven crime prevention strategies will lead to building lasting interventions (Clarke, 1980).

The crime 'event', or the actual act that is criminalized, is only one of the 'events' in the process leading to and after that 'event' (Cornish, 1994). The crime 'event' requires planning, which may include the acquisition of necessary tools, the selection of specific locations and targets, and a multitude of other decisions that need to be made before the actual criminal act. Similarly, once the crime is committed, there is a series of post-crime actions that need to be taken to complete this act, such as taking measures to safeguard oneself from getting caught, disposing of the evidence, disposing of a stolen/illegal property, and so on (Petrossian & Pezzella, 2018). In other words, careful and logical steps need to be taken before, during, and after the crime 'event' to ensure the successful completion of it. Crime script analysis can be used to capture these logical, sequential steps that need to be taken by offenders to prepare for, undertake, and complete a crime (Chainey & Berbotto, 2022), as well as to devise intervention entry points.

Crime scripts require the descriptions of the actual acts undertaken by offenders, and these acts can be organized into scenes that involve the offenders, facilitators, and the settings where these acts take place (Chainey & Berbotto, 2022). The original crime script proposed by Cornish (1994) involved seven sequential stages that were organized in relation to "facets"¹ and choice-structuring conditions required for a criminal activity to unfold. These included preparation (e.g. getting necessary tools, selecting co-offenders), entry (e.g. entering setting), pre-condition (i.e. enabling conditions), initiation (e.g. locating or selecting the crime target), actualization (multiple functions), doing (the act of crime), post-condition (i.e. enabling conditions for the successful completion of the crime, such as leaving the crime scene undetected), and exit (e.g. completion of the crime, such as disposing of the stolen item) (Cornish, 1994).

Until 2010, there was limited use of crime script analysis in both research and practice, and scholars argued that this is due to the original proposed scripting methods being complex, difficult to validate, and lacking clarity (e.g. Basamanowicz & Bouchard, 2011; Sytsma

¹ Cornish (1994, p. 173) defines "facets" as "alternative methods of carrying out the action particular to each scene".

& Piza, 2018). To improve the practical utility of the crime script analysis tool, Tompson and Chainey (2011) introduced a new approach that retained the core conceptual principles of Cornish's originally proposed method but was simple in both application and practice. The researchers proposed a method of scripting that focused on the key stages involved in committing a crime, rather than the "facets" defined by Cornish (1994). They identified four core stages of a crime: preparation, pre-activity, activity, and post-activity. This research uses these four core stages to create a script for the illegal sale of spiny-tailed lizards on YouTube.

The application of crime script analysis to crimes against wildlife

While crime script analysis has been primarily applied to study traditional crime types, such as auto theft (e.g. Tremblay et al., 2001), sex offending (e.g. Leclerk et al., 2011), insider trade and fraud (Willison & Siponen, 2009), and arms trafficking (Chainey & Guererro, 2019), its applications to crimes against wildlife have grown significantly in recent years. The foundational study conducted by Moreto & Clarke (2013) on crime script analysis of transnational illegal markets in endangered species lays important groundwork for the adaptation of crime script analysis to study wildlife crimes and trade. This framework allows researchers to identify key actors involved in wildlife crimes, as well as the trade routes, the targeted species, and the derived products. Crime script analysis has since then seen growth in its application to various crimes against wild animals and plants, examples of which include internet-mediated wild plant trafficking (Lavorgna, 2014, 2015); illegal ivory markets (Moreto & Lemieux, 2015); the illegal removal and landing of fish, and seafood fraud (Petrossian & Pezzella, 2018); illegal harvesting of live corals (Sosnowski et al., 2020); jaguar paste production (Lemieux & Bruschi, 2019); rhino poaching, as well as rhino horn and live pet trafficking (van Doormaal et al., 2018; Viollaz et al., 2018); and amur tiger poaching (Skidmore, 2021).

A more recent study conducted by Chainey & Berbotto (2022) explored the applications of Open-Source Intelligence (OSINT) and proposed a structured framework for using open-source data for a crime script analysis to study organized crime. Such data on the internet is a great source of intelligence that can inform policy and practice. Therefore, this study relies on data collected from publicly accessible and non-proprietary online sources to build the proposed crime scripts.

In the past, no studies have taken account of crime script analysis to study illegal wildlife trade on the surface web using open-sourced data. Our research is, therefore, the first to apply such techniques to study the illegal

wildlife trade of spiny-tailed lizards over YouTube, relying on the data extruded primarily from YouTube videos and associated comments from the users to build detailed crime scripts. These are discussed in more detail in the following section.

Methods

Data source

The preliminary steps of this study involved a comprehensive scanning of literature, including incident reports, online news, and published articles related to the poaching of spiny-tailed lizards. Searches were predominantly conducted through 'Google News' using the following keywords: 'spiny-tailed lizard poaching', and 'spiny-tailed lizard hunting'. The review of the extensive literature suggested that STL poaching was prevalent in the Indian subcontinent (India-Pakistan), the Arab countries (Saudi Arabia and UAE), and Indonesia (APP, 2018; Ghanghar, 2020; Mandhro, 2021; Rimal, 2022; TNN, 2020). This review also helped us identify the search terms used in local languages to locate products derived from STL on online marketplaces.

To search for videos associated with spiny-tailed lizard on YouTube (www.YouTube.com), we generated the search keywords and terms in Hindi, Urdu (*Sanda ka tail*), Arabic (*Dhab oil*), and English (*Sanda oil*), and these included: *Sanda* (common name for STL in India and Pakistan); *Saande ka tail* (STL oil); *Sanda oil*; *spiny-tailed lizard oil*; *Dabb oil* and *Dabb lizard* (*Dabb* is common name for STL in Arabic); and *ubat dhab* and *dhab sinai* (which means medicine of *Uromastyx* spp. in the Malay language).

Video selection criteria and procedures

Criteria

For the purpose of the analysis, the final YouTube videos were selected based on the following inclusion criteria:

- The videos must describe a process of capturing and fat extracting. The aforementioned process can provide insights into the *modus operandi* of the illegal trade.
- The videos explicitly offer *Uromastyx* spp.-based products for sale. This selling process may reveal invaluable information on the nature of the trade.
- The videos are spoken either in Hindi or Urdu due to linguistic limitations.

Based on these selection criteria, we identified three (3) YouTube channels: *Original Sanda Oil*, *House of Herbal*, and *Yaseen Super Power Tilla Center*, containing 127 videos that shared information on medicinal products derived from *Uromastyx* spp. Based on the information

shared by the video makers, such as the narration language in videos, we were able to identify that these YouTube channels were operated from Pakistan.

Procedures

Video transcription All 127 videos were transcribed and translated into English for subsequent analyses. All videos were scrutinized individually and coded manually. We analyzed both verbal and visual content from the videos. The verbal content provided information that a video maker willingly disclosed, such as product making, benefits, and delivery. On the other hand, visual content included dissecting, the condition of the animals shown in the video, and spatial and temporal attributes.

Viewer comment extraction To gather more detailed information regarding the sale process, as well as the date, time, and likes for further analysis, comments of selected videos were extracted using the *Comment Picker*.² Viewers often disclosed information about their geographic location, either by overtly asking for product delivery or availability in a particular city or country, or by providing their phone number to be contacted. The comments were predominantly written in English and regional languages, such as Hindi and Urdu. One of the authors, a native speaker who understands both regional languages, assisted in the translation of these comments. However, a small proportion of the comments were typed in Arabic, Punjabi, and Gujarati. Given the basic nature of the comments, we used 'Google Translate' to convert them into English. After translations, additional information from all 4608 comments were also incorporated into the crime script.

Building the crime scripts

The process of creating a crime script involved three stages: creating the template, populating data, and consolidating the information from all videos and comments into a master script. Using Tompson and Chainey's (2011) simplified crime script template, the team used the translated transcripts, comments, and visual contents to populate the script. Data for each phase was coded using guiding questions provided in Table 1.

