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Consumer demand and traditional medicine prescription of bear products in Vietnam☆

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ABSTRACT

The illegal trade in wildlife products is a major driver of the global biodiversity crisis. Trade in wildlife products is driven by consumer demand; however, consumer's motivations are often poorly understood. In this study, we use mixed social science approaches to understand the motivations driving consumers of bear products for medicine in Vietnam, and of traditional medicine practitioners who may be influencing consumers. In addition, we provide current information about the ways bear products are used in the two largest cities of Vietnam: Hanoi and Ho Chi Minh City. We found that bear products are still used widely in Vietnam, despite their use being prohibited since 2006. We directly estimated use at 45% of the sample of consumers for Hanoi, and 18% for consumers in Ho Chi Minh City. However, bear products are used differently between the two cities, with Hanoians more likely to take bear medicine products to treat an ailment, versus Ho Chi Minh City, where it is taken as a daily tonic. We also found that some traditional medicine practitioners in Vietnam are continuing to prescribe bear products, despite medicinal prescription of bear bile being made illegal, and availability of traditional medicine herbal alternatives. Generally, use of bear products appears to still be widely acceptable in the country, indicating a need for changing the social norms of bear product consumption. The insights gathered here will be beneficial to conservation managers working in Vietnam and throughout the Southeast Asia region, and will be particularly informative for developing and implementing demand reduction campaigns.

1. Introduction

Southeast Asia is a global biodiversity hotspot (Paradis, 2018), yet ongoing and largely uncontrolled legal and illegal hunting, particularly to supply the demand for wildlife meat and traditional medicine, has driven population declines in many of the region's wildlife (Vié et al., 2009, Wilcove et al., 2013, and Gray et al., 2018). Vietnam is a focal country of the illegal wildlife trade, with illegal trading documented for a variety of species (e.g. Milliken and Shaw, 2012; Cao and Wyatt, 2013, and Nguyen and Willemsen, 2016). Globally threatened taxa such as rhinoceros (*Rhinocerotidae* sp.), pangolins (*Manis* sp.), tigers (*P. tigris* sp.), and bears (*Ursidae* sp.) are all consumed within Vietnam, primarily for medicinal purposes (Newton et al., 2008; Van Song, 2008; Drury, 2009a; Milliken and Shaw, 2012, and Dang and Willemsen, 2018), and Vietnam remains a leading consumer country for a variety of illegal wildlife parts (Cao and Wyatt, 2013 and Olmedo et al., 2018). The decline in certain species' populations due to legal and illegal hunting means that widespread extirpation of these species in Vietnam and neighboring countries is likely (Newton et al., 2008; Milliken and Shaw, 2012; Garshelis and Steinmetz, 2016, and Scotson et al., 2017), with some species such as the Javan rhinoceros (*Rhinoceros sondaicus annamiticus*) (Brook et al., 2014) and probably the tiger (*Panthera tigris*)

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already lost (Goodrich et al., 2015).

Wildlife law enforcement in Vietnam, and throughout the Southeast Asian region, has been largely unsuccessful in abating declines of wildlife populations (O'Kelly et al., 2012, Preece et al., 2012, and Cao and Wyatt, 2013). This is particularly true for large terrestrial species such as bears and tigers, which are caught in cheap, homemade snares placed throughout forests, with devastating effects on their populations (Gray et al., 2018). Given the challenges of regulating and abating the supply of wildlife parts, efforts are increasingly focused on consumption, with people-centered mitigation techniques such as behavior change/demand reduction; often using social marketing principles (Veríssimo et al., 2017). Such campaigns can only be successful if there is an understanding of the influences of demand, and the true drivers of consumers purchasing behavior (e.g. Vu and Nielsen, 2018 and Olmedo et al., 2018). To explore the motivations and influencers of those prescribing and consuming wildlife as medicine, we use the bear bile industry in Vietnam as a case study.

In Vietnam, recent surveys have shown that sun bear (*Helarctos malayanus*) and Asiatic black bear (*Ursus thibetanus*) populations remain low following declines during the 1990s – 2000s (Crudge et al., 2016). Use and trade in bear parts and derivatives is widespread throughout Vietnam (Nguyen, 2006; Drury, 2011; Cao and Wyatt, 2013; Willcox et al., 2016, and Crudge et al., 2018). Moreover, bear bile farms persist in Vietnam, despite recent efforts by the Vietnamese government to end this illegal practice (Willcox et al., 2016 and Crudge et al., 2018). Regulations were introduced in 2006 intended to limit the number of wild-sourced bears entering bear bile farms. However, the introduction of regulations did not legalize bear bile farming; all bears on farms were of illegal origin, the bears remained property of the government and, although individuals were permitted to keep registered bears, it was illegal to extract bile from these bears (Nguyen, 2007; Willcox et al., 2016). However, recent research has shown that bile extraction has continued into the present (Crudge et al., 2018). Although the demand for farmed bear bile now appears to be in decline, as is the number of bears held in bile farms in Vietnam (Crudge et al., 2018), the impact that continued demand for wild-sourced bile is having on wild bear populations is unknown.

