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Who eats wild meat? Profiling consumers in Ho Chi Minh City, Vietnam

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Abstract

1. Overexploitation for consumption of meat from wild animals in urban centres currently threatens numerous species across the globe. Indiscriminate offtake to satisfy demand for wild meat affects a range of wildlife of conservation concern in Vietnam. It is essential to understand the consumption of wild meat in Vietnam in order to ensure it is not detrimental to wild species.

2. We apply the principles of target audience segmentation to a sample of 384 respondents who had consumed wild meat in the previous year in Ho Chi Minh City, Vietnam. We carried out a cluster analysis to divide wild meat consumers into subgroups considering demographic, behavioural and psychographic variables.

3. We found three consumer groups: Classic Consumers (older, less educated), Up-and-coming Professionals (younger, wealthier, more educated) and Students. Compared to Students, Classic Consumers and Up-and-coming Professionals were significantly more likely to have paid for their meal at wild meat restaurants and to have ordered a combination of wild meat and other types of food rather than other types of food only.

4. Classic Consumers match previous characterisations of wild meat consumers, but the other two groups should also be considered in demand reduction campaigns. As Students appear to have limited influence on restaurant/food choices in certain social contexts and less propensity to eat wild meat, Up-and-coming Professionals may be an important target group.

5. A wide variety of species are consumed in wild meat restaurants. Some, such as pangolins, are of conservation concern and were consumed by 5% of our respondents. This is potentially an unsustainable level of consumption.

6. Our study showcases an audience segmentation approach to understanding wildlife consumers and provides insights for behavioural interventions and further research to curtail demand for wild meat in Ho Chi Minh City, Vietnam where it is of conservation concern.

1 | INTRODUCTION

Overexploitation has caused severe declines in terrestrial wildlife populations in Southeast Asia in the last three decades (Duckworth et al., 2012; Harrison et al., 2016). While there is a prevailing demand for wildlife for various uses, Gray et al. (2017) argue that indiscriminate hunting in the region persists primarily to satisfy demand for meat from wild animals (hereafter 'wild meat'). Vietnam is one of the countries where wildlife has been gravely affected by unsustainable offtake and where demand for wild meat has been highlighted as a key driver (MacMillan & Nguyen, 2013; Nguyen et al., 2019; Sandalj et al., 2016; Shairp et al., 2016). In Vietnam, poor law enforcement fails to deter poaching and trafficking, while pervasive demand for wildlife continues to drive illegal exploitation (Duckworth et al., 2012; Gray et al., 2017; MacMillan & Nguyen, 2013). Wild meat is consumed by rural communities and hunters' families but many species, including pangolins, have a high market value and are illicitly sold to middle men, traders and restaurants for consumption in large urban centres (Harrison et al., 2016; MacMillan & Nguyen, 2013). In the Vietnamese context, Hanoi, Ho Chi Minh City (HCMC), Hai Phong and Hue are some of the many cities where illegally sourced wild meat is consumed in restaurants, despite attempts by local authorities to bring these establishments into compliance with the law (Drury, 2009; Nguyen, 2008; Sandalj et al., 2016).

This illegal trade exists in the context of a legal trade in wild caught and captive bred wildlife. Commercial farming of wildlife provides a legal supply of certain species (e.g. deer, snakes and porcupines) to restaurants (Brooks et al., 2010; Nguyen, 2008; WCS, 2008). However, this legal trade is not closely regulated in Vietnam, facilitating the illegal trade by enabling the laundering of wild caught specimens (Brooks et al., 2010). In July 2020 (after our study), in light of the COVID-19 pandemic, Vietnam passed a new directive which calls for the enforcement of existing laws to eliminate markets and other establishments where advertising, buying, selling and consuming illegal wildlife products takes place. This directive was introduced in order to minimise any potential public health risk associated with the consumption and trade in wild animals (Directive No. 29/CT-TTg). It remains to be seen if and how this law will be enforced.

There is a recognised need to address demand for, and consumption of, wild meat where it constitutes a threat to species through initiatives that change consumer behaviour (e.g. Gray et al., 2017; Harrison et al., 2016; Shairp et al., 2016). Critically, interventions must go beyond providing information on existing laws and penalties, to focus on influencing consumers' choices the species and products they consume. Research demonstrates that initiatives based on the 'knowledge deficit' model are rarely effective in achieving a change in human behaviour (McKenzie-Mohr et al., 2012) and therefore, carefully designed, tailored and evidence-based messages that align with the motivations for consumption must be delivered (Olmedo et al., 2018; Veríssimo et al., 2020). Many wildlife products are illegally traded and consumed by different actors for various purposes (e.g. pangolin meat, timber and rhino horn), and there is no single intervention that can curb demand across all products and users, or even address all uses for a single product (Thomas-Walters et al., 2020). To understand the drivers of wild meat consumption and how they can be addressed, it is crucial to understand who the individuals consuming a given product are and the context in which consumption takes place (Veríssimo et al., 2020).