Results

In our initial exploration of the collected video data, we examined the YouTube videos' views and likes across channels, months, and seasons and revealed notable trends (see [Appendix](#) or comprehensive details on

descriptive statistics by channel, month, and season). April emerged as the month with the highest views and likes, followed by October. Seasonally, the spring season exhibited notable engagement. The channel "Yaseen Super Power Tilla Center" garnered significant views and likes, particularly during spring. The top ten most viewed videos were predominantly from the channel "Yaseen Super Power Tilla Center," with a distinct seasonal pattern that showed a preference for uploads during the spring and summer seasons. On the other hand, the channel "Original Sanda Oil" uploaded the most videos but garnered fewer views and likes compared to others. Overall, these descriptive statistics provided crucial insights into viewer trends, engagement metrics, and seasonal variations in STL sales videos on YouTube, which set the stage for our further investigation of the video content using crime scripts.

Crime script analysis

In our analysis of the YouTube video content, we identified three major crime scripts describing the process of illegal sales of spiny-tailed lizards using information obtained from YouTube video content and their corresponding comments. Our analysis of the YouTube videos included not only the verbal content but also the visual content. Additionally, we examined the content in the comment sections of those videos to gather more information associated with the crime script steps. The three crime scripts depict the lizard poaching stage (Table 2), the lizard oil extraction stage (Table 3), and the lizard oil sale stage (Table 4), respectively. The section concludes with a summary of the sales pitches of spiny-tailed lizard oil on those YouTube channels (Table 5).

The process of spiny-tailed lizard poaching

Preparation and pre-activity stages

As illustrated in Table 2, the initiation of the spiny-tailed lizard poaching process requires several steps of preparation with the necessary tools and knowledge. The first step involves obtaining materials essential for constructing traps, which include strings and wood sticks. The preparation also involves gaining proficiency in knot tying and trap setting. Furthermore, a crucial aspect of the preparation involves acquiring knowledge on identifying the geographical areas where spiny-tailed lizards reside. Understanding the habitats of these lizards is vital for successful poaching. In conjunction with this, individuals involved in this process learn how to locate holes and burrows within the identified geographical area to target the specific species of spiny-tailed lizards.

The chosen location for lizard poaching is the grassy countryside of Pakistan, as shown in the YouTube videos, with hills and mountains visible in the distance.

² The Comment Picker is a platform of social media tools that allows users to export and download YouTube comments and related data in Excel or CSV format.

Table 1 A crime script analysis template and guiding questions to facilitate the process of populating the script

Stage	Steps and Options	Spatial	Temporal	People/actors
Phase: poaching				
<i>Preparation</i> Description of the planning and preparation that is required for the activity to occur	<ul style="list-style-type: none"> • What tools or equipment are acquired (if any) to capture the lizards? • Are lizards captured to fulfill orders from buyers? • How are locations for selecting lizards determined? • Are lizards from some geographical areas more valuable than others? • Is there a seasonal preference (time of year) or time of day preference for capturing the lizards? • What suppliers are used to obtain the necessary equipment or tools? • Are there co-offenders involved? • Is professional help required to carry out the poaching? 			
<i>Pre-activity</i> These are the actions taken to establish or awaits condition under which the crime can be committed	<ul style="list-style-type: none"> • Is extensive travel to poaching locations required? • Does it require setting traps to capture the lizards? • How are lizards transported once captured? • Are efforts made to evade detection by law enforcement or government? 			
<i>Activity</i> The action taken to fulfil the goal of the offender. Obviously, the poaching event has already taken place as soon as the animal is killed	<ul style="list-style-type: none"> • What can be said about this actual activity? • How are they captured and handled? 			
<i>Post-activity</i> Description of the activities that occur immediately after the activity itself, and that need to occur to exit the activity	<ul style="list-style-type: none"> • Are the lizards kept live or killed at once? • How are they handled before they are transported to the oil extraction location? • How are the lizards or fat sold? • What payment system(s) are used? • How do poachers communicate with purchasers? 			
Phase: oil production				
<i>Preparation</i> Description of the planning and preparation that is required for the activity to occur	<ul style="list-style-type: none"> • Are special tools required to extract the oil? If so, what are these and is there any indication about how these are acquired? • Are other ingredients acquired to be used in the process? • Are lizard oil products made to order for particular buyers? Or is a lizard oil supply made and producers attempt to sell their stock? • What type of location is needed for oil production? 			
<i>Pre-activity</i> These are the actions taken to establish or awaits condition under which the crime can be committed	<ul style="list-style-type: none"> • How complex is the production of the oil and what additional pre-activities are required to carry it out? • Are efforts made to evade detection by law enforcement or government? 			
<i>Activity</i> The action taken to fulfil the goal of the offender	<ul style="list-style-type: none"> • How is the oil extracted? • What is the lizard oil production process? • How much product is made at one time? • Do producers make efforts to avoid detection by law enforcement or government? 			
<i>Post-activity</i> Description of the activities that occur immediately after the activity itself, and that need to occur to exit the activity	<ul style="list-style-type: none"> • How is the oil stored? • Does it require special handling? How is it packaged? • What brand names and/or logos are used? • Where is packaged? • How are packaging materials obtained? • How is the packaging paid for? 			

The time of day specified for these preparatory activities is daylight, indicating the need for visibility and efficiency in trap setting. However, the choice of the time of year ranges from the winter, spring, and summer seasons. While one YouTube channel's poacher expressed the difficulty of finding lizards in the winter, another YouTube channel's poacher claimed that

lizards were more readily available in the winter and their fatty tissue was thicker during this season than in the summer. The selection of the time of year for lizard poaching is probably influenced by the geographical distinction between the northern and southern regions in Pakistan.

Table 1 (continued)

Stage	Steps and Options Spatial Temporal People/actors
<p>Phase: oil sale</p> <p><i>Preparation</i> Description of the planning and preparation that is required for the activity to occur</p>	<ul style="list-style-type: none"> • What steps are taken to prepare for the marketing of the product? (e.g., labels acquired, bottles?, online advertisements, recording of the promotional videos, etc.) • What animals or animal products are displayed—dead or alive? • What information is given about how lizards are obtained? • What lizard oil production process is demonstrated (if any)? • What lizard oil products are advertised/displayed? • What brand names/logos/packaging are displayed for product? • How much of the product(s) is displayed? • What benefits of the oil are being advertised/promised? • What country is the video made in? • What language(s) spoken? • What type of location where the video is recorded (outdoors, store, home?) • Who appears in the video? • How many individuals are in the video? (include roles and names, if any)
<p><i>Pre-activity</i> These are the actions taken to establish or awaits condition under which the crime can be committed</p>	<ul style="list-style-type: none"> • How do the vendors communicate with their potential buyers? • Are certain types of buyers targeted? • How active are they in responding to buyer comments/inquiries? • How openly does all this activity take place? • What platforms are used to sell products (e.g., Facebook, IG, etc.)? • Do sellers use Dark web sites or platforms? • Are sellers taking steps to evade detection by law enforcement or government?
<p><i>Activity</i> The action taken to fulfil the goal of the offender</p>	<ul style="list-style-type: none"> • How is the sale initiated? • Does the vendor talk about the easiness of payment (even if it to international buyers)? For example, do they talk about a PayPal account that can be used to pay, a direct bank transfer? • Any other discussion of a third-party vendor? • Do they also mention other sites (e.g., Etsy?) that the buyers can find their products on? • What is the price for advertised lizard oil product? • What payment platforms are used to sell products? • What communication methods are offered between seller and buyer? • What phone number, email address, or other contact info for the seller is supplied to potential buyers? • Are sellers offering other products besides lizard oil? • Do online sellers have physical stores to sell same products?
<p><i>Post-activity</i> Description of the activities that occur immediately after the activity itself, and that need to occur to exit the activity</p>	<ul style="list-style-type: none"> • How are the products shipped? • Do sellers make efforts to disguise contents of shipment? • Can products be returned? • Do buyers post reviews?