Bear parts have been used in traditional Chinese medicine (TCM) for centuries (Feng et al., 2009), although it is less certain how long they have been used in traditional Vietnamese medicine. What is certain is that use for medicinal purposes has been documented as being widespread in the capital, Hanoi (Drury, 2011) and throughout the country (Nguyen, 2006). Indeed, bear bile has been cited as one of the most widely consumed illegal wildlife products in Vietnam (Drury, 2011). Moreover, bear products have been identified as commonly used traditional medicine (TM) products by TM students in Hanoi and Ho Chi Minh City (HCMC) (Dang and Willemsen, 2018). Even though some research has been done on the use of bear parts in Hanoi (Drury, 2011), there is little information about prescription of bear parts by traditional medicine practitioners (hereafter practitioners) in Hanoi and HCMC. The purpose of this research is threefold. First, we aim to better understand the medicinal use of bear parts in HCMC and Hanoi. Second, we aim to quantify the prescription of bear parts as medicine across Vietnam. Finally, we use the Vietnamese consumption of bear bile products for medicine as a case study for understanding the motivations of consumers and their influencers. These results are intended to meaningfully inform future conservation initiatives in Vietnam, such as demand reduction campaigns for bear products. Additionally, these results could be important for developing and encouraging the use of sustainable, herbal or synthetic products, and for indicating priority areas for successful enforcement of bear medicine use in urban Vietnam. The data also provide a deeper understanding the complex nature of demand, driven by the consumers and influencers, for other wildlife parts that can then be tested in Vietnam and throughout the Asian region in a complementary manner in the future.

2. Materials and methods

2.1. Survey instrument

A mixed method approach (i.e., using quantitative as well as qualitative methods) was used to survey consumers in Hanoi and HCMC and traditional medicine practitioners throughout Vietnam, using three separate survey instruments. Two consumer surveys were used, one wholly quantitative and one wholly qualitative. Both were conducted as an interview survey.

The consumer questionnaire built on two previous surveys that had been conducted within Laos and Cambodia, both to understand bear part use and a similar consumer survey that was conducted in Hanoi and Ho Chi Minh City, Vietnam to investigate the motivations to consume tiger products. The following specific methods were used to test and evaluate the quality of the questionnaire: *Expert opinion method*: Several members of TRAFFIC, who have many years of experience in developing and implementing demand reduction programs in Vietnam were consulted about the appropriateness, feasibility and usefulness of survey questions within the context of Vietnam; "*Role play interviews*" *by enumerators*: During the training workshops, enumerators, who conducted a number of social-economic surveys tested the questionnaire to identify inconsistencies and ambiguities in terms of logic and translation; *Pilot survey*: The researchers conducted a small pilot survey on randomly selected pedestrians in a public venue in Hanoi, Vietnam to identify any remaining issues with the questions and answer values.

In addition, we conducted a mail survey of active practitioners across Vietnam, as identified by the Vietnam Traditional Medicine Association (VTMA). We used a mail survey to obtain a representation of the 60,000+ practitioners in the VTMA, who are spread across 64 provinces and municipalities in Vietnam. All three instruments were designed using questions tested and used in similar studies in the region and known to be effective at eliciting information in the Southeast Asian context (Davis et al., 2016 and Davis et al., 2019). All surveys were written in/conducted in Vietnamese. All the instruments were anonymous. Ethical approval was obtained from Miami University Ohio IRB for Human Subject Research, Protocol Number FWA00023676.

2.1.1. Quantitative instrument for individuals in Hanoi and Ho Chi Minh City

The quantitative survey instrument was divided into several sections (Appendix A). Respondents were asked for demographic information of the participants (e.g. gender, place of residence), followed by a section focused on knowledge and attitudes towards bear products and use of bear products by the participants. Individuals who had consumed bear products were then asked about their consumption (e.g. what product was consumed, for how long, etc). Individuals who had purchased bear products were asked questions related to purchase, and individuals who had recommended bear products were asked about their recommendation of the product.

2.1.2. Qualitative instrument for consumers and non-consumers in Hanoi and Ho Chi Minh City

For the qualitative aspects of the survey, the interviewer solicited discussions about the individual's emotions towards nature and medicine, as well as their trusted media channels (Appendix B). Participants were then asked about their perceptions of bear part users (e.g. age, gender, etc), followed by specific questions for self-reported bear part users. These questions were designed to understand product use, rationale for use, intentions towards consumption, and the use of bear products within their social network. Alternatively, non-bear part users were asked what reasons they had for not using bear parts.

2.1.3. Mail instrument for traditional medicine practitioners

The mail-response survey for practitioners began with the demographic questions (Appendix C). After these questions, the survey split

into two channels, with those practitioners that prescribed bear products directed to questions related to prescription. Practitioners that had not prescribed bear products recently answered questions related to potential, past prescriptions. All groups of practitioners were asked about perceptions of their colleagues' prescriptions of bear products, as well as their own understanding of what ailments bear products are often prescribed to treat. The third section of the mail survey was related to general wildlife consumption of the surveyed practitioners. The last section was related to marketing, and asked practitioners about the benefits of bear products, versus the benefits of alternative prescriptions.

2.2. Survey protocol

Hanoi and HCMC, which were chosen as study sites as they are the two largest cities in Vietnam. When bear bile farms were prevalent in Vietnam, they were concentrated around these large urban centers (Crudge et al., 2018), and both cities have high instances of wildlife consumption (Drury, 2009a, 2009b and Shairp et al., 2016). Consumer surveys were conducted between December 2017 and January 2018. Practitioner surveys were sent out in December 2016 and received by February 2017.

The quantitative sampling method of consumers was a combination of cluster random sampling method and semi-random sampling strategy, with a total of 1344 individuals surveyed. The target sampling size was over 1000 to ensure that broad patterns could be identified, and to ensure a “buffer” of additional data in case of missing and/or incomplete data. Due to the difference in the urban population, fewer surveys were conducted in Hanoi (n = 432) than HCMC (n = 912). Surveys were conducted at locations throughout both cities (Appendix D). The quantitative survey of consumers used a three step sampling process: first, purposive sampling was employed to target only adults (older than 18) in urban districts of Hanoi (nine districts in total) and Ho Chi Minh City (19 districts in total); second, cluster random sampling was used, where the study population was divided into two clusters, including primary sampling units (districts) and secondary sampling units (wards), with 4 wards in each district selected using probability proportional to size approach; and finally random sampling was used in the field where surveyors selected 10 households in each ward using the random walk method.