To characterise the different consumer groups involved in the consumption of wild meat in Vietnam, we applied the principles of audience segmentation; a social marketing technique that defines similar subgroups within a wider audience and identifies a segment for intervention implementation (Longfield et al., 2016). Segments can be identified by exploring demographic, psychographic and behavioural characteristics which allows researchers to define a segment's profile, purchasing power, consuming habits and attitudes (Kitunen et al., 2019; Kotler, 2002). Demographic characteristics are the most popular for consumer segmentation because they are the easiest to measure; they include gender, age, income, profession and education. Reference to these characteristics at the end of the segmentation process is useful to identify the distribution channels required to reach specific segments (Kotler, 2002). Psychographic characteristics define a group's values, personality or lifestyle, and behavioural characteristics provide data on the use of a product, consumption habits and occasions on which a product is used (Kotler, 2002). Once segments have been identified, researchers and/or practitioners can select one or more of them to target. Segmentation has proven successful in guiding the design of targeted interventions in public health (Kitunen et al., 2019) and environmental conservation efforts (Metcalf et al., 2019) but is not yet used widely in biodiversity conservation (Jones et al., 2019).

Research carried out in urban centres in Vietnam demonstrates that most wild meat consumption occurs in restaurants, as opposed to households (Do et al., 2011; Drury, 2011; Sandalj et al., 2016). Furthermore, the literature on restaurant choice identifies multiple factors which guide choices, including satisfaction with the experience, dish options and perceptions of tastiness. Two different stimuli that affect food likeability have been identified: food-internal stimuli, which refer to the food taste, texture, temperature, sound and appearance; and food-external stimuli such as societal influence, availability of food and health information (Eertmans et al., 2001). Social consequences, activities and interactions associated with food consumption are also important determinants of food choice (Desmet & Schifferstein, 2008; Rozin & Vollmecke, 1986). Beyond food, several other factors also influence satisfaction with a dining experience; waiting time, quality of service, responsiveness of front-line employees, menu variety, food prices, food quality, food-quality

consistency, ambience of the facilities and convenience (Andaleeb & Conway, 2006; Gupta et al., 2007; Ladhari et al., 2008).

In this study, we aimed to use the food-choice literature to gain an understanding of wild meat consumption behaviour in wild meat restaurants in HCMC, Vietnam. We define wild meat restaurants as those that sell wild meat, although these same establishments most often also sell other kinds of food, for example seafood and meat from domestic animals. We offer insights for the development of behavioural interventions for species of conservation concern in need of reduced consumption. We focused on HCMC as previous studies have found active wild meat consumption in the city (Do et al., 2011; Nguyen, 2008; Olmedo, Veríssimo, Milner-Gulland, et al., 2021; Shairp et al., 2016). This city also has among the highest income per capita in the country, meaning residents have higher disposable incomes and can more likely afford aspirational products, including wild meat (General Statistics Office, 2019). We conducted audience segmentation to discern consumer types based on demographic, psychographic and behavioural differences, and identified motivations for consumption of different meat products. This study aims to contribute to the literature on wild meat consumption by carrying out audience segmentation of wild meat consumers and exploring motivations for restaurant-based wild meat consumption using a food-choice framing.

2 | METHODS

2.1 | Sampling strategy

We aimed to obtain a sample of individuals who had frequented wild meat restaurants in HCMC in the 12 months prior to the survey. To calculate the sample size, we assumed random sampling, a confidence level of 95% and a 5% confidence interval (or margin of error). We estimated that a sample of 384 respondents would ensure the inclusion of consumers of even less commonly consumed wild meats, such as pangolin, based on the lower bound of consumption prevalence estimated in a survey of residents of HCMC (Olmedo, Veríssimo, Milner-Gulland, et al., 2021). We aimed to survey 400 individuals to account for incomplete or invalid responses. We ncluded individuals that had resided in HCMC for at least a year prior to the survey, were 18 years of age or older at the time of the survey and gave their free, prior and informed consent to participate. This research was approved by the University of Oxford's Social Sciences and Humanities Inter-Divisional Research Ethics Committee (R59702/RE003).

We collected data in the urban districts of central HCMC (District 1, District 2, District 3, District 4, District 7, District 8, District 10, Tan Binh, Go Vap, Thu Duc) as this is where the majority of known wild meat restaurants are located (Do et al., 2011; Lê Long, pers. comm.). We used non-probability and targeted sampling (Newing et al., 2010), with intercept surveys in areas with high foot traffic near restaurants known to sell wild meat. The aim of this approach was to increase the probability of encountering customers of these

restaurants. Previous research in Vietnam has suggested that trade and consumption of wildlife in restaurants, including wild meat, are sensitive behaviours, as many of the species that are sold are nationally protected, and trade and consumption of these species are illegal (Olmedo, Veríssimo, Milner-Gulland, et al., 2021; Sandalj et al., 2016). To mitigate the potential of non-response and social desirability bias, therefore, questionnaires were conducted using tablets and self-administered by respondents (St. John et al., 2010; Tourangeau & Yan, 2007). We did not ask directly about the consumption of illegal products, but allowed respondents to indicate themselves which species they had consumed. Data were collected in April and May 2019 by a team of seven local Research Assistants who visited survey locations on afternoons and evenings throughout the week.