Activity and post-activity stages

The primary activity stage of spiny-tailed lizard poaching involves a series of careful and methodical steps to ensure a successful catch. The first action in this stage is

to check if the trap string is taut, ensuring its readiness for potential catches. If a lizard appears to be caught in the trap, the next steps include using a stick to dig out the hole where the lizard is ensnared and then carefully

Table 2 A crime script on the process of spiny-tailed lizard poaching

Stage	Steps and options	Spatial	Temporal	People/actors
Preparation	<ul style="list-style-type: none"> • Obtain materials for building traps (strings, wood sticks) • Learn how to tie knots and set traps • Learn how to identify geographical area where lizards live • Learn how to find holes/burrows where lizards live within that area 	Grassy countryside of Pakistan; hills/ mountains in distance		[Selected example] A male poacher arrives at the scene on a motorbike, and his license plate is visible in the video
Pre-activity	<ul style="list-style-type: none"> • Find where lizards live • Set traps 	Grassy countryside of Pakistan; hills/ mountains in distance	Time of day: Daylight Time of year: • Spring and Summer months in Pakistan • Fall and Winter months in Pakistan	[Selected example] A male poacher demonstrates making traps and lizards' habitat and mentioned using a helper to capture lizards
Activity	<ul style="list-style-type: none"> • Check if trap string is taut • If lizard appears to have been caught in trap, dig out hole with stick • Pull trapped lizard from its hole • Catch from 0 to 8 lizards in one day • Avoid lizard's claws and spikes on tail which can cut 	Grassy countryside of Pakistan; hills/ mountains in distance	Time of day: Daylight Time of year: • Spring and Summer months in Pakistan • Fall and Winter months in Pakistan	[Selected example] A male poacher demonstrates checking traps, catching lizards [Selected example] The face of a male poacher is shown with captured lizard of a different variety (no other information about his poaching methods)
Post-activity	<ul style="list-style-type: none"> • Place lizards in cloth or duffel bag for transport • Break backs or hipbones of lizards to disable them but keep them alive • Or keep lizards intact after capture until the time of fat extraction 	Grassy countryside of Pakistan; hills/ mountains in distance	Time of day: Daylight Time of year: • Spring and Summer months in Pakistan • Fall and Winter months in Pakistan	[Selected example] A male poacher demonstrates placing captured lizards in a cloth bag [Selected example] A lizard oil seller shows captured lizards in a duffel bag

Table 3 A crime script on the process of spiny-tailed lizard oil production

Stage	Steps and options	Spatial	Temporal	People/actors
Preparation	<ul style="list-style-type: none"> Order placed by customer for lizard oil or store owner determines oil supply needed for retail sales (dictates how many lizards needed to make required amount) Acquire spiny tailed lizards (sanda) Obtain necessary tools and supplies for oil production (specialized pot, kindling, stove, matches, knife (possibly Nakiri), spoon, bottles with stoppers/tops) 			<ul style="list-style-type: none"> One male individual appears to complete all steps Face of the male individual is visible Unknown if others involved in acquiring lizards, supplies or production space
Pre-activity	<ul style="list-style-type: none"> Slit open abdomen of dead lizards Slit abdomens of live lizards Identify male lizards Remove two fat deposits from each lizard One channel kills lizards first using Halal method Another channel does not demonstrate killing method 	<p>Outdoor space, possibly near home or business</p> <p>Indoor space, possibly home or business location</p> <p>Inside or outside retail store in Lahore, Pakistan</p>	<p>Generally daytime</p> <p>One video is at night time</p>	<ul style="list-style-type: none"> One male individual appears to complete all steps; unknown if others assist Face of the male individual is visible Possibly female individual cuts open lizard and removes fat
Activity	<ul style="list-style-type: none"> Light fire in stove with kindling and matches, or light burner on gas stove or canister Place fat deposits in pan Cook fat deposits in pan over fire (wood, gas or coal), stirring and breaking up chunks of fat organ, until oil forms from heating of fat Remove remaining chunks of fat organ from oil Cook adds small reddish-purple items from plastic bag to pot with fat glands before cooking Multiple sandas' fat tissues are cooked with tiger's fat tissue, turtle's fat tissue, fish fat tissue, black scorpions, cloves and mixture of herbs Dozens of fat deposits cooked in one large pan 	<p>Outdoor space, possibly near home or business</p> <p>Indoor space, possibly home or business location</p> <p>Inside or outside retail store in Lahore, Pakistan</p>	<p>Generally daytime</p> <p>One video is at night time</p>	<ul style="list-style-type: none"> One male individual appears to complete all steps; unknown if others involved in producing oil Face of the male individual is visible
Post-activity	<ul style="list-style-type: none"> Bottle oil while still hot and ship oil immediately (step implied by making of oil for specified customer) Other channels do not demonstrate or discuss bottling or shipping process Bottles have pre-printed labels with brand name "H.Y. Super Power" (earlier videos do not have branded bottles) 	<p>Outdoor space, possibly near home or business</p> <p>Indoor space, possibly home or business location</p> <p>Inside or outside retail store in Lahore, Pakistan</p>	<p>Generally daytime</p> <p>One video is at night time</p>	<ul style="list-style-type: none"> One male individual appears to complete bottling, at times with help of two other males and one female individual Unknown who ships bottles; no discussion or demonstration of shipping One male individual displays bottles of oil with printed brand name

Table 4 A crime script on the process of spiny-tailed lizard oil sales via YouTube

Stage	Steps and options	Spatial	Temporal	People/Actors
Preparation	<p>Online transaction preparation:</p> <ul style="list-style-type: none"> • Set up communications accounts (cellphone, WhatsApp) • Set up payment accounts: uses Moneygram, Western Union, and bank transfers; not all channels describe payment systems • Set up shipping accounts uses DHL for international shipping and Tranzum Courier Service (TCS) in Pakistan; not all channels describe shipping methods • Acquire shipping materials (foam, envelopes) <p>Retail transaction preparation:</p> <ul style="list-style-type: none"> • Establish retail store that allows walk-in customers to purchase sanda oil (buy or rent store space, set up displays, operate store during business hours) <p>Advertisement preparation:</p> <ul style="list-style-type: none"> • Create YouTube Channel with potential linked social media accounts (Facebook, Instagram, Twitter) • Acquire device with video filming capability (likely cellphone) • Plan what to film in video and how to film it (for example, demonstration of oil production to show oil is 100% pure sanda, or display of live sandas and discussion of sanda oil health benefits, or demonstration of sanda trapping, etc.) • Original Sanda Oil includes screenshots of DHL shipping info and texts with customers • Be mindful of YouTube policies that prohibit cutting live animals in videos • Blur images of bloody lizards • Live lizards cut open in videos • Plan for what will be said during video: sales pitches, anecdotal information, reminders to subscribe to the channel and share the video, how to contact sellers, how to make a purchase, delivery information • Assemble supplies needed for lizard oil production or other demonstration that will be filmed for video • Find suitable location for filming • Find someone to film the video • Film video • Edit video into advertisement; regularly display contact info and logos in bold letters and colors 	<p>Transaction and some steps of advertisement preparation: Location with reliable internet access</p> <p>Advertisement filming:</p> <ul style="list-style-type: none"> • Outdoor location, possibly near home or business • Poaching videos filmed outdoors in lizard habitat; other demonstration videos filmed indoors • Most videos filmed indoors in retail store; small number filmed outdoors showing oil production • All channels' videos presumably filmed in Pakistan 	<p>Time of day: Daylight for making of outdoor advertisement videos; Indoor videos could be any time of day</p> <p>Time of year: Video production may correspond with seasonal lizard poaching</p>	<ul style="list-style-type: none"> • One male individual demonstrates sanda's qualities and lizard oil production throughout advertisements, narrates video, and offers to be contacted regarding sales; face is seen • One male individual films the video; another male (possibly videographer) holds up bottles of oil to the camera; unknown if these individuals and/or others set up the accounts for transactions or participated in other preparation steps • One male individual narrates and appears in videos showing lizard poaching and oil production; second unknown individual likely films video • One male individual narrates and appears in videos discussing sandas, other animals and oil production. At least one other individual is visible assisting with taking videos and other tasks

Table 4 (continued)