A key difference between the surveys of consumers, and the surveys of practitioners, was that the consumer surveys were conducted by Vietnamese interviewers employed by TRAFFIC and trained in administration of face-to-face surveys. The survey of practitioners, however, was a self-administered mail-in survey. The VTMA facilitated mailing the survey to 1513 of its members in 48 provinces and municipalities. The number of surveys sent to each individual province was based on the number of practitioners in that province. A total of 800 were returned (52.9%; 800/1513) (Fig. 1).

We also used purposive sampling for the qualitative interviews conducted, as well as snowball sampling techniques. Both techniques were used to select individuals that were most appropriate for the intent of the qualitative interviews conducted (Newing, 2010); i.e. bear bile users were asked to suggest other bear bile users they knew of who might be willing to be interviewed. A total of 30 interviews were completed in Hanoi and HCMC (n = 15 in each city, 10 users of bear bile and 5 non-users) to explore and investigate different aspects of the attitudes and behavior of bear product consumers, contrasting them with the non-user group as well as identifying effective ways to influence their behavior. When selecting the interviewees, the researcher took into consideration their age and gender in order to make the sample as representative as possible of the general population of each city.

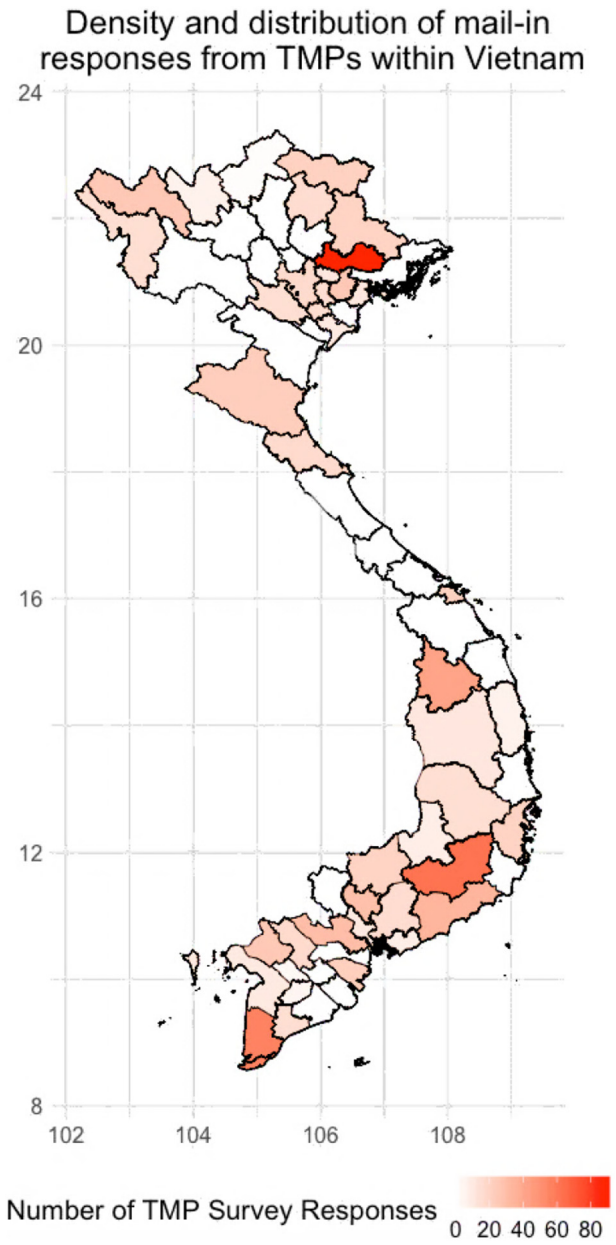

Fig. 1. Distribution of returned practitioner surveys. The VTMA facilitated mailing the survey to 1513 of its members in 48 provinces and municipalities. The number of surveys sent to each individual province was based on the number of practitioners in that province. A total of 800 were returned (52.9%; 800/1513). The majority of the surveys returned were from Bac Giang province (107 E, 23 N), followed by Tiền Giang province (108 E, 10 N). The surveys were sent out in December 2016 and received by February 2017.

2.3. Statistical analysis

We accepted quantitative and mail-in questionnaires for analysis if they had the demographics section completed, but respondents may not have answered every question. As such, each question analyzed has differing sample sizes depending on the number of responses to that question.

We tested data for normality and homogeneity of variances using both the Shapiro-Wilk and Bartlett's Tests (Bartlett, 1937 and Srivastava and Hui, 1987). We found the data to be non-normal. Transformations were not attempted on the data, as survey data are often non-normal (Vaske, 2008). Thus, we used standard non-parametric unpaired two samples Wilcoxon tests for comparisons between two groups (Hollander

Table 1
Table of demographics in the two samples of consumers from quantitative interviews in Hanoi (n = 432) and Ho Chi Minh City (n = 912).

Demographics		Hanoi			Ho Chi Minh City		
Gender	Male	48.8%		(n = 211)	46.7%		(n = 426)
	Female	51.2%		(n = 221)	53.3%		(n = 486)
Age	Range	18-90			18-86		
	Average	45.5			41.5		
	Median	46			41		
Education	Common highest level	High school	34.7%	(n = 150)	High school	25.3%	(n = 231)
Religion		None	84.5%	(n = 365)	None	47.3%	(n = 431)
Mean income per month		6.9 million VND ($302)			7.4 million VND ($324)		

et al., 2013), while the chi-squared test and Kruskal-Wallis non-parametric test were used for comparisons between multiple groups (Kruskal and Wallis, 1952). We considered results significant with 95% confidence intervals (p-value < 0.05). All statistical analyses were performed in R (R Core Team, 2018), and all figures were created using ggplot2 (Wickham, 2009).