2.2 | Survey instrument

Our questionnaire collected data on respondent demographics, food consumption, food satisfaction, restaurant selection and animals consumed (Supporting Information 1). Demographic characteristics included gender, age, education, profession and income. Direct questions on reasons for selecting restaurants, food choice and the social context of food consumption were multiple choice questions where respondents could also select 'Other' and 'Don't know/Don't want to answer'. The literature on food likeability and selection and restaurant satisfaction and choice were consulted to guide the design of the questions (Andaleeb & Conway, 2006; Gupta et al., 2007; Ladhari et al., 2008). Questions regarding the social context in which consumers visit wild meat restaurants were informed by the research conducted by Sandalj et al. (2016), who found that people in the city of Hue are likely to visit wild meat restaurants with friends, family and/or colleagues. Questions on species consumed were informed by a list of animals found in wild meat restaurants in studies conducted elsewhere in Vietnam (Sandalj et al., 2016; WWF, 2017). A list of species was presented to respondents so they could select which they had consumed; they also had the option of adding 'Other' if an animal they had consumed was not on the list. Although we used common names for species or species groups (e.g. 'pangolin', which encompasses eight species, or 'snake'), we used the IUCN Red List of Threatened Species to identify, as far as possible, animals native to Vietnam of conservation concern which would benefit from a reduction in consumer demand. It was beyond the scope of this study to assess whether respondents believed the wild species consumed in restaurants were indeed wild caught as opposed to farmed, to inquire with the restaurants themselves about the origin of wild species served, or determine the legality of specimens reportedly consumed by respondents.

Respondents were also asked to rate attributes of meat types on a 5-point Likert scale. The list of food attributes comprised taste, freshness, quality, health value and price, and was informed by food preferences and motivations for wild meat consumption in Vietnam (Drury, 2009; Rozin & Vollmecke, 1986; Sandalj et al., 2016;

WWF, 2017; Zhang et al., 2012). The scale was bipolar and all the points on the scale were given text labels (Krosnick & Berent, 1993; Krosnick & Fabrigar, 1997).

The questionnaire was piloted with 40 respondents in our survey locations prior to data collection; these data were not included in the final dataset. Piloting led to the addition of a final question regarding the frequency with which respondents purchase wild meat in restaurants to be consumed elsewhere. This is because our research assistants encountered individuals who explained that they do not consume wild meat at restaurants but purchase it to consume it at home. This question was added to determine whether purchasing wild meat for consumption away from a restaurant was a prevalent behaviour which ought to be considered in future interventions.

2.3 | Analysis

To explore the demographic characteristics of respondents we grouped education, income and profession levels into broader categories (Supporting Information 2). To segment our respondents, we performed a two-step cluster analysis in SPSS 26.0, which generated subgroups with similar demographic and psychographic characteristics, and relationships to wild meat consumption. A two-step cluster analysis first groups individual cases into pre-clusters. The algorithm determines if each case should be grouped with a previously formed pre-cluster or if it should start a new pre-cluster based on log-likelihood distance. The pre-clusters are then consolidated into the best number of clusters based on Schwartz's Bayesian information criterion (Norusis, 2012). This analysis was considered most appropriate because it allows exploratory testing, where numbers of clusters do not need to be specified prior to analysis, and it can be used with categorical data (Kitunen et al., 2019). Cluster quality is evaluated based on the average silhouette score; a measure of the similarity (cohesion) between the elements within a cluster and the difference (separation) between clusters (Norusis, 2012). This score is presented between –1 and 1; the higher the score, the smaller the distances within clusters and the larger the distances between clusters. If the score is, or is close to, zero the average distance among cases within a cluster is the same as the distance between those cases and those in adjacent clusters. If the score is negative, the average distance among cases within a cluster is larger than the average distance to adjacent clusters (Norusis, 2012). Thus, the higher the score, the stronger the cluster quality (Rousseeuw, 1987).

We started with all variables except those that resulted from questions that are conditional on previous answers (i.e. only respondents who stated that a different person had paid for a meal at a restaurant for them were asked who this other person was), and those which represented a behaviour to be influenced rather than the respondents' characteristics. Variables were first tested for collinearity using CRAMER'S V Package for nominal variables. No collinearity at or above an association coefficient of 0.7 was found. To determine the variables that differentiated respondents the most, in

order to form clusters, we looked at the predictor importance score of each variable. This reveals which variables vary most between respondents and are therefore the most useful for cluster creation. We then sequentially removed variables with the lowest predictor importance score until the silhouette score could not improve further while maintaining a small number of large clusters, following Norusis (2012).

Once the clusters were identified, we conducted a multinomial regression analysis in R 3.5.2 using the NNET package (R Core Team, 2019) with behavioural variables that could inform the selection of a segment for a behavioural intervention. We chose behavioural variables that characterised a respondent's agency and consumption habits. With respect to agency, an effective intervention would target people who have the power to change their own behaviour. Behavioural models contend that having the social opportunity and psychological capability, or the perceived ability to perform a behaviour, are essential to enacting a behaviour (de Vries, 2017; Michie et al., 2011). The variables chosen in relation to respondent agency were; whether the respondent had selected the type of restaurant to attend, and whether they paid for the meal themselves (or had split the cost or someone else paid for them). With respect to consumption habits, we were aiming for people who were most likely to order wild meat dishes once in the restaurant, as they would be targets for interventions. Social marketing literature suggests prioritising a high-impact behaviour to guide intervention design and achieve the desirable outcome (Lede et al., 2019; Schultz, 2011); in our study, this ordering wild meat. The variable chosen was: whether an individual was more or less likely to order: (a) wild meat only, (b) meat from domestic animals/seafood/another type of food or (c) a combination of the two. The multinomial analysis was completed with a two-tailed z test to calculate the p-value of the coefficients and determine statistically significant differences between groups.