Stage	Steps and options	Spatial	Temporal	People/Actors
Pre-activity	<ul style="list-style-type: none"> • Post advertisement to YouTube channel • Respond to questions in YouTube comments 	Location with reliable internet access; all videos presumably posted from Pakistan	Anytime of day or night with internet access	Video narration suggests the individuals appearing in the videos also participate in the posting process; unknown how many others also are involved
Activity	<ul style="list-style-type: none"> • Engage in sales process via cellphone and WhatsApp (take orders, explain payment options, get shipping info, etc.) • Engage in sales process with walk-in customers at retail store • Take payment in advance for international online oil orders via Moneygram, Western Union and bank transfers. • Accept cash-on-delivery orders in Pakistan • Keep anonymity of customers 	<ul style="list-style-type: none"> • Location with reliable internet access • Retail shop is selling various animal products • Shop is located in front of Sharda Station in Lahore, Pakistan 	Anytime of day or night with internet access	Video narration suggests the individuals appearing in the videos also participate in the sales process; unknown how many others also are involved
Post-Activity	<ul style="list-style-type: none"> • Package bottles in bubble wrap, cello tape, waterproof bag used for international shipping • Normal single bag used for shipping in Pakistan • Ship orders via DHL (international) and Tranzum Courier Service (TCS) (within Pakistan) (cash on delivery) • Supply documents for delivery abroad • Customers leave reviews in YouTube comments or via text to sellers • Sellers respond to customer reviews • Not all channels describe post-sale activities 	<ul style="list-style-type: none"> • Near shipping location for DHL and TCS services • Video and comments discuss shipping internationally to: USA, Canada, UK, Germany, Netherlands, Australia, Singapore, Malaysia, Nepal, UAE, Oman, Saudi Arabia, Kuwait, Qatar, Bangladesh, India (Mumbai, Amritsar, Punjab, Jammu Kashmir, Haryana, Patiala, and other locations) • Shipping within Pakistan (Islamabad, Karachi, Lahore, Rawalpindi, and other locations) • No shipping to Israel 	Times when DHL and TCS services are available to make outgoing shipments	Video narration suggests the male individual appearing in the videos participates in the shipping process; unknown how many others also are involved

Table 5 Sales Pitches of Spiny-Tailed Lizard Oil on YouTube Channels

Advertising strategies	Narratives
Purported medicinal benefits	<p><i>Male sexual function</i></p> <ul style="list-style-type: none"> • Increasing male prowess, erection • Aiding with weakness in the penis • Penis will appear longer, thicker, firmer, stronger and better in shape • Heals nerves in penis weakened by excessive use of the hands by youngsters these days • Excessive porn videos leads to masturbation which is bad for nerves and causes decrease in strength and firmness • Excessive porn videos leads to masturbation which is bad for nerves and causes muscle weakening/ decrease in strength and firmness, leads to problems when have to be married • Protects from poor timing issues due to nerves getting weaker from masturbation • Helps suicidal people whose failure is based on the lack of getting an erection • Protects from strains in relationships later in life • Men who use sanda oil for 6–7 months never fail in making love • Helps men make love in a respectful manner that the woman enjoys • Increases blood circulation in nerves and makes them stronger • Good for married and unmarried people up to age 60–70 (ages 18–65) • Younger men [ages 18–25, or under 30] should use sanda oil because it is very beneficial and has no side effects <p><i>General use</i></p> <ul style="list-style-type: none"> • People who don't have issues can use this oil as only has benefits, no side effects • Relieves joint and muscle pain • Relieves pain in backbone and joints • Positive/miraculous medical effect • Relieves various body aches, pains, weaknesses and illnesses • Strengthens back if you have it in the form of a curry • Refers to veins weakening, miracle medicine <p><i>Medication instructions</i></p> <ul style="list-style-type: none"> • Massage 5–6 drops before you go to sleep and wash it off in the morning • Use externally by massaging 3 drops on each side every day for 5–6 min and washing with lukewarm water in the morning • Massaging penis and balls with oil for 15–20 min for 6–7 days will lengthen and strengthen penis • Overuse of oil will result in a health hazard • For 60–80 year old men, mix oil with milk and drink for a week to showcase results • Massage oil where this pain and do not sit in front of the fan or air conditioner for 2 h • Effective results in 1–2 weeks • The effect of this product is not temporary, it is permanent
Quality of product	<p><i>Pure ingredient</i></p> <ul style="list-style-type: none"> • Original; 100%; pure original oil; no mixing • Need to use pure oil to get the benefits • Impure/mixed oil will not benefit you • Many things in market for these issues, but nothing better than pure sanda oil • There may be other videos...or medical professional saying different things, but I guarantee you that if you use this pure oil, you will see exceptional results <p><i>Fresh production, instant delivery and reasonable price</i></p> <ul style="list-style-type: none"> • We don't keep readymade oil • We will make oil over a video call to show the customer who ordered that it is fresh • Worldwide delivery; subscribe to our channel • Our price is not that high, difficult to export liquids but we have access to export, our product will reach you after being cleared by customs • Know how to ship liquids worldwide with proper documentation despite expense—we ship responsibly <p><i>Consumers' positive reviews</i></p> <ul style="list-style-type: none"> • Many satisfied and happy customers • Never been a complaint against us from 1000+ customers <p><i>Business responsibility</i></p> <ul style="list-style-type: none"> • Made before your eyes: only the best product • Guaranteed quality and results • Never commit fraud with customers • This is our livelihood, we have animals with us • Oil does not go bad • Been making sanda oil for 15 years

Table 5 (continued)

Advertising strategies	Narratives
Benefits of wild sandas/male sandas	<ul style="list-style-type: none"> • Male sanda oil more beneficial than female • Fresh male sandas just caught from the jungle • By seeing wild sandas being caught, you know it authentic oil • We are cutting living sandas to make the oil • Domesticated sandas not as potent as wild sandas • Sandas’ hipbones are broken so they do not run away • We use fresh, wild sandas, older animals have less fat tissue • Only wild sanda oil is original • Sandas are very strong, very fast speed, while it is running it is impossible to spot • Even after being cut apart for the fat, it stays alive for 4 h • Wild sandas are very strong • We have cut the animal and its head and it is still alive; • Sandas without their backs broken produce better oil—should not be tortured by breaking their backs—breaking their backs forces them to live off their fat deposits which diminishes the quality • Best quality oil comes from wild sandas without broken backs—this is real sanda oil, not fake oil that comes from diminished fat deposits after sandas backs are broken • Very hard work to find and catch wild sandas; sanda bite and claws can cause grave injury • Sandas are so powerful they can live for 3 to 4 years without food or water • Sanda lizard does not have an issue with someone breaking its back or neck, but you cannot break its legs or excretion area • Lizards are alive after breaking backs, killing animals is only useful if its death is useful to men • Lizards stay alive for 10 h of cutting its throat • Out of one animal you only get a little bit of oil • Lizards live in the desert and eat only grass and rainwater
Religious justifications	<ul style="list-style-type: none"> • “God’s present to humankind” • “Each ailment has a medicine, and God has made this natural medicine for this reason; keep us in your prayers” • “Due to God’s mercy that this particular layer of fatty tissue exists inside this animal” • Product is like a blessing from God • “This oil is a gift from God” • “Thank God for its existence and creation” • Muslims never cheat or mix, they are truthful and never lie • The Quran states that if a person mixes and sells fake goods, that person is not a Muslim • Allah has made this lizard and the world knows the importance and benefits of its oil
Sanda oil mixed with other animals, plants	Black cobra; Black scorpion; Tiger fat; Turtle fat; Fish fat; Can make oil from any animal

pulling the trapped lizard from its hiding hole. The outcome during this stage ranges from zero to eight lizards in a single day, likely depending on environmental factors and successful trapping techniques. An important aspect of the catch is the awareness of potential risks, particularly avoiding the lizard’s claws and spikes on its tail, which have the capability to cause cuts. The process of capturing spiny-tailed lizards highlights the hands-on and subtle aspects of poaching, emphasizing the need for both skill and caution in executing each step of the process.