3. Results

3.1. Demographics of potential consumers of bear parts and traditional medicine practitioners

The quantitative questionnaires administered in Hanoi and HCMC generated sample sizes of 432 and 912 respectively. 800 people responded to the TMA mail survey. We reported the demographic information in Table 1.

In Hanoi and HCMC 15 qualitative questionnaires were administered in each city. Demographic information is reported below in Table 2.

3.2. Use and prescription of bear parts

Respondents from Hanoi used bear parts as medicine more frequently than respondents from HCMC (45% versus 18%; Wilcoxon W = 552,490, $p < 0.05$).

As shown in Fig. 2, type of products used did not vary substantially between HCMC and Hanoi. Bear bile was the most popular product in both cities, although individuals in HCMC appeared slightly more likely to use a variety of products, with bear gallbladder and bear paw cited as being the second and third most popular products used. Approximately 10% of the individuals from HCMC who stated that they had used bear products had used bear gallbladder and/or bear paw, versus 1.5% of Hanoians who had used bear products. However, the types of products used did not differ statistically significantly between the cities (Kruskal-Wallis, H = 5.533, $p > 0.05$, effect size = 0.15).

Table 2
Qualitative interview demographics for Hanoi (n = 15) and HCMC (n = 15).

City and age group	Non-user		User		Total
	Female	Male	Female	Male	
Hanoi	2	3	5	5	15
a. 18–29		1	1	1	3
b. 30–44	1	1	1	1	4
c. 45–59	1		2	2	5
d. Over 60		1	1	1	3
Ho Chi Minh City	3	2	5	5	15
a. 18–29	1		1	1	3
b. 30–44	1	1	1	1	4
c. 45–59	1		1	2	4
d. Over 60		1	2	1	4
Total	5	5	10	10	30

Practitioners also reported prescribing bear products. Of the practitioners who reported prescribing bear products, 24% stated that they had prescribed bear bile. Their reasons given for this prescription included bear bile being “easy to use” and “convenient”. Additionally, practitioners stated that men were more likely to be prescribed bear products than women were.

Although the type of product used by individuals did not vary between cities, the level of monthly consumption did (Fig. 3). Users in HCMC used fewer times a month compared to bear part users in Hanoi. For example, in HCMC 62 out of 116 individuals stated that they had used bear products only once that month (53.4% of self-stated users), while 30 out of 64 Hanoians (47%) who used bear products stated they used them once a month. Although use per month was still low in Hanoi, there were more users who used bear parts up to 30 times a month (8/64, 12.5%), compared to HCMC (6/116, 5.2%). This is supported by the average use per month in each city, where Hanoi has an average of six times per month, while HCMC has an average of four times a month.

Use by gender varied significantly in HCMC ($\chi^2 = 15.4$, $p < 0.05$, effect size = 2) compared to Hanoi, where no significant difference of use was found between Hanoian males and Hanoian females. In Hanoi more males used bear parts compared to women (23%; 98/426); however, females still used bear parts at the comparatively high rate of 13% (63/486).

Consumers of bear products were most likely to have purchased bear products to cure a disease (Fig. 4), although nearly 40% of users in HCMC also used bear products as tonics for improving overall health. This use was much less popular in Hanoi.

Use was found to vary between Hanoi and HCMC, with Hanoi individuals more likely to apply a bear product to pain areas on the skin, versus HCMC individuals who preferred to drink bear bile and/or drink bear bile/gallbladder with wine (Fig. 5). This was supported by the qualitative data gathered in HCMC, where bear bile wine taken daily appeared to be a more popular form of ingestion than in Hanoi.

The sample of the 800 practitioners interviewed was slightly predominantly male (56.6%). Like the sample of consumers, the majority of the practitioners had a high school education. They were also predominantly non-religious, although 20% of the sample stated that they were Buddhist. Like the consumer samples, the sample of practitioners primarily identified as Kinh.

Of the practitioners, 25 directly admitted to having prescribed bile products. However, every practitioner was asked to state which ailments they felt were most commonly treated by bear bile and bear gallbladder. Of the full sample, 198 practitioners stated illnesses bear bile/gallbladder could treat. The most common ailments cited by these individuals were reducing pain of different body parts and intestinal organ diseases, specifically: bruises; blood congestion; digestive disorders; shoulder and neck pain; joint pain; backache; liver disease; swollen areas; general pain; sprain; feeling hot inside (fever); and arthritis. The second most commonly cited ailments were: arthralgia; diabetes; cancer; gout; and hepatitis. The ailments less commonly cited were: heart disease; and mental illness. Commonality was considered to be determined by the order individuals listed the ailments in, as well as the percentage of citations of the ailment. Percentages are not given, however, as some responses overlapped (for example, practitioners would cite “swollen/hurts” together, as the primary ailment individuals would be treated for with bear bile).

When asked about alternatives to prescribing bear products, the practitioners surveyed cited benefits as being that they are safer (a concern cited as being raised by practitioner patients), cheaper, and easier to access. Practitioners cited many herbal alternatives, with the most popular being the “bear bile plant” (In Vietnamese: *Cỏ mật gấu*; Scientific name: *Isodon lophanthoides*). The second most popular herbal alternative that was cited was the safflower plant (*Carthamus tinctorius*).