3 | RESULTS

3.1 | Wild species consumed

A wide variety of wild species is consumed in wild meat restaurants; wild pig, deer and junglefowl were the most common (Figure 1). Individuals who typically eat wild meat are more likely to order it with other types of food than by itself. Only 16% of respondents claimed to typically order only wild meat at these restaurants. One third of all respondents stated that they typically order only domestic meat (i.e. beef, pork, chicken or buffalo), seafood or other food types, rather than wild meat or a combination of the two. However, when asked about the last time a wild meat restaurant was visited, less than 5% of respondents claimed to have solely eaten a different type of food to wild meat. This reveals a stark difference with claims made of typical consumption at wild meat restaurants, and suggests that 95% of respondents consumed some form of wild meat the last time they frequented a wild meat restaurant.
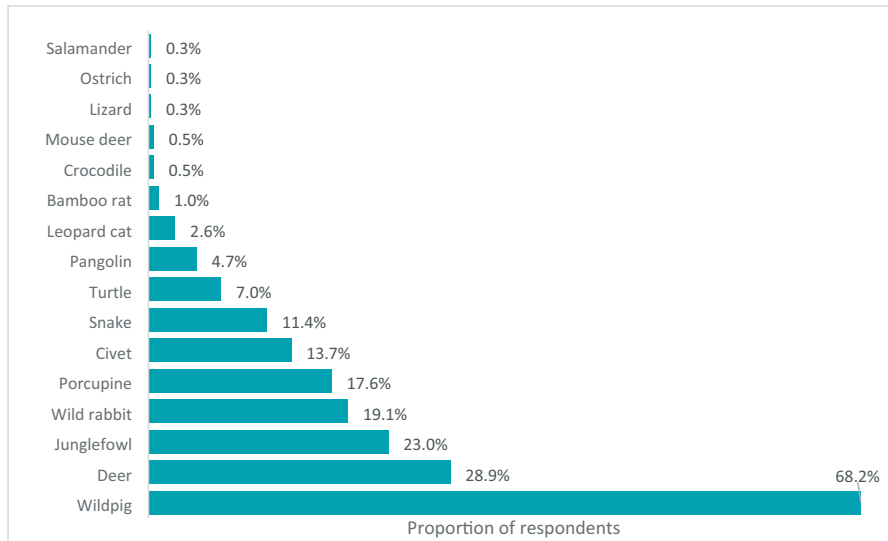
FIGURE 1 Wild species consumed by respondents the last time they frequented a wild meat restaurant (% of respondents stating they had consumed this meat). Respondents could select multiple animals
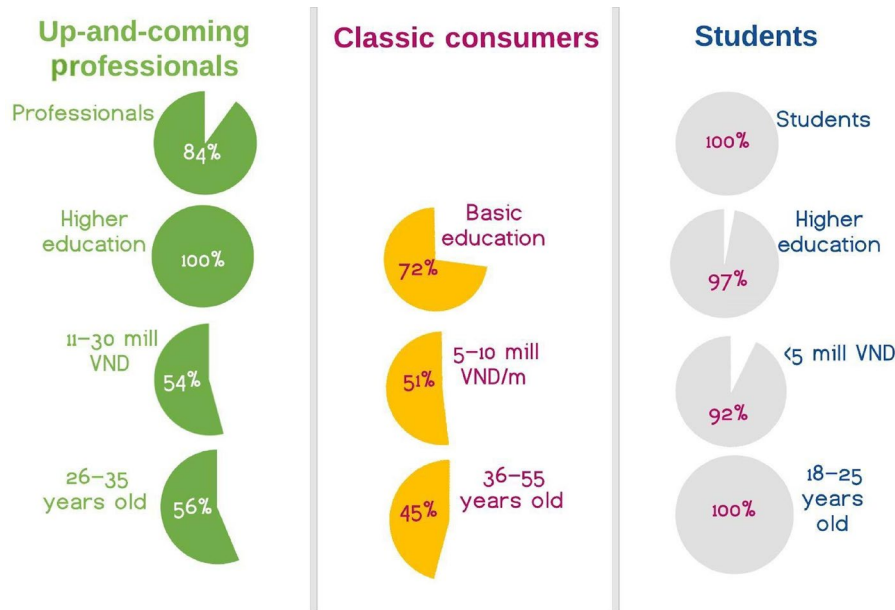

FIGURE 2 Cluster analysis results depicting three clusters of patrons of wild meat restaurants in Ho Chi Minh City, Vietnam. Variables are presented in order of predictor importance (top to bottom)

Only two species or groups from the list in our questionnaire could be unquestionably categorised as of conservation concern: pangolins (*Manis javanica*, *Manis pentadactyla*, *Manis crassicaudata*, *Manis culionensis*, *Phataginus tricuspis*, *Phataginus tetradactyla*, *Smutsia gigantea* and *Smutsia temminckii*), as all eight species are threatened, and wild rabbits, which we infer to be the Annamite-striped rabbit *Nesolagus timminsi*, which is endangered. Both are known to be threatened by overexploitation for consumption (Supporting Information 3). Our results indicate that 19% and 5% of all respondents had consumed wild rabbit and pangolin respectively the last time they visited a wild meat restaurant (Figure 1). It is possible restaurants are serving farmed rabbit or hare rather than *N. timminsi* because it is considered rare (Tilker et al., 2019). Other

species consumed may well include species of conservation concern (see Supporting Information 3), but as the exact species consumed are not known, it is impossible to state with certainty.