Once the lizards are captured, the next step involves placing the captured lizards in a cloth or duffel bag for transport. Some poachers choose to break the backs or hip bones of the lizards in order to disable them while keeping them alive. This method may be employed as a means of immobilizing the lizards for easier transport or handling later. However, other poachers choose to maintain the lizards in their intact state after capture until the time of fat extraction. The contrasting approaches in this post-activity stage reflect different considerations

concerning the purported quality of lizard oil and its portability and handling convenience. In fact, one lizard oil seller on a particular YouTube channel lamented the post-capture methods of poachers who broke the backs of the lizards to restrain them and then sell them to others for oil production. The seller claimed that this method created inferior oil. This seller further advocated for not torturing lizards by breaking their backs. Interestingly, some viewers’ comments on various YouTube videos also asked sellers not to torture the lizards.

The process of spiny-tailed lizard oil production
Preparation stage

In the preparation stage of spiny-tailed lizard oil production, as illustrated in Table 3, the process begins with an order placed by a customer seeking lizard oil or the store owner determining the required oil supply for retail sales, thereby dictating the quantity of lizards needed to meet the specified amount. Subsequently, the essential step involves acquiring spiny-tailed lizards, commonly referred to as sandas. With the spiny-tailed

lizards captured, the production phase proceeds by obtaining the necessary tools and supplies tailored for oil extraction. The common oil extraction equipment includes a specialized pot, kindling for heating, a stove, matches, a knife (possibly a Nakiri), a spoon for stirring, and bottles with stoppers or tops for storing the finished oil.

Pre-activity and activity stages

When the demanded quantity of lizards is met and the equipment is ready, both dead and live lizards may be used to produce oil. The pre-activity steps include the identification of male lizards, precise slitting of their abdomens, and removal of two fat deposits from each lizard. Variability exists among channels, with one employing a Halal method for killing lizards before extraction, while another channel choosing not to demonstrate the killing method. Entering the core activity stage of oil production, the production process involves igniting a fire in a stove or lighting a gas burner, followed by placing fat deposits in a pan. The fat deposits are cooked over a fire, be it wood, gas, or coal, with continuous stirring to form oil. The remaining chunks of fat organs are removed. A range of ingredients, such as red mites, tiger's fat tissue, turtle's fat tissue, fish fat tissue, black scorpions, cloves, and a mixture of herbs, may be added to enhance its quantity or quality. Such preparations were referred to as 'Tilla' in the local language. They were promoted as cures for various ailments. Overall, the oil extraction steps can be completed by a single person.

Post-activity stage

The final steps of spiny-tailed lizard oil production after the oil has been extracted include oil bottling and packaging. The practice of bottling the oil while it is still hot and immediately shipping is implied as part of sellers' advertisement strategies, particularly for specific customer orders. However, not all channels within the spiny-tailed lizard oil business choose to showcase or discuss this bottling and shipping process. Notably, one YouTube channel demonstrates the bottles used for packaging, which are marked with pre-printed labels displaying the brand name "H.Y. Super Power." This indicates a more sophisticated branding strategy. Interestingly, in earlier videos of the production series, the use of branded bottles was not evident, suggesting a potential evolution or refinement in the business's packaging approach over time. This could also suggest that the actual profit they have made from sanda oil sales enables the advancement of marketing.

The process of spiny-tailed lizard oil sales via YouTube channels

Preparation stage

As illustrated in Table 4, the illegal sanda oil business launches its sales process by preparing for online and retail transactions and advertisements, which involves strategic organization of various aspects.

Firstly, in the preparation of online transactions, the business sets up communication channels through cell phone and WhatsApp, creates payment accounts utilizing Moneygram, Western Union, and bank transfers, and arranges shipping logistics with international couriers, such as DHL, and Tranzum Courier Service (TCS) for domestic shipments.³ Secondly, in the realm of retail transactions, the business takes steps to establish a physical retail store, ensuring it is equipped for walk-in customers interested in purchasing sanda oil. These steps may include buying or renting store space, setting up displays, and operating the store during business hours.

As for the marketing preparation, it starts with creating a YouTube channel linked to potential social media accounts, such as Facebook, Instagram, and Twitter, with video content primarily captured on a device with filming capability, likely a cell phone. The planned video content ranges from exhibiting lizard trapping methods, showcasing live lizards, demonstrating oil production, and emphasizing sanda oil's health benefits. Some of the business's YouTube channels adhere to YouTube violent or graphic content policies on animal abuse content, blurring images of bloody lizards and avoiding live animal cutting in videos. Overall, they carefully plan the video script, incorporating sales pitches, anecdotal information, subscription reminders, contact details, purchasing guidelines, and delivery information. The filming process involves assembling supplies for lizard oil production or other demonstrations, finding a suitable location, and securing someone to film the video. After filming, the video requires editing to transform it into an advertisement, with regular displays of contact information and logos in bold letters and colors.

Lastly, transactional and advertisement preparations require logistical considerations in terms of time and location. Choosing a business base with a reliable internet connection is essential for smooth transactions. Advertisements can be filmed in several locations

³ For example, a seller from one of the YouTube channels said in the video: "We are delivering our product worldwide. Whether you are from Pakistan or anywhere else, we will deliver you our best quality product. In Pakistan, it is coming through TCS and in other parts of the world through DHL courier service." (Audio transcript from Video #3). Another example was a potential buyer who left a comment below one of the STL oil sales videos, asking: "Brother, I want it, can I get it? Please make a WhatsApp call in Ludinya 8*****2" (Comment left under Video #96).

at different times. For example, poaching videos of lizards in their natural habitat are preferred in outdoor locations during daylight hours. Videos featuring sanda oil and related activities, on the other hand, offer more flexibility on time and place: while most of them are filmed in the retail store at any time of the day, few videos are purposefully produced outdoors, especially when promoting fresh oil production. In general, all channels' videos are likely shot in Pakistan, reflecting a localized focus of this sanda oil business.

Pre-activity and activity stages

Once all transactional and advertisement preparations have been finalized, the sanda oil business proceeds with its operations, commencing with pre-activity tasks that are mainly focused on the publication of advertisement videos on their YouTube channels, as well as the responses to the associated comments. These openly published YouTube videos of sanda oil sales create a platform for potential customers to connect with the business. Concurrently, the business ensures a responsive online presence by addressing inquiries and questions in the YouTube comments section.

Following a customer's decision to purchase the sanda oil product through a particular channel, the core activity may involve multifaceted sales processes both in the virtual and physical spheres. Through cell phones and WhatsApp, the business may engage in a dynamic sales process, facilitating order placements, explaining payment options, and obtaining shipping information. Similarly, walk-in customers at the retail store may experience personalized interactions aimed at facilitating sales. The business seems to adopt a flexible payment approach, taking advance payments for international online oil orders via Moneygram, Western Union, and bank transfers. For local transactions, cash-on-delivery orders are accepted in Pakistan. Notably, customer anonymity is not an issue throughout these transactions. Both the sellers and the customers are willing to share their name and contact information in the video content and the comments section. Overall, this combined online and offline strategy highlights the business's adaptability and open approach to navigating diverse sales avenues.

Post-activity stage

Following successful transactions, the sanda oil business proceeds with post-sale activities to ensure efficient order fulfillment and customer satisfaction. The process may involve careful packaging of the oil bottles, employing bubble wrap, cello tape, and waterproof bags for international shipments, while simpler single bags suffice for domestic orders within Pakistan. Shipping is facilitated through DHL for international deliveries and

Tranzum Courier Service (TCS) for local shipments, with the option for cash on delivery. For international orders, the business supplies the necessary documents to facilitate smooth deliveries abroad. Subsequently, customers express their experiences by leaving reviews in the YouTube comments section or conveying feedback directly to the sellers via text messages. The seller, in turn, actively responds to customer reviews, fostering a responsive and customer-centric interaction. It is worth noting that not all channels provide detailed information on these post-sale activities. Therefore, it remains unclear how different businesses may handle this post-sale customer service differently.

Importantly, the YouTube video content of the sanda oil sales and associated comments explicitly discuss the availability of international shipping services to various destinations, including the U.S., Canada, the U.K., Germany, Netherlands, Australia, Singapore, Malaysia, Nepal, UAE, Oman, Saudi Arabia, Kuwait, Qatar, Bangladesh, and multiple locations within India (such as Mumbai, Amritsar, Punjab, Jammu Kashmir, Haryana, and Patiala). Domestic shipping within Pakistan is also accommodated, covering major cities like Islamabad, Karachi, Lahore, and Rawalpindi, among others. However, it is noteworthy that shipping to Israel is explicitly excluded from the service offerings. This implies the global nature of the illegal trade network, demonstrating that sellers are actively engaging with an international customer base.

