

Audience research as a cornerstone of demand management interventions for illegal wildlife products: Demarketing sea turtle meat and eggs

Diogo Veríssimo^{1,2}  | Sara Vieira³ | Domingas Monteiro^{3,4} | Joana Hancock⁵ | Ana Nuno⁶

¹Department of Zoology, University of Oxford, Oxford, UK

²San Diego Zoo Institute for Conservation Research, Escondido, California

³Programa Tatô, Largo do Bom Despacho, Cidade de São Tomé, São Tomé e Príncipe

⁴MARAPA – Mar, Ambiente e Pesca Artesanal, Largo Bom Despacho - CP 292, Cidade de São Tomé, São Tomé e Príncipe

⁵CE3c - Centre for Ecology, Evolution and Environmental Changes, Faculdade de Ciências, Universidade de Lisboa, Edifício C2, 5º Piso, Sala 2.5.41 Campo Grande, Lisboa, Portugal

⁶Centre for Ecology and Conservation, College of Life and Environmental Sciences, University of Exeter, Penryn, Cornwall, UK

Correspondence

Sara Vieira, Avenida Amílcar Cabral no 27, Cidade de São Tomé, São Tomé, São Tomé and Príncipe.

Email: info@programatato.pt

Funding information

Oxford Martin School, University of Oxford, Grant/Award Number: Oxford Martin Programme on the Illegal Wildlife Trade

Abstract

The unsustainable wildmeat trade has been long recognized as a threat to wildlife. Yet, its impact on marine species has been underresearched. Sea turtles have been historically threatened by unsustainable trade, but there are few studies of consumer profile, motivations, and preferences. We conducted a survey in São Tomé Island, Gulf of Guinea, West Africa, including eight rural communities ($n = 1,160$) and the capital city of São Tomé ($n = 628$). We estimated prevalence of consumption, preference and availability of sea turtle meat and eggs. About 25% of rural and 32% of urban respondents had consumed meat in the past year. Around 25% of rural respondents were egg consumers, whereas little consumption was found in urban areas. Social norms were a predictor of consumption of sea turtle meat and eggs in rural communities but not in São Tomé city. Regarding influencers, teachers and religious leaders were the most trusted sources in rural communities, while teachers and NGOs were most trusted in São Tomé city. Radio and television were the most trusted channels in rural communities, while urban dwellers trusted radio the most. This research showcases how a structured approach to audience research can obtain behavioral insights that can guide behavior change efforts.

KEYWORDS

aquatic, behavior change, bushmeat, demand reduction, illegal behavior, marketing, São Tomé and Príncipe, unmatched count technique, wildlife trade, wildmeat

1 | INTRODUCTION

All major threats to biodiversity are a consequence of the daily decision-making patterns of billions of humans worldwide (Schultz, 2011). Thus, conservation practitioners and scientists are increasingly focused on

influencing human behavior and understanding the drivers behind it (Veríssimo, 2019). This has led to the increasing interest in fields such as conservation marketing, which is the ethical application of marketing strategies, concepts, and techniques to influence attitudes, perceptions, and behaviors of individuals, and ultimately

This is an open access article under the terms of the Creative Commons Attribution License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

© 2020 The Authors. Conservation Science and Practice published by Wiley Periodicals, Inc. on behalf of Society for Conservation Biology

societies, with the objective of advancing conservation goals (Veríssimo, 2013, 2019; Wright et al., 2015). Marketing strongly emphasizes the key role of having an in-depth understanding of the people using a given resource (i.e., the consumers), a group often called the target audience (Kotler & Armstrong, 2010; Noel, 2009). Through consumer or audience research, marketers are able to better understand the drivers and context in which consumers make decisions about resource use. These drivers can be psychographic (e.g., attitudes, social norms, and behavior) and/or demographic (e.g., gender, age, income), and influence not only the recognition of a need but also the decision to act on it (Figure 1). This knowledge allows marketers to segment key audiences, define messages, and select channels and influencers through which to reach the target consumers (Kotler & Armstrong, 2010; Noel, 2009) (Figure 1).

Yet, in the context of biodiversity conservation in general and the illegal wildlife trade in particular, many behavioral interventions are planned and implemented without a solid evidence base with which to identify and understand a target audience (Greenfield & Veríssimo, 2019). This is problematic because, even when there is detailed knowledge of the target audience, the high complexity and high uncertainty surrounding behavior change interventions mean that the occurrence of unintended consequences is a real possibility (Douglas &

Winkel, 2014). The high complexity in which behavior change interventions occur comes from the different social actors attempting to influence the behavior of any stakeholder group while the uncertainty comes from both the feedback loops between the actions of different stakeholders but also the unpredictable external factors such as macroeconomic trends or fashions that can quickly change the preferences and norms regarding a given behavior.