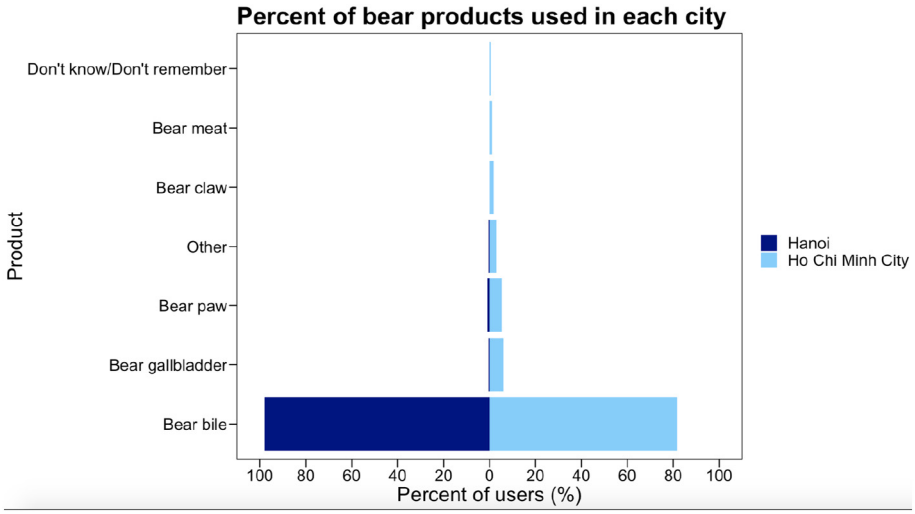

Fig. 2. The stated bear products used by consumers in each city Hanoi (n = 194) and Ho Chi Minh City (n = 164). By far the most popular item used is bear bile, followed by bear gallbladder.

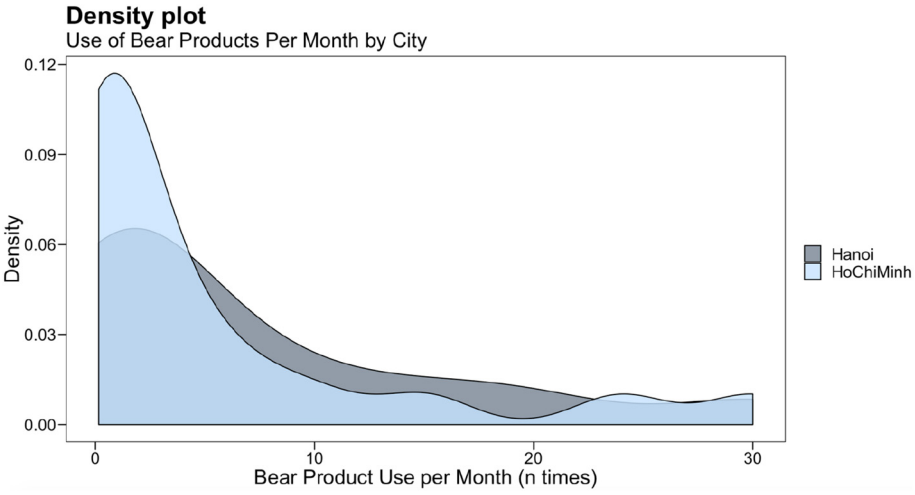

Fig. 3. Density plot of use of bear products per month for Hanoi (total n = 432, n of users = 194) and Ho Chi Minh City (total n = 912, n of users = 164).

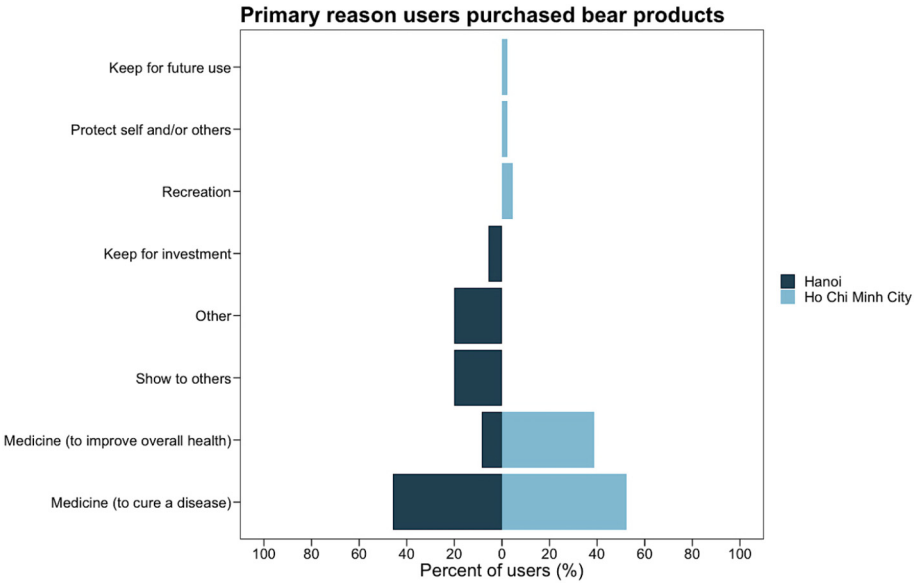

Fig. 4. Reasons given by consumers of bear parts as to why they purchased the product in Hanoi (n = 194) and Ho Chi Minh City (n = 164).