Sales pitches of spiny-tailed lizard oil on YouTube channels

The advertising strategies for spiny-tailed lizard oil are multifaceted (see Table 5). Primarily, the oil is promoted for its purported medicinal benefits, addressing various aspects of male sexual function, relieving joint and muscle pain, and claiming miraculous medical effects. The product is positioned as a versatile solution with applications for both specific health concerns and general well-being.

The quality of the product is emphasized as pure and original, with an insistence on using unadulterated oil to maximize its benefits. The advertising further highlights the immediate production and delivery of the oil, as well as its reasonable pricing. Positive consumer reviews and a commitment to business responsibility are also presented to instill confidence in potential customers.

The benefits of using wild male *sandas* are prominently featured, suggesting that the oil derived from these creatures is more potent than that from domesticated ones. Religious justifications also play a significant role in advertising, framing the product as a divine gift bestowed by God. Additionally, some sellers promote the blending of *sanda* oil with other animals and plants, introducing

a diverse range of components like black cobra, black scorpion, tiger fat, turtle fat, and fish fat. This mixture of different oils appears to contradict the alleged benefit of pure *sanda* oil, but it may appeal to a distinct group of potential customers who value the other components.

Overall, the advertising strategies aim to position spiny-tailed lizard oil as a holistic and potent remedy, combining purported health benefits, quality assurances, religious justifications, and a distinctive blend of ingredients.

Discussion/conclusions

Summary of findings

Prior research has established that the poaching and trade of spiny-tailed lizards (STLs) is rampant in many of the regions they inhabit (Ilyas, 2016). In 2023, Gondhali and Petrossian extended this research by investigating the use of YouTube channels to sell STL products produced in Pakistan and Malaysia (Gondhali & Petrossian, 2023). This paper continues their study by using crime script analysis to better understand the activities depicted in the YouTube videos, and to propose potential interventions.

The three YouTube channels examined in this study were operated by separate individuals in Pakistan. However, each seller targeted the same group of consumers, namely male individuals seeking a traditional remedy for sexual dysfunction, using videos that function as infomercials. As noted in prior research, pharmaceutical treatment of male sexual dysfunction (such as Viagra and similar medications) is banned in Pakistan (Rimal, 2022). As a result, these vendors market their products to those who seek medicinal treatment but have limited options. By using an online sales platform, oil sellers reach potential customers outside of Pakistan as well.

Several YouTube videos provide an unguarded depiction of poaching methods, following a man as he locates, traps, and captures numerous STLs in the wild. The video narration focuses on the heightened effectiveness of wild lizard products. Along with establishing the authenticity of their STL oil products, these poaching-centered videos and the emphasis on wild lizards may be a response to competitors' products made from domestically-bred lizards. STL farming for the purpose of oil production appears to occur largely outside of Pakistan, in countries such as Malaysia (Gondhali & Petrossian, 2023), and is a successful alternative to hunting lizards in the wild.

Oil producers appear to use several production models. Some videos demonstrate a process where oil is made-to-order to fulfill the request of a specific customer. Other videos display quantities of pre-filled oil bottles, suggesting a larger scale of oil production predicated on

maintaining a supply on hand. Oil production models may have a significant impact on poaching practices. In the oil-for-order model, lizards may be captured based on producers' needs, resulting in a more controlled approach to lizard poaching. In the inventory model, where oil production is designed to create a stock of continually available merchandise, indiscriminate and high-yield poaching may be encouraged.

The torture of STLs is a factor in the viability of these production models. As noted earlier, poachers routinely break the lizards' spines to immobilize and control them. Paralyzed lizards can live for long periods of time, and therefore remain "fresh" for use in oil production long after the poaching occurred. Indeed, some sellers tout the lizards' ability to remain alive without ingesting food or water as evidence of their strength, and therefore the efficacy of the oil produced from their fat deposits. The use of paralyzed lizards to produce STL oil may increase the amount of poaching. When lizards can be stockpiled and used at later times, poachers may be incentivized to keep hunting.

STL oil producers prefer to use the fat of male STLs in marketing a cure for erectile dysfunction. This practice suggests negative consequences for the wild population, such as disproportionate destruction of male lizards, overpopulation of female lizards, and over-poaching of all lizards to secure a sufficient supply of males. Poachers capture lizards before knowing their gender, and lizard gender is determined by size, weight, and possibly coloration (Khalil et al., 2022). It is unclear whether lizards that poachers believe to be female are released or kept for other purposes, or whether female lizards are killed for oil production, and then discarded when dissection reveals their gender. The poaching impact on lizard gender disparity is a potential area for further study.

The global reach of these video advertisements is significant. As described in the results earlier, the videos from three sellers were viewed by millions of people, with tens of thousands of viewers actively engaging with the content through "likes" and comments. Data indicates a consistent concentration of video creation and viewer engagement during the Spring and Summer months. In some of the videos discussing the hunting of wild STLs, the seller-narrators offer their thoughts on the optimal season for poaching. One seller indicated that lizards can be trapped more easily during the summer; another claimed that winter was the ideal trapping season. This difference in opinion may reflect regional disparities based on local climate, as well as methods of trapping that might be seasonally dependent.

Oil sellers operate as legitimate businesses and, as established in the companion study, STL oil-trafficking occurs openly on the surface web (Gondhali & Petrossian,

2023). The use of international communications, payment and shipment services to facilitate the sale of STL oil is notable. Oil vendors in this study rely on YouTube, WhatsApp, Facebook, Instagram, and Twitter/X to communicate and advertise about their products. These services are operated by U.S. companies (Meta and X). Some of the YouTube channels are monetized, meaning YouTube shares revenue with the oil sellers from advertisements that run alongside their videos. For international transactions, sellers accept payment through three U.S.-based financial services companies—Western Union, Moneygram and PayPal. And to send oil to international customers, the sellers utilize DHL, a major shipping service based in Germany.

Selling STL oil is a crime in Pakistan, and buying STL oil is illegal in many of the destination countries to which the oil is being shipped. STLs are listed in Schedule II of Pakistan's Wildlife (Protection, Preservation, Control, and Management) Act, 1972. This schedule prohibits the use, hunting, trade, or possession of STLs. These lizards also are included in CITES' [Appendix](#), meaning that any international trade requires a CITES permit.

Despite these prohibitions, oil sellers conduct themselves without fear of enforcement action. Beyond the open use of online services and platforms, little to no efforts are made to remain anonymous or conceal identity. Two of the oil sellers identify themselves by name in their videos. All three reveal their faces. Over the course of several videos, one seller discusses and displays the location of a retail location from which he sells products derived from STLs and other protected species (including tigers). Viewers of the study videos also exhibited little fear of repercussions for purchasing STL-derived products. Thousands of comments contain users' real names, locations, and account information traceable to identifiable individuals.

Recommendations and conclusion

As seen firsthand in the study videos, STL poaching and oil production is relatively easy to accomplish, typically by a single person using minimal, inexpensive tools. The ease of these activities underscores the high level of threat to STLs. Nevertheless, to prevent these crimes, various situational crime prevention techniques can be applied, examples of which are provided below.

Given so few natural or logistical barriers exist, reducing STL poaching can be accomplished by *increasing the risks of apprehension*. This can be accomplished by *strengthening formal surveillance* through enforcing Pakistan's existing protection laws. Additionally, *removing excuses* can be carried out by *alerting public's conscience and* changing public attitudes about the impacts

and circumstances of the illegal use of STL products and encouraging them to engage in the efforts to protect the species.

Over the period of this study, a distinct surge of video creation and viewer engagement is observable in the Spring and early Summer months. Further study is needed into potential causes of this trend, such as lizard behavior, climate activity and cultural events. If poaching is seasonal in certain geographic areas, then *increasing the effort* can be achieved through focused surveillance and interdiction by *hardening targets* and *controlling access to facilities* (i.e. known poaching locations) during those time periods to reduce the volume of lizard hunting.