3.2 | Clusters

Our analysis of a total sample of 387 respondents (after removing incomplete answers) produced three consumer groups with an average silhouette score of 0.5, which represented a good separation of clusters. We labelled the groups in a way that summarised their main characteristics, as Up-and-coming Professionals, Classic Consumers and Students (Figure 2). A visual summary of the

descriptive statistics of all respondents is provided in Supporting Information 4.

The Up-and-coming Professionals, which represent 50.3% of respondents, are mostly professionals who have received higher education, earn 11–30 million VND (Vietnamese Dong)/month, which is above the average income for HCMC overall (~6.3 million VND, General Statistics Office, 2019) and are 26–35 years old (Figure 2). The majority of individuals who belong to the Classic Consumers, representing 31.7% of respondents, have received basic education, are middle-aged (36–55 years old), and earn 5–10 million VND/month (Figure 2). Students, which make up 18% of respondents, are students who fall in the lowest income category, are between 18 and 25 years old, and have received higher education (Figure 2). Variables excluded from the cluster analysis because they do not significantly differ between groups are summarised in Table 1.

Psychographic variables, including the reasons why people go to wild meat restaurants, their opinion on the most important food attribute and their rating of food attributes, did not differ between groups (Figure 3). With regard to the choice of restaurant, *Food* was the main reason, followed by *Not my choice* (Figure 3a). *Price*, *Reputation* and *Ambiance* were the least-selected reasons for going to a wild meat restaurant. Regarding the attributes of food in the restaurant, *Taste* was most important, followed by *Variety of options* (Figure 3b). Only 2% of respondents valued *Price* most highly. Attributes were relatively consistently rated, with 'Okay' and 'Good' being the most usual answers (Figure 3c).

TABLE 1 Summary of the demographic and behavioural variables excluded from the cluster analysis (% of respondents in each category)

Variable	All respondents
Gender	Male: 63%
	Female: 35%
	Other gender: 0.8%
Group gone to the restaurant with	Friends: 61%
	Family: 50%
	Colleagues: 34%
Last time restaurant was visited	In the last 6 months: 29%
	In the last 3 months: 24%
	In the last month: 18%
	In the last year: 18%
Purchased wild meat as take-away	Never: 57%
	1–3 times in the last year: 21%
	1–3 times in my life: 8%
	1–3 times a month: 4%
	Once a week: 3%
Number of people the restaurant was visited with	1–5 people: 47%
	6–10 people: 42%
	11–20 people: 7%
	>20 people: 1%

The person who paid for the meal and the type of food typically consumed significantly differed between consumer groups (Figure 4). Students were significantly more likely than Up-and-coming Professionals and Classic Consumers to have someone else pay for the meal at wild meat restaurants, and to order meat from domestic animals, seafood or another food type instead of a combination of these and wild meat. Family (24%) and older relatives (21%) were most likely to cover the cost of Students' meals.

4 | DISCUSSION

Previous studies have identified one primary wild meat consumer group in Vietnam, characterised as wealthy, educated, middle-aged men. Here, we use data collected from people known to have frequented wild meat restaurants in the year to demonstrate that there is more heterogeneity among wild meat consumers than was previously known. While it is highly probable that one of the target groups we identified through the cluster analysis, Classic Consumers, is the consumer group other studies described in HCMC as well as other localities in Vietnam (Do et al., 2011; Drury, 2011; Sandalj et al., 2016; WWF, 2017), we identified two more consumer groups in HCMC. We have also gained insights into the demographic, psychographic and behavioural profiles of three different consumers groups, using a food-choice framing. This lays the foundations for evidence-based behaviour change interventions for these audiences. Considering multiple attributes of consumers enabled us to gain a deeper understanding of the context in which wild meat is consumed in HCMC. This contrasts to segmentation studies which focus solely on demographic and geographic information to target consumers (Kitunen et al., 2019).