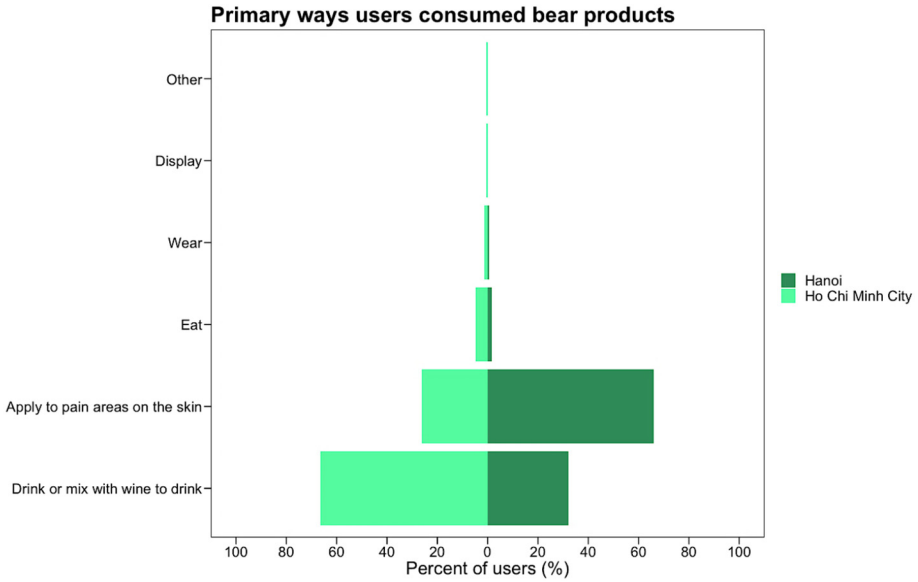

Fig. 5. Use of bear parts between Hanoi (n = 194 users of bear parts) and Ho Chi Minh City (n = 164 users of bear parts).

Herbal alternatives, and Western alternatives such as heat pads (for topical bruises) and medicated heating oil, were said to be ineffective and/or slower-acting by most of the users of bear parts interviewed in Hanoi (90%, 9/10 users), with only one user citing that Western topical pads and heating oil being effective as well.

3.3. Perceived efficacy of wild versus farmed bear bile

A user of bear bile in Hanoi stated that farmed bear bile was "trendy" approximately ten years ago. He perceived a decline in people using farmed bear bile and theorized that it was due to the following reasons:

> Suddenly people felt using farmed bear bile unsafe… the farmed bears did not eat natural food like wild bears…. I thought that people were afraid of using farmed bear bile because the press reported the fact that farmed bears might have infections or the government banned bear farming.

The man also stated that he saw "no effects" of farmed bear bile wine, a sentiment shared by a few other users of bear bile in Hanoi and one user in HCMC. One user in HCMC stated that she believed farmed bear bile is only "80% effective" compared to wild bear bile, and that wild and farmed bear bile can be distinguished by the "richness" of their flavour.

The majority of the interviewed users of bear bile in Hanoi and HCMC did not state any strong preference for wild bear bile over farmed. Often they were taking or had taken farmed bear bile willingly, or were unsure and unconcerned as to the source of their bear bile. Many users admitted that it is often difficult to know the source of bear bile, yet would take bear bile anyway regardless of the known or unknown source, due to factors including overarching belief in bear bile's efficacy, as well as pressure from their peers.

Instead, a recurring theme of the qualitative interviews was of users taking bear bile and being concerned with "authenticity", e.g., any kind of bear product. One user in Hanoi stated "I will only buy wild bear bile if I know someone selling authentic products. I have no interest in farmed bear bile." Thus, although the man does state a preference for wild bear bile, his "ultimate" preference is for an authentic bear product. However, most of the other users of bear bile interviewed stated that their concerns over authenticity were that the product they bought was genuinely from a bear, regardless of whether the bear was farmed or wild.

3.4. Social influences on using bear parts

We found that individuals' social networks are most important in influencing the use of bear bile products for both Hanoi and HCMC, rather than being prescribed by a practitioner. A male participant in HCMC stated that he had been given bear bile wine to take as a tonic, and despite what his friends told him, did not think it was effective. He believed that was because the bile he was given was from farmed bears and stated that he thought wild bear bile would be more effective in treating bruises and reducing pain, a sentiment corroborated by one user of bear bile interviewed in HCMC. However, the man said he would not admit to his friends that he believed the product was ineffective, as he did not want to make them feel bad for having given the recommendation. A woman in HCMC also echoed this social aspect. Indeed, she did not want to admit to her well-meaning friends that she did not think bear bile wine had been effective.

Users in HCMC, like those in Hanoi, cited word-of-mouth as the impetus for their use of bear bile. One woman did cite the origin of use in her family as having been a practitioner approximately 10 years ago who suggested to her sister that she use bear bile wine; however, all others said that they only knew to use it from friends and relatives who were not healthcare professionals.

Non-users in Hanoi and HCMC (33.3%, 5/15 and 40%, 2/5) had also heard about use of bear bile through word-of-mouth, and believed in its healing properties based on what was said by their friends and relatives who used it. This included being told solely that the product was effective. In HCMC there was also general consensus among users that bear bile is effective for treating bruises, more so than herbal or Western alternatives, such as topical medicated oils and/or balms. One woman in HCMC was effusive about its efficacy, when used consistently:

> Bear bile is the best traditional medicine. If possible, we should use it regularly….
> Bear bile can prevent cancer and improve our immune systems. However, we should drink it moderately instead of overusing it.

However, some users of bear bile in HCMC admitted that when taking bear bile they had also taken other non-bile medicines, such as topical medicated oils and herbal tonics. Therefore, they did not know whether bear bile had been truly effective, or whether herbal/Western alternatives had treated their ailment.

In addition, nobody contacted law enforcement bodies despite

knowing that other people possessed and/or were using bear products. A retired doctor in Hanoi, who doubted the effectiveness of bear bile due to the lack of scientific evidence, shared that "It may be okay if they are killed to save human life." At the end of the interview, he added that "Even when the government has established the policy to protect animals in the Red List, people still hunt them down."

4. Discussion

4.1. Medicinal use of bear parts in Hanoi and Ho Chi Minh City

We found that bear bile is the most common bear product used for medicinal purposes in Hanoi and HCMC, due to its low price and ready availability throughout the country. Individuals cited many varied medicinal benefits, ranging from the treatment of disease, to the maintenance of general health. Thus, there are many opportunities for individuals to be given, recommended or prescribed bear bile.