1.1 | The case of wildmeat

In the last decade, the unsustainable consumption and trade of meat from wild animals, also known as wildmeat, has been increasingly recognized as a key threat to wildlife populations (van Velden, Wilson, & Biggs, 2018). In some regions, including the tropics where most biodiversity is located, this phenomenon has been responsible for the decline and even local extirpation of several large and medium bodied species (Ripple et al., 2016). Attempts to tackle this unsustainable exploitation have focused mostly on the supply side, through improved law enforcement and tightening of harvesting regulations (Challender & MacMillan, 2014; Wright, Bhammar, Gonzalez Velosa, & Sobrevila, 2016). Yet, these actions have been shown to not be enough as they

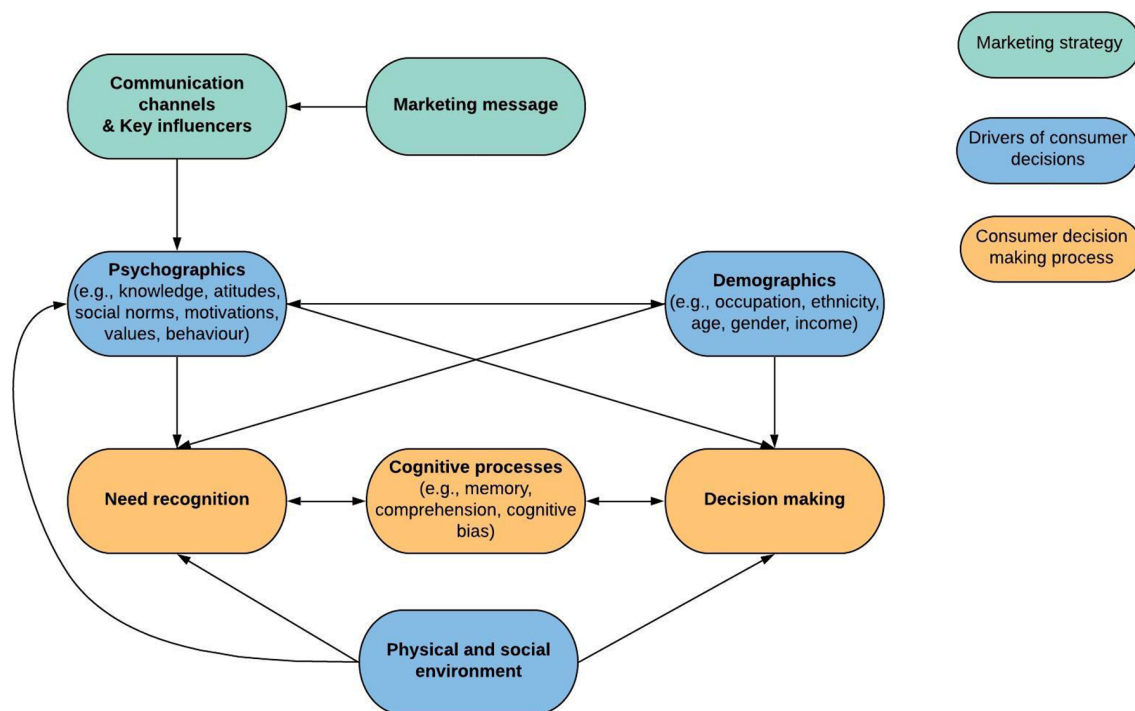


FIGURE 1 A conceptual model of consumer decision-making processes and their drivers in the context of a social marketing intervention. Blue marks the stages targeted during consumer research to better understand consumers (adapted from Middleton, Fyall, Morgan, Morgan, & Ranchhod, 2009; Milner & Rosenstreich, 2013; Noel, 2009)

are often undermined by the central role played by wildmeat in the livelihoods and social interactions of millions of people worldwide (Brashares et al., 2004). While on many contexts wildmeat is a key part of the diet of human rural populations, in urban contexts it is often a delicacy (i.e., a preferred and less accessible food item), but also used for important social interaction such as business meetings (Chausson, Rowcliffe, Escouflaire, Wieland, & Wright, 2019). These factors mean that a strong demand for wildmeat remains, which together with weak governance has tended to undermine many interventions focused on stifling supply of wildlife products (Challender & MacMillan, 2014).