The reviewed YouTube videos contain quantitative data that can aid researchers interested in the impact of oil production on the STL population. Captured spiny-tailed lizards, both alive and dead, are seen in all but a few of the 127 reviewed videos. Production videos show that oil derived from the fat of one lizard typically fills one bottle sold to consumers. In addition, comments left by people who have viewed the videos provide a window into the customer demand for STL oil. Sellers often kill lizards to fulfill specific customer orders, so the demand for oil has a measurable and direct impact on the lizard population. All of this information about the three observed oil sellers offers the opportunity to extrapolate and quantify the number of lizards being captured annually by these sellers, as well as others working in a similar manner. Importantly, this information offers insights into how intervention efforts can also focus on reducing the demand through *reducing provocations*. This can be achieved by *discouraging imitation* via targeted messaging (e.g. through advertisements, billboards, education materials and campaigns) that undermine the utility of the STL oil as a panacea for the medical conditions it claims to cure.

The fact that STLs can be raised domestically is a promising opportunity for preserving the wild population and assisting those who are economically dependent on poaching activities. Government and conservation efforts can focus on *removing excuses* by *assisting compliance* through the promotion of STL farming as a viable replacement for poaching to protect lizards while also offering a realistic alternative for lizard poachers who might have no other livelihood. Combining these efforts with educational campaigns demonstrating the physical equivalency of wild and domestically-bred lizards could counter the appeal of wild lizard oil.

As discussed earlier, the study videos contain sales pitches appealing to men seeking treatment for sexual dysfunction. In light of governmental and religious prohibitions of pharmaceutical treatment options, we

recommend interventions focused on desensitizing dialogue about sexual wellness and discrediting the effectiveness of STL-oil (i.e. *reducing the rewards by denying benefits*). Cultural influencers, such as religious leaders, doctors and educators, could lend persuasive authority in debunking the value of STL-oil for sexual dysfunction. YouTube and other online platforms could be used to improve awareness in a manner that reaches potential consumers, such as by using similar keywords that will prompt discovery of content from both STL-oil vendors and educators.

Raising awareness or *alerting conscience* among consumers about the vulnerable status of STLs also can discourage purchases of oil, particularly among international customers who may not know that lizards are being hunted unlawfully.

Importantly, the online services facilitating oil trafficking must *increase the risks by utilizing place managers* to engage in combating this trade. As described in the earlier study (Gondhali & Petrossian, 2023), social media and communication platforms, payment processors and shipping companies that are informed about the oil sellers’ sales model can take significant steps to block the trafficking of wild STL-oil. In addition, these companies should be encouraged to join the ‘Coalition to Prevent Wildlife Trafficking Online, a group convened by TRAF-FIC, the World Wildlife Fund and the International Fund for Animal Welfare. The Coalition partners with online companies in various industries in the effort to stop the global online illegal wildlife trade. Prevention efforts by the services that enable cyber transactions could make an important impact on ending the illegal wildlife trade.

Study limitations

This study was limited to the video postings of three STL-oil sellers over a period of approximately 3 years. As such, its findings come from a small sample size of limited duration. Nevertheless, the total videos posted by these sellers, combined with more than 4,000 comments associated with these videos, provide insight about the modus operandi of the online sales of spiny tailed lizards, as well as the processes of consumer engagement with these videos. Future research can expand analysis to include more

sellers and possibly videos for longer time periods, both of which are likely to offer even more information about the scope of STL exploitation.

Concluding remarks

The trade in oil derived from the spiny-tailed lizard illustrates how, in the age of the Internet, local customs impacting a threatened species can quickly develop into a global force, pushing the species towards extinction. The videos that are the subject of this study provide a clear demonstration of wildlife trafficking that occurs openly online, enabled by an array of communication, payment, and shipping services. Analysis of these videos suggests several avenues for prevention of this illegal trade, as well as areas for further research.

Appendix: Descriptive statistics by channel, month, and season

The comments and video content provide insight into the behavior of those who poach spiny-tailed lizards (STL). Before providing the analysis using the crime scripts, this section discusses baseline information on YouTube videos. This preliminary exploration includes the views and the likes for the videos by channel, by published months, and by published seasons, as seen in Tables 6, 7, and 8.

Table 6 provides an overview of views and likes for three YouTube channels: “Original Sanda Oil,” “Sahara Herbal Center,” and “Yaseen Super Power Tilla Center.” The Yaseen Super Power Tilla Center has substantial views of 5,917,599 and 71,398 likes of the 21 videos, an average of 281,790 views per video, and 3400 likes for each video. The “Original Sanda Oil” channel has garnered 1,846,765 views and 10,218 likes for its 93 videos. On average, each video received 19,858 views and 110 likes. “Sahara Herbal Center,” while having a total number of 13 videos, had a total of 616,672 views and 13,124 likes. The mean number of views per video and the mean number of likes per video are 47,436 and 1010, respectively.

Table 7 presents an overview of the STL poaching videos on YouTube, categorized by months. In April, there

Table 6 Descriptive statistics by channel

Channel name	Views	Likes	Video counts	Avg views per video	Avg likes per video
Original Sanda Oil	1,846,765	10,218	93	19,858	110
Sahara Herbal Center	616,672	13,124	13	47,436	1010
Yaseen Super Power Tilla Center	5,917,599	71,398	21	281,790	3400
Total	8,381,036	94,740	127		

Table 7 Descriptive statistics by month

Published month	Views	Likes	Video counts	Avg views per video	Avg likes per video
1	237,739	2405	24	9906	100
2	156,834	2416	16	9802	151
3	29,243	613	6	4874	102
4	4,923,192	56,380	12	410,266	4698
5	61,056	1110	5	12,211	222
6	751,091	12,247	10	75,109	1225
7	59,364	1873	5	11,873	375
8	635,107	8029	10	63,511	803
9	96,439	2531	13	7418	195
10	1,409,319	6222	19	74,175	327
11	18,153	852	3	6051	284
12	3,499	62	4	875	16

were a total of 12 videos posted, accumulating 4,923,192 views and 56,380 likes. Throughout this time frame, the videos in April had an average of 410,266 views and 4698 likes per video. Overall, the highest number of views and likes were in the month of April. October was the month with the second highest number of views and likes, recording 1,409,319 views and 6222 likes across 19 videos. The average views per video and average likes per video were 74,175 and 327, respectively.

Table 8 presents the descriptive statistics of the videos classified based on the different seasons in Pakistan (World Bank Group, 2021). In the Spring (Warm & Dry) season, a collective sum of 5,013,491 views and 58,103 likes were recorded across 23 videos. Each video in this season has an average of 217,978 views and 2526 likes. This suggests a significant level of involvement during the Spring season, with notable averages per video. During the Summer (Rainy & Monsoon) season, a total of 1,542,001 views and 24,680 likes were recorded across 38 videos. The mean number of views per video and the mean number of likes per video during this season are 40,579 and 649, respectively. During the Fall (Retreating Monsoon) season, the videos accumulated a total of 1,427,472 views and received

7074 likes from 22 videos. The mean number of views per video and the mean number of likes per video were 64,885 and 322, respectively. Lastly, during the Winter (Cool & Dry) season, a total of 398,072 views and 4883 likes were recorded for 44 videos. The mean number of views per video and the mean number of likes per video were 9047 and 111, respectively. Although there was a greater number of videos, the engagement metrics per video were relatively lower in the Winter season.

Table 9 highlights the top ten most viewed videos of the 127 videos. Notably, the channel “Yaseen Super Power Tilla Center” has the most popular videos, with six of its videos securing positions in the top ten most viewed list. Further analysis reveals a seasonal pattern within the top ten most viewed videos. A predominant presence of eight videos published during the spring and summer seasons signifies heightened interest and viewership during these warmer periods. Conversely, there is a comparatively lower representation, with only one video, each from the Fall and Winter seasons, securing a spot in the top ten.