Bear bile use varied between consumers within the two cities. Individuals in HCMC were more likely to use bear parts only once a month, and for medicinal purposes. Hanoi respondents appeared more likely to use bear bile multiple times within a month, although there was not a statistically significant difference in the frequency that bear bile was used per month between the two cities.

Generally, these results show that HCMC individuals are more likely to use bear bile medicine in preventative ways, to improve their overall health, while in Hanoi bear bile appears to be used only when needed, rather than as a general health improvement. Although we did not identify any significant demographic trends, including age, in users of bear bile in either city, earlier research has shown that older individuals are more likely to use bear bile as a health tonic (Drury, 2011).

4.2. Prescription of bear parts as medicine across Vietnam

Practitioner responses showed that 3% ($n = 25/800$) of the individuals surveyed are still prescribing bear bile products for their patients, despite the ban on doing so. This was a direct report, and so may be substantially lower than the "true" prevalence of bear bile prescription occurring within the Vietnamese Traditional Medicine Association, due to potential response bias (e.g. Nuno and John, 2015). To obtain an accurate measure of prescription occurrence in Vietnam, future studies should utilize specialized questioning techniques, which can counteract the issues of social desirability and illegality bias (Davis et al., 2019 and Nuno and John, 2015).

4.3. Motivations and influences of consumers

Prevalence of use was much higher in Hanoi (45%) than in HCMC (18%). This estimate was gathered through direct questioning, it may be biased by social desirability and/or illegality concerns. Therefore, it is possible that the true prevalence of use is higher in actuality. One example of potential social desirability bias occurred in HCMC, with men admitting to use more frequently than women do ($p < 0.05$). Previous research investigating other socially sensitive behaviors such as sexual activity has shown that women are less likely to admit to the behavior in question (de Jong et al., 2012), so it is possible that the "true" level of use in HCMC could be gender-balanced. In Hanoi, admittance of use did not vary between genders, which may reflect the true patterns of use, and/or less social desirability bias present among the women surveyed. However, both practitioner and consumer respondents interviewed from both cities believed men used bear products more frequently (but this may also reflect social desirability bias among women). Although women may be unwilling to appear to seek bear bile out, they will accept and use it when it's given to them, evidenced by several women interviewed stating that they were given the product by their husband/male relatives. Moreover, some bear products appear to be solely the provenance of women (e.g. bear gallbladder wine for post-partum ailments in Cambodia (Davis, 2019)), a similar trend could be occurring in Vietnam.

Qualitative responses from users of bear bile in Hanoi (66.7%, $n = 10/15$) perceived bear bile to be very effective for topical application to reduce bruising. It was argued to be more effective than natural herbal alternatives such as the plant *Co Mat Gau* (*Vernonia amygdalina*) and safflower (*Carthamus tinctorius*). Respondents stated that both these herbal treatments act as bear bile does in that they break up congested blood and disperse heat. We were unable to elucidate a clear reason for this perceived dichotomy in efficacy between herbal alternatives and bear bile/gallbladder. Therefore, it is reasonable to conclude that the motivations behind use are more complex than simple efficacy and/or pharmaceutical delineations. In addition, ingrained beliefs in the greater power of wild bear bile/gallbladder (over and above farmed bile or herbal remedies) were also found as a recurring theme in the qualitative interviews, which is a similar result to what was found by Drury (2011), and corroborates recent research in Laos (Davis et al., 2016).

A previous study of Hanoi residents, found that consumers value bear bile primarily for its medicinal properties, and broadly consider it an effective and necessary household medicine (Drury, 2009a, 2009b). Concerns as to the efficacy of farmed bear bile encouraged some consumers to seek whole bear gallbladders and bile from wild bears. Thus, using the case of bear bile in Vietnam, this study provides further support to these previous findings that once products have become established in society and perceived as essential, the overall demand for wild-caught products may eventually increase (Drury, 2009a, 2009b). Farmed bear bile may provide a cheaper entry-level product for consumers, which later seek out the ostensibly superior wild-sourced products. Therefore the market created by the widespread availability of farmed bear bile ultimately results in greater demand for wild products (Drury, 2009a, 2009b; Meacham, 1997; Robinson et al., 2007; Shairp et al., 2016). This is supported by the results of this study, which indicate a move within urban Vietnamese bear bile consumers away from farmed bear bile, yet no significant moves away from the act of consumption altogether. In addition, although several consumers reported belief in wild bear bile efficacy over farmed, an equivalent number of consumers in both cities did not express a strong preference for either. These results give yet more support to the assertion that bear bile farming in Vietnam acted to encourage prevalent use, which has continued into the present.

Some practitioners expressed that certain patients had concerns about possible health risks associated with bear bile consumption. Although this concern was not often discussed in the qualitative interviews of consumers, some non-users in HCMC were more vocal when giving reasons for not using bear bile/gallbladder. For instance, one woman who was interviewed discussed feeling sad when she saw the process of bile extraction on television. Another individual in HCMC said that he too felt sad at the thought of an animal potentially being killed for a product, and that it was illegal to consume such products. One woman in HCMC specifically stated conservation concerns as a reason not to use bear bile, as well belief in its ineffectiveness. Finally, another non-user of bear bile in HCMC stated that he too believed that it was ineffective, as he had not observed any significant difference between users and non-users. Only one individual in HCMC who had used bear bile for topical application said that he did not think it was effective, and would not use again. The same individual also stated that he did not believe any wildlife product was effective; rather the use of such products was only for communicating prestige and high status. Dissatisfaction with the effectiveness of bear bile as medicine was found to be to a factor contributing to the declining consumer demand for farmed bear bile in Vietnam (Crudge et al., 2018).