Our results reveal that not all consumers have the same agency when consuming wild meat at a restaurant. In particular, Students lack agency in the choice of restaurant and tend not to pay the bill either (Table 2). Previous research conducted in HCMC (Do et al., 2011) identified individuals from 26 to 35 years of age as a consumer group for wildlife products generally, including wild meat. This age group matches the majority of our Up-and-coming Professionals group. Individuals in this group are more likely than Students to pay the bill at the restaurant, indicating they have the financial means to pay for a potentially expensive meal and suggesting they have more agency. Demographic characteristics of Classic Consumers match descriptions of previously identified wild meat consumers (Do et al., 2011; Drury, 2011; Sandalj et al., 2016; WWF, 2017). However, an interesting nuance is that, although Classic Consumers have a lower income than the Up-and-coming Professionals, they are just as likely to pay for the meal themselves. They also typically consume wild meat at these restaurants, which is more expensive than other meats (Drury, 2011; WWF, 2017). This suggests that, contrary to previous studies, wild meat is not solely a delicacy consumed by wealthy individuals; although differences with other studies may be also attributed to regional differences throughout the country (Table 2; Drury, 2011; Sandalj et al., 2016; Taylor, 2013).
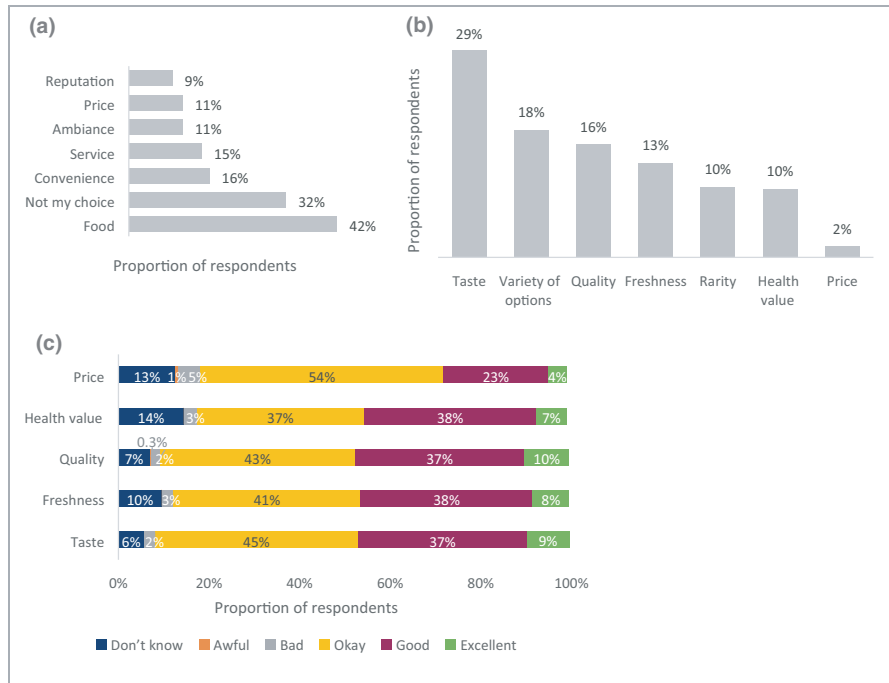
FIGURE 3 Psychographic variables excluded from the cluster analysis presented by proportion of all respondents. (a) Reasons for going to a restaurant. (b) Food attributes valued the most. (c) Rating of food attributes based on the last time respondents went to a wild meat restaurant.
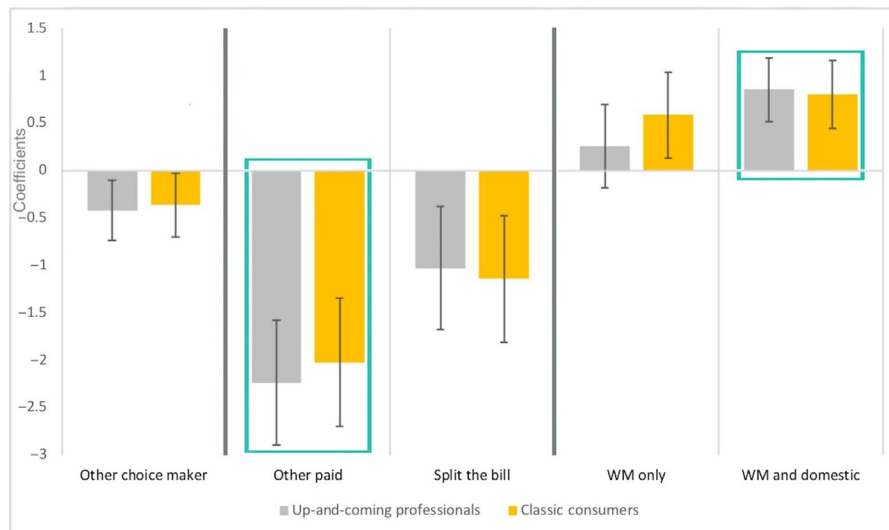

FIGURE 4 Multinomial results depicting differences between consumer groups in their behaviour at wild meat restaurants, with the y-axis showing differences from the respective reference levels with respect to three factors. The two groups shown are Up-and-coming Professionals and Classic Consumers, with Students as the reference level. Of the three factors shown, two relate to respondents' agency [who chose the restaurant—the respondent (reference level) or another; and who paidrespondent (reference level), another person, or the bill was split] and one relates to Consumption Habits [what meat was eaten in the meal—Domestic meat (reference level), wild meat only or wild meat and domestic meat]. Statisically significant results are highlighted in blue boxes. Wild meat is abbreviated as WM. Bars represent the Standard Error

A third of all consumers claim not to have chosen to go to a wild meat restaurant. Two factors may explain this: (a) consuming wild meat in HCMC and/or going to wild meat restaurants is a sensitive activity and perhaps individuals would rather not take responsibility for having done so (Olmedo, Veríssimo, Milner-Gulland, et al., 2021; Sandalj et al., 2016), or (b) some individuals who frequent wild meat

restaurants are invited by someone else and are treated to the meal (Drury, 2011; WWF, 2017). Our results suggest that this second explanation is likely for Students who have less agency in the choice of restaurant, and while we aimed to design our study to minimise response bias, it is still possible that social desirability bias influenced some respondents. Past research has determined that men are more

TABLE 2 Insights from our findings which could inform potential behavioural interventions to reduce the consumption of wild meat in Ho Chi Minh City, Vietnam