Reducing or shifting the demand from this commodity to other more sustainable alternatives is therefore likely to play a critical part of any solution to mitigate the impact of wildmeat harvesting on biodiversity (Chaves et al., 2018). This realization has led to an increase in the number of demand reduction interventions by conservation practitioners (Veríssimo, Schmid, Kimario, & Eves, 2018; Veríssimo & Wan, 2019). This focus on the reduction of demand, as opposed to the more widespread use of marketing to stimulate demand, has been labeled in the social marketing literature as “demarketing,” and defined as “marketing that deals with discouraging customers in general or a certain class of customers in particular on a temporary or permanent basis” (Kotler & Zaltman, 1971). Demarketing has been used in a variety of issues by social marketers, namely around public health issues such as smoking or alcohol consumption (Lefebvre & Kotler, 2011).

1.2 | Beyond terrestrial wildmeat

While there has been a number of consumer research studies on wildmeat use in the context of terrestrial species, such as rodents, ungulates, and primates (Chausson et al., 2019; Schenck et al., 2006; Shairp, Veríssimo, Fraser, Challender, & MacMillan, 2016), there is a large knowledge gap in terms of wildmeat consumption in the aquatic context, or aquatic bushmeat (Aquatic Mammals Working Group of the Convention of Migratory Species, 2017; Cosentino & Fisher, 2016). This lack of consumer research within aquatic systems is concerning given close linkages of, for example, coastal and marine areas to issues of food security, poverty alleviation, wellbeing, and health, in addition to sustainable use of natural resources and biodiversity conservation. As such it is imperative that interventions to reduce demand for wildmeat take into account the context in which they are being implemented to ensure not only that they have the highest likelihood of success but also that there are no

undue burdens placed on the target audience. This could be the case for example if a group of people using wildmeat for either livelihood or subsistence purposes were targeted for using wildmeat without considering that there could be no other viable alternatives to them.

In this article we outline how consumer research can be used to inform a behavior change intervention for biodiversity conservation. We use the demand for sea turtle meat and eggs in the island of São Tomé, Gulf of Guinea, West Africa, as a case study. Sea turtles are a biological group which has been the target of documented unsustainable exploitation for decades (Frazier, 1980; Garland & Carthy, 2010), and for which limited consumer research is available (but see, e.g., Garland & Carthy, 2010; Nuno et al., 2018) despite the fact that this group is often targeted by demand reduction interventions (Veríssimo & Wan, 2019).

1.3 | The sea turtles of São Tomé

The island of São Tomé is the largest island of the archipelago of São Tomé and Príncipe, being home to more than 95% of the country's population. It is a known nesting and foraging ground for five species of sea turtles, of which the most abundant are the green (*Chelonia mydas*) and olive ridley sea turtles (*Lepidochelys olivacea*) (Castroviejo, Juste, Pérez, Castelo, & Gil, 1994). Sea turtles have been exploited for human consumption in São Tomé Island for centuries, with both meat and eggs used for both commercial and subsistence reasons (Castroviejo et al., 1994; Vieira et al., 2016). Sea turtle conservation efforts started in the 1990s, and led to the creation of the sea turtle conservation project “Programa Tatô” (www.programatato.org), (“Tatô” being the local name for olive ridley sea turtle). Run until 2018 by the local non-governmental organization (NGO) MARAPA (Graff, 1996), Programa Tatô is now run by an independent NGO of the same name. Programa Tatô was initially focused on monitoring the nesting activity of sea turtles around São Tomé Island, but has progressively engaged a wide range of stakeholders, resulting in activities such as training workshops for law enforcement officers, education campaigns targeting schools and lobbying the national government in the case of the legislation forbidding the trade of sea turtle products (Vieira, Jiménez, Besugo, et al., 2016; Vieira, Jiménez, Hancock, et al., 2016).

In 2014, the Santomean government approved national legislation (Decreto-Lei n.8/2014, of 28 April), criminalizing the possession, trade and transportation of sea turtles (dead or alive) and their by-products in the archipelago (Vieira, Jiménez, Besugo, et al., 2016). However, the law was not readily enforced, a challenge

common to many developing nations where competent institutions often lack of the necessary technical capability and logistic means (Albuquerque & Cesarini, 2009). This lack of enforcement led to the need to shift focus from supply, and more coercive measures, to demand and voluntary behavior change, thus arising the need for understanding sea turtle consumption in the island.