An individual's social group appears to be by far the most powerful factor affecting the use of bear parts, based on the insights obtained in the qualitative interviews, where bear bile was almost exclusively given as a gift. This is an important finding, as previously the prescription of

bear parts by practitioners was thought to be a primary influence. Instead, bear bile may act as a tool to strengthen social relationships, and its use may be maintained through such actions. A common theme present in the qualitative interviews was that of bear bile having been given to the individual, or being given to others, usually when the recipient had suffered some sort of ailment. One individual stated that in his social group, which included government officials, bear bile is often given as a present. The giving of bear bile is therefore an act of care, and a way to increase one's prestige in certain circles, with prestige recognized here as being separate from notions of "status", in that it refers to a "valuative element" (Wegener, 1992). In this instance, prestige translates to increased relationship "credit", sometimes termed social capital (Lin, 1999). Another factor influencing the social dynamics of bear bile/gallbladder for medicine is the preference for wild bile over farmed (Crudge et al., 2018). Although farmed bear bile is relatively low financial investment, several individuals said that they were given what was claimed to be wild bear bile by friends, which indicates a moderate level of financial investment and by extension increased social investment.

Giving wildlife products as gifts is practiced in Vietnam, including the gifting of bear bile (Drury, 2011). From our findings, bear bile appears to still be a relatively popular and prevalent gift within Vietnam, likely in part because bear bile continues to be easily accessible for most Vietnamese, especially in the cities where farmed bear bile is cheap (Crudge et al., 2018). More generally, this trend indicates the overall inefficacy of attempts to change this behavior within Vietnam, including such interventions as television ads, sponsored herbal medicine health checks, and other interventions. Considering these social dynamics, it is possible that efforts to end the consumption of bear bile for medicinal purposes will continually be hampered by these social status factors at play, and need to be included in demand reduction strategies. Although the market for farmed bear bile does appear to be decreasing, as long as bear bile remains relatively affordable and accessible, it may persist as a form of social capital. Although individuals stated a preference for wild bear bile over farmed bile, our results show that individuals will still be grateful to receive farmed bear bile. Thus, both commodities of farmed and wild bear bile/gallbladder will continue to generate social capital and strengthen relationships between individuals.

Such complex social dynamics in the general use of bear products are also reflected in individuals acknowledging that others were using bear parts, but not reporting that use to the authorities. This kind of inaction and acceptance of bile use as a social norm allows users of bear products to feel that they will not be punished, which contributes to the continuity in bear product consumption.

A limitation here is that specialized questioning techniques were not used for gathering accurate data from consumers or practitioners. Additionally, non-response rates for mail survey questions are high, thus hampering conclusions to be drawn from the practitioner data. While our samples may not be representative of the population of Vietnam and generalization of the results limited, this study provides critical insights into key drivers of prescription and consumption for direct behavior change interventions and demand reduction campaigns tackling to tackle the use of bear bile in Vietnam.

5. Conclusion and recommendations

Here, we provide more comprehensive insights into the medicinal consumption of bear bile in Vietnam. The mixed methods approach of questionnaires and interviews has led to a better understanding of the practices and social aspects involved, with the subsequent result of a more robust suite of information upon which to develop initiatives designed to tackle the consumption of bear products.

From our findings, it is apparent that consumers and practitioners are two separate groups that will have to be targeted in specific ways. Currently, practitioners believe that bear bile can cure a wide range of health complaints, and conservation was not cited as a prevailing concern. As such, practitioners may be willing to obtain bear bile products when patients request it, if they believe that bear bile products are effective and easy to access.

These results demonstrate that bear bile is still a prevalent form of medicine in Hanoi and HCMC; however, the behaviors driving this use are spatially variable. For example, more in-depth research is necessary to understand why use in HCMC is more ingrained within daily ritual, versus the Hanoian method of taking bear bile/gallbladder as a treatment. Additionally, admittance by gender varies across the two sites, and it may be worth exploring this dichotomy, to inform and enhance future behavior change initiatives.

For all sites, respondents who used bear bile appeared to be convinced of its efficacy by their social networks. Recognizing the powerful role these social networks play will be another essential component of behavior change campaigns in Vietnam. Indeed, we have shown that it is not the practitioners prescriptions or influence, but rather the social aspects of friends and relatives, which are critical in embedding the perceived benefits of bear-bile to their health within their social networks. Furthermore, the prevailing belief in bear bile medicinal efficacy present among consumers as well as non-consumers is a significant hurdle and one that must be acknowledged when crafting behavior change campaigns. In addition, our results show that the farming of bears has not been a conservation positive option in Vietnam. The extensive availability of bile has clearly not sated consumer demand, and alternative conservation initiatives will need to be implemented to address this continuing preference for bear bile. It is widely agreed that the illegal trade in wildlife products needs to be addressed with interventions at both the supply- and demand-side (Veríssimo and Wan, 2019; Wallen and Daut, 2018 and Willemsen and Watson, 2018); as supply-side interventions have not worked in Vietnam for addressing bear bile use, demand reduction initiatives should be adopted.

Thus, this research serves to deliver supply-side insights, as well as insights for initiatives intended to reduce the demand for bear products in Vietnam. Such research is vital for the development of effective behavior change interventions to user groups and/or tackle motivations for consumption of wildlife products with tactics that resonate, and to monitor the efficacy of such interventions over time and space. Furthermore, with the improved sharing of information and publishing of these results it may become possible to find commonalities in motivations and deliver more generalized demand reduction campaigns tackling these motivational clusters for a wider range of species products (Thomas-Walters, 2018). Finally, the improved collaborative efforts between different organizations to tackle the illegal trade chain from all angles (i.e. demand, supply and actors in between), will result in more effective interventions to reduce the threat of illegal trade to wildlife populations in Southeast Asia.

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