Figure 1 displays the monthly statistics for the count of videos, average views, and average likes by channel. The channel “Original Sanda Oil” uploaded the most number of videos, with the majority of them being published in October and January. Despite the fact that the videos from Channel “Original Sanda Oil” comprise the largest number of videos, they have garnered the fewest views and likes. The channel “Yaseen Super Power Tilla Center” has the second highest number of videos out of the three channels. The videos were primarily posted between April and June, and garnered the maximum number of views and likes from April to May. The YouTube channel “Sahara Herbal Center” consistently uploaded their videos throughout the months, but received the majority of their views and likes in August.

Figure 2 illustrates the patterns of released videos according to their published seasons. In the top-left figure, The channel “Original Sanda Oil” had the highest number of videos, especially in the winter season. Nevertheless, a notable discrepancy arises, as the number

Table 8 Descriptive statistics by season

Pakistan seasons	Views	Likes	Video counts	Avg views per video	Avg likes per video
Spring (warm & dry)	5,013,491	58,103	23	217,978	2526
Summer (rainy & monsoon)	1,542,001	24,680	38	40,579	649
Fall (retreating monsoon)	1,427,472	7074	22	64,885	322
Winter (cool & dry)	398,072	4883	44	9047	111

The seasons are broken down according to World Bank Group (2021) by the following months: spring (March to May), summer (June to September), fall (October to November), winter (December to February)

Table 9 Top ten videos ranked by views

YouTube title	Views	Likes	Published date	Channel	Video link	Published season	Published month
Khalis, sande ka tel bnta hwa 03181005378 (watsapp)	3,321,311	34,651	4/20/2019	Yaseen Super Power Tilla Center	https://www.youtube.com/watch?v=_ti4FOzB2-s	Spring (warm & dry)	4
sande ki khsosiyat (Qualities of spiny tailed lizard)	1,339,863	14,374	4/9/2019	Yaseen Super Power Tilla Center	https://www.youtube.com/watch?v=dmX09mhXQ0o	Spring (warm & dry)	4
Making sanda oil in pakistan for sanda oil (03361482571)	1,293,695	4797	10/7/2019	Original Sanda Oil	https://www.youtube.com/watch?v=9YOGHpKo-Wk	Fall (retreating monsoon)	10
How to Make Sandha Oil	382,576	5870	6/24/2019	Yaseen Super Power Tilla Center	https://www.youtube.com/watch?v=TIi30ciMguM	Summer (rainy & monsoon)	6
Sandy ka tail Banta huwa live	340,270	4110	8/28/2019	Yaseen Super Power Tilla Center	https://www.youtube.com/watch?v=wJIEIJYuhU	Summer (rainy & monsoon)	8
Sanda kaisy pakrty han How to catch sanda/ How to make sanda oil Orignal Sanda oil Sande Ka Tel	201,463	2841	8/25/2019	Sahara Herbal Center	https://www.youtube.com/watch?v=a37k9DIKO3M&list=PLfL-in4zdDcJS0bRsMyPFOOXeaO2SJBP&index=9	Summer (rainy & monsoon)	8
Sanda Kaise Pakrty Han How To Catch Sanda Animal Is Sande Ka Tel Faida Deta Hai Oil Benefits	186,901	4585	4/14/2020	Sahara Herbal Center	https://www.youtube.com/watch?v=KygziJqn-4A&list=PLfL-in4zdDcJS0bRsMyPFOOXeaO2SJBP&index=4	Spring (warm & dry)	4
Pure Sanda oil (Man Power Oil)	146,201	2232	6/24/2019	Yaseen Super Power Tilla Center	https://www.youtube.com/watch?v=RI-P8jtd6BY	Summer (rainy & monsoon)	6
Khalis sandy ka tail Banta huwa live	120,011	1612	6/8/2019	Yaseen Super Power Tilla Center	https://www.youtube.com/watch?v=VRTg_ywf6pQ	Summer (rainy & monsoon)	6
How to use & making original sanda oil (03361482571)	98,480	525	1/15/2020	Original Sanda Oil	https://www.youtube.com/watch?v=8CajdF4TEiM	Winter (cool & dry)	1

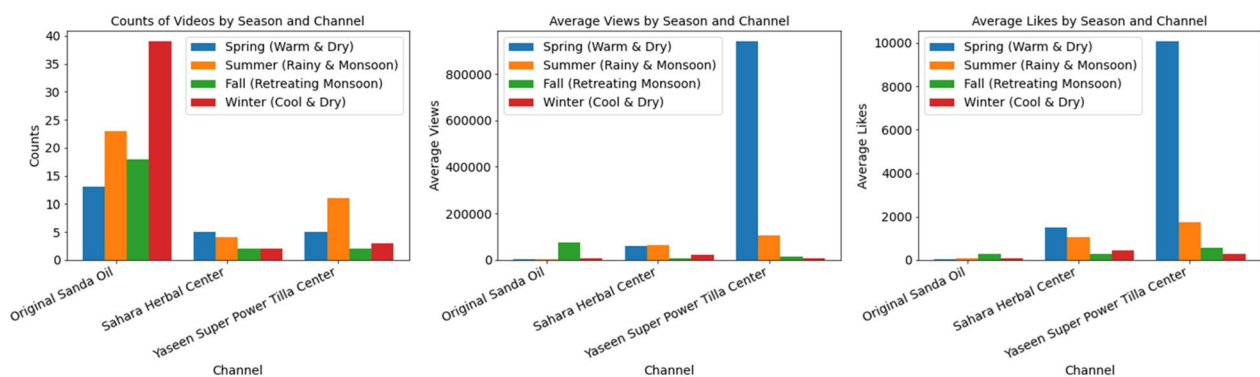


Fig. 1 Counts of videos, views, and likes by channel and by published month

of views and likes does not correspond proportionally to the large number of videos posted. Moving to the top-center, “Yaseen Super Power Tilla Center” demonstrates a surge in published videos during the summer,

although videos posted in the spring earn the maximum number of views and likes among all three channels. Significantly, this difference implies that viewers have a seasonal inclination towards specific content. Lastly, in

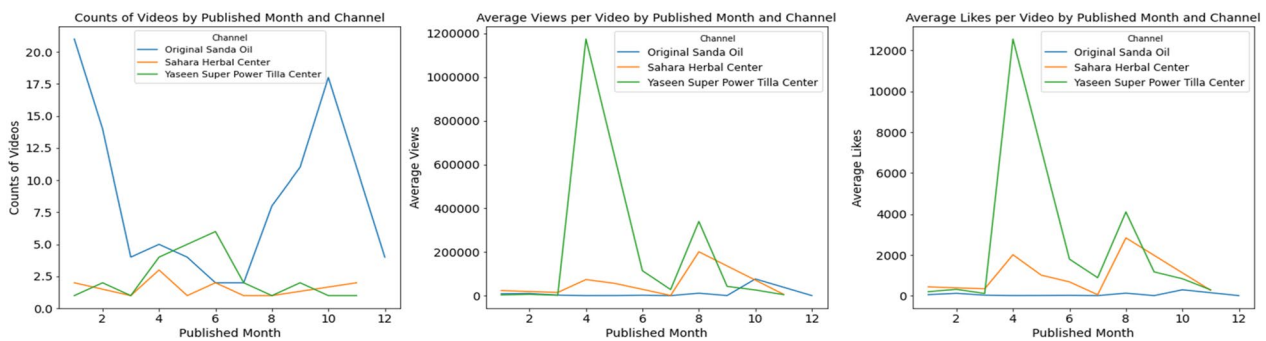


Fig. 2 Counts of videos, views, and likes by channel and by published season

the top-right of the graph, the channel “Sahara Herbal Center” distributed their video publications throughout the spring and summer seasons, and the number of views and likes that they received closely corresponded to their publication pattern.

Acknowledgements

We thank the anonymous reviewers for their helpful comments.

Author contributions

All authors read and approved the final manuscript.

Funding

No outside funding was used to support this work.

Availability of data and materials

The data that support the findings of this study are available on request from the corresponding author, UG.

Declarations

Competing interests

The authors declare that they have no competing interests.

Received: 19 January 2024 Accepted: 31 March 2024

Published online: 15 April 2024

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