2 | METHODS

Our data was obtained using a questionnaire survey divided into four sections (See Supporting Information S1 and S2). To guide the development and content of our questionnaire, we focused on attitudes, a positive or negative evaluation of something or someone; as well as social norms, collective understandings of group conduct as well as individual perceptions of desirable or simply actual group conduct (Lapinski & Rimal, 2005). This follows the simplified version of the Theory of Planned Behavior adopted by on Fairbrass, Nuno, Bunnefeld, and Milner-Gulland (2016). The Theory of Planned Behavior is one of the most widely used models to understand and identify the drivers of human behavior (Barber, 2012). In its full form the theory contends that attitudes toward a behavior, subjective social norms and perceived behavioral control, together shape an individual's behavioral intentions and consequently his/her behaviors (Ajzen, 1991).

This survey was then refined using insights from 19 unstructured interviews with Santomean fishers and sea turtle meat sellers conducted from December 2014 to March 2015. The first questionnaire section covered sociodemographic characteristics of the respondents, including ownership of multiple household items meant to allow for the calculation of a household wealth index, as well as self-reported level of trust regarding different media and potential key influencers. The wealth index used is an asset based measure based on the presence or absence of 12 items (See Supporting Information S4). It was used as a more robust way to understand long term patterns around household expenditure, when compared to traditional direct questions on income which require extensive field work in order to capture what are often multiple income streams, self-employment, and in-kind transactions (Vyas & Kumaranayake, 2006), not to mention challenges due to social desirability bias and the potential sensitives around openly disclosing income level.

The second section focused on the consumption behavior for sea turtle eggs and meat, and used the unmatched count technique (UCT) also known as a list experiment; this is a specialized questioning technique developed to improve the willingness of respondents to

answer truthfully to possibly embarrassing or self-incriminating questions by providing greater levels of privacy and anonymity and reducing question sensitivity (Glynn, 2013; Nuno & St John, 2015). In UCT, survey respondents are allocated into a control or a treatment group, in which control group members receive a list of nonsensitive items (e.g., food items such as chicken or fish), whereas the treatment group receives the same list but with the addition of the sensitive item (i.e., sea turtle). Group allocation (control or treatment) for the UCT was assigned pseudo-randomly at the start of the UCT, based on the time of the day; if the watch of the enumerator marked an even number of minutes, the respondent was assigned to the treatment, if it was odd the respondent was assigned to the control. Every respondent was thus shown multiple UCT cards (one pair per question; see Supporting Information S3) and asked to indicate how many, but not which, items applied to them (Glynn, 2013). UCT questions were preceded by a nonsensitive training question about household occupations.

The third and fourth sections focused on, respectively, attitudes and social norms toward sea turtle conservation and consumption. These two last sections used five-point Likert scales to measure self-reported levels of agreement with specific statements. Here, we used direct questioning rather than a specialized questioning technique such as the UCT, as the concern in the context of São Tomé was with potential legal repercussions stemming from law breaking, something that can only happen through actual behavior.

We piloted our questionnaire in the city of São Tomé Island ($n = 10$), based on which minor adjustment to language of several questions were made. This pilot data was not included in any further analysis. The length of each questionnaire was ~20 min. Participation in the survey was voluntary. The use of UCT for asking potentially sensitive questions makes it impossible to directly link incriminating data to an individual, and respondents were informed they could refuse to answer any question and withdraw at any time. Only respondents over 18 years old were eligible. The anonymity of participants was fully protected, and the study and its methodology were approved by the College of Life and Environmental Sciences (Penryn) Ethics Committee at the University of Exeter (reference 2017/1755), United Kingdom.

Data collection focused on two priority groups: the inhabitants of rural and coastal fishing communities and the residents of the capital city of São Tomé. Regarding the former, the survey was conducted by two enumerators affiliated with the Santomean NGO Monte Pico, an organization with no institutional affiliation with Programa Tatô, the only sea turtle conservation program in the island. This survey took place between May and