Research insight	Advise for potential interventions	Suggested actions
Students are likely treated to wild meat restaurants by older relatives and it is possible they do not consume wild meat unless they are invited to do so by family members	Students might not be in a situation where refusing to consume wild meat is socially acceptable. Messages aiming to convince this group to reduce their consumption at the restaurant are likely futile	Conduct further research to determine if it is socially acceptable for this group to refuse invitations to wild meat restaurants or to influence their family's restaurant choice, or choice of dish. Focus interventions on older relatives who pay for the meal
Classic Consumers consume wild meat despite not having a high income, unlike Up-and-coming Professionals	These consumers might be more habitual and their wild meat consumption behaviour might be harder to change than the other two groups	Investigate whether Classic Consumers consume wild meat, despite not having a high income, is because they eat cheaper wild meats or because they are hard-to-shift consumers. If the latter, this group might need more coercive measures (e.g. enforcement)
High expectations of food attributes (*Taste*, *Freshness*, *Quality*, *Health value* and *Price*) pertaining to a meal at a wild meat restaurant are not being met	Focus on positively framing these same attributes (particularly *Taste*, *Quality* and *Freshness*) linked to different types of food other than wild meat, and highlight the consistency with which a high expectation will be met when eating these other food types	Through social research (e.g. focus groups, interviews with restaurant staff, and restaurant goers) identify other food types that are considered to meet the described attributes
Although highly valued, *Taste*, *Quality* and *Freshness*, were not consistently rated positively, suggesting that qualities related to the meat itself are not the only motivation for consuming wild meat	Behavioural interventions might be more successful in addressing the consumption of wild meat if they consider both the food-internal stimuli (qualities of the food itself) and the food-external stimuli (e.g. social perceptions of conducting this behaviour)	Investigate the extent to which food-external stimuli (e.g. a tradition of consuming wild meat, and the anticipated social consequences of consuming these products) can compensate for lack of food-internal satisfaction
Consumers currently eat other types of food in wild meat restaurants or a combination of other food types and wild meat	Focus on descriptive social norms to highlight those customers who order other types of food	Test positive messaging focusing on descriptive norms with relevant consumer audiences. Ensure (via pre-testing) that messages will not inadvertently advertise wild meat to consumers
Purchasing wild meat at a restaurant for consumption elsewhere is not a highly prevalent behaviour	Focus on consumption of wild meat in the social context of visiting wild meat restaurants in HCMC	Test various types of behavioural interventions/messages addressing consumption of wild meat at restaurants. Support local authorities to limit the supply of species served and consumed at wild meat restaurants, particularly those that are threatened and protected by national law

likely to consume wild meat than women in Hue and Hanoi, and wildlife products in general in HCMC (Do et al., 2011; Drury, 2011; WWF, 2017), which aligns with our sample being male biased.

Our finding that Taste was the most important food attribute echoes research conducted on wild meat consumption in Sub-Saharan Africa where various studies, particularly in urban settings, have identified taste as a primary driver for wild meat preference. In these settings, wild meat is also preferred over domestic meat and frozen domestic meat because it is perceived as organic, fresh and healthier (Chausson et al., 2019), drawing additional parallels with perceptions in Vietnam. Drury (2009) argues that Hanoians consider wild meat delicious not only due to the physical qualities of the meat but also because of its association with power and wealth, due to its rarity and price. Other studies have discussed

the social consequences of consuming wild meat in Vietnam as a key motivation driving consumption, since engaging in this activity communicates one's prestige and social leverage (Drury, 2011; Shairp et al., 2016). These studies reinforce the literature arguing that social activities and interactions with food consumption are determinants of food choice (Desmet & Schifferstein, 2008; Rozin & Vollmecke, 1986). However, our results demonstrate a low proportion of individuals value food's *Rarity* and a low proportion choose a wild meat restaurant because of *Reputation*. Differences to past studies (i.e. Drury, 2011) might also be affected by the cultural differences between regions in Vietnam, or by the economic development which the country has seen since these previous studies were conducted (Taylor, 2013). Thus, we suggest exploring the external stimuli driving wild meat consumption further in future research.

The food attribute ratings, based on the last time a wild meat restaurant was visited, indicate that overall the expectations of a high proportion of consumers were not met for many. This was the case for three of the most highly valued attributes, *Taste*, *Quality* and *Freshness*. This is an opportunity for the design of behavioural interventions; potentially, providing alternative, more satisfying, experiences may draw people away from wild meat restaurants (Table 2). These findings also pose the question of why people continue to consume wild meat if important attributes of the meat itself are considered to be mediocre.

In line with previous findings that wild meat is typically consumed at restaurants (Do et al., 2011; Drury, 2011; Sandalj et al., 2016), we did not find evidence for a substantial take-away element to consumption. Therefore, we suggest that behavioural interventions to curtail the consumption of wild meat in HCMC should be tailored to the various social contexts in which wild meat restaurants are visited (Table 2). We found an inconsistency in that a third of all consumers claimed to typically eat other types of food rather than wild meat at a wild meat restaurant. However, when asked to list the species consumed the last time a wild meat restaurant was visited, only 5% of respondents indicated they had consumed types of food other than wild meat. There are several potential explanations for this. It may be an artefact of the timing of our study, perhaps the last visit was for a particular occasion in which customers were more likely to eat wild meat (although we were not aware of such an occasion in the calendar). Question placement may have contributed to this result, in that the question inquiring about the type of food typically consumed was early in the questionnaire, while the question regarding which species were consumed was later (Supporting Information 1). Thus, it is possible respondents felt more comfortable to divulge this information further along in the questionnaire. Finally, it is well known that responses to 'typical' questions about consumption do not always align well with responses to specific questions about the last consumption event, indicating reporting biases which might relate to the mismatch between people's conceptions of their behaviour and their actual behaviour (Stockwell et al., 2004).

Regardless, our results show that consumers are likely to consume other meats alongside wild meat. Given that consumers of wild meat already do this, there is an opportunity to design demand reduction interventions in a positively framed way that encourages a shift using descriptive norms rather than prohibiting a behaviour (Schultz, 2011; Thomas et al., 2017). This has been effective in public health in promoting healthy behaviours. For example, Thomas et al. (2017) found posters emphasising that a majority of people eat vegetables with their meal led to an increased proportion of meals purchased with vegetables in workplace restaurants in the United Kingdom. It may be particularly powerful in a restaurant setting because people can observe the behaviour of others and use it to guide their own behaviour (Table 2).

We identified several animals consumed as wild meat in HCMC. Wild pig is the species consumed most by respondents in our study in HCMC, which was also found in Hanoi and Hue (Do et al., 2011; Drury, 2011; Sandalj et al., 2016; Shairp et al., 2016; WWF, 2017).

Whether the meat served is wild boar, farmed boar, domestic or feral pig, is unknown and may vary between restaurants and/or cities. Further research is needed to establish if and to what extent wild animals, such as wild boar, are being laundered through commercial captive breeding facilities to better understand the relationship between legal and illegal wild meat trade in the country. Other species commonly consumed are deer, porcupines and snakes, which are probably supplied by wildlife farms (Do et al., 2011; Drury, 2011; Sandalj et al., 2016; Shairp et al., 2016; WCS, 2008; WWF, 2017). Species that do not appear to be as commonly consumed in our study, but have also been recorded in previous studies, are civets, turtles and pangolins (Do et al., 2011; Drury, 2011; Sandalj et al., 2016; WWF, 2017). Leopard cats and bamboo rats, while still present in the three cities, appear to be consumed less frequently both in our study and others (Do et al., 2011; Drury, 2011; Sandalj et al., 2016; WWF, 2017).

The results presented here and those from existing studies conducted elsewhere in Vietnam demonstrate demand for wild meat affects a wide range of species, some of which are likely being supplied by wild populations, thus providing an incentive for hunting and poaching in the country and elsewhere in Southeast Asia. Considering *Variety of Options* was identified as an important attribute, it is expected that restaurants will continue supplying various species in order to stay competitive, thus confirming a risk for a wide variety of taxa in Vietnam and potentially neighbouring countries. While some of the wild species served at restaurants are most likely supplied from farms (WCS, 2008), there is evidence that some farms have laundered wild caught animals as captive bred, which has contributed to declines in wild populations (e.g. porcupines; Brooks et al., 2010). Other studies in Hue and HCMC have identified a preference for wild caught animals over farmed wildlife (Sandalj et al., 2016; Shairp et al., 2016). However, preferences for wildlife species are not dichotomous (e.g. wild vs. farmed) and various other factors require due consideration (e.g. price and availability among others; see Hinsley & 't Sas-Rolfes, 2020). Considering the relatively high proportion of respondents who claimed to have consumed species of concern the last time a restaurant was visited, we conclude that consumption of wild meat in HCMC could be leading to the overexploitation of native wildlife. It is also possible that the consumption prevalence of each animal is underestimated in this study due to the sensitivity of consumption of at least one species group (pangolins), perhaps leading respondents to under-report consumption in direct questions (Olmedo, Veríssimo, Milner-Gulland, et al., 2021). This speaks to a general limitation of this work: although our study was designed to minimise response bias, it is possible that respondents still altered some of their answers due to the sensitivity of the topic.

In this study, we have sought to provide insights into the heterogeneity of wild meat consumers in HCMC, Vietnam, in order to offer recommendations for future research and conservation practice. Even though the three consumer groups we identified are consuming wild meat similarly and for similar reasons, they differ in their demographic characteristics and in the manner in which they engage

with wild meat restaurants. Thus, approaches developed to reduce the consumption of wild meat in HCMC will need to be tailored to each consumer group to increase their likelihood of being effective.

CONFLICT OF INTEREST

Huong Dao works for Save Vietnam's Wildlife, a wildlife conservation non-profit organisation in Vietnam.

AUTHORS' CONTRIBUTIONS

A.O. was involved in conceptualisation, instrument and sampling design, led piloting, data collection, result analysis and write-up; D.V. and E.J.M.-G. were involved in conceptualisation, instrument and sampling design and support with analysis and write-up; D.W.S.C. was involved in conceptualisation, instrument and sampling design and support with write-up; H.T.T.D. was involved in piloting and fieldwork.

DATA AVAILABILITY STATEMENT

Data for this publication are publicly available in figshare https://figshare.com/articles/dataset/AO_Data_xlsx/14306894 (Olmedo, Veríssimo, Challender, et al., 2021).

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.