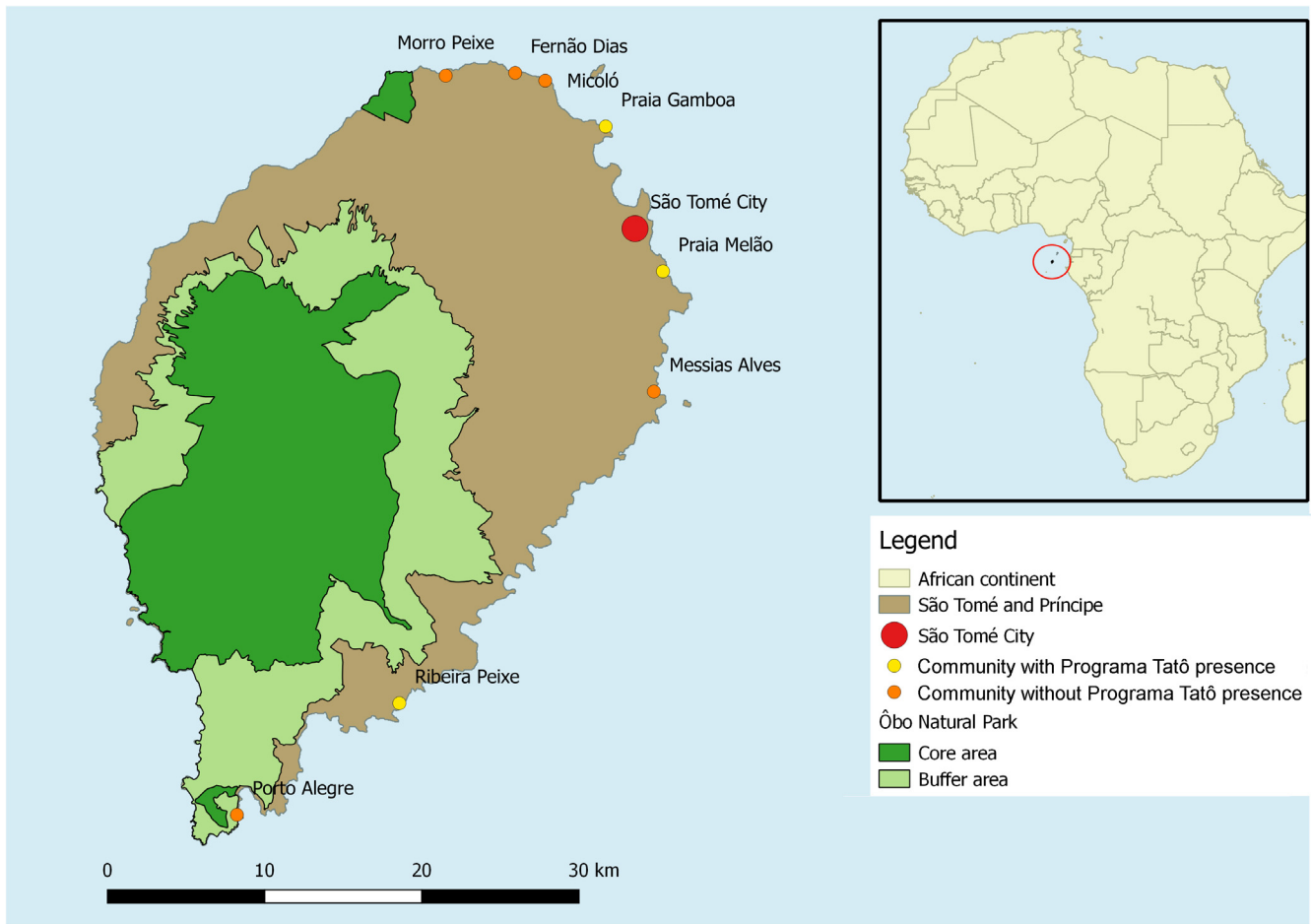


FIGURE 2 Locations in São Tomé island surveyed about the consumption of sea turtle meat and eggs

October 2016, in five communities where Programa Tatô has worked since 2014, and three communities where Programa Tatô has never worked (Figure 2).

The survey was conducted in Portuguese, with occasional use of the Fôrro (local dialect) when necessary. These fishing communities were selected because they neighbor important turtle nesting beaches where sea turtle poaching is known to happen. We set out to conduct a household census in the target villages, with questionnaires being conducted at the respondent's home. Within a household, we identified the respondent pseudo-randomly, using the house number. Where the house number was even, we surveyed the male head of the household, where it was odd, we surveyed the female head of the household.

The second priority group was the inhabitants of the São Tomé city, where the key produce market of the country is located and where sea turtle is more regularly available for purchase. Our aim was to target all 17 neighborhoods of the city, to achieve a broad picture of behavioral patterns of urban dwellers. This survey took place between October and November 2017 and was carried out in Portuguese by two enumerators affiliated with

University of São Tomé and Príncipe. We used a street-intercept survey method, with one busy location in each neighborhood selected and each third person approached to participate. Only people over 18 years old were eligible to participate.

2.1 | Data analysis

To measure the wealth of a household we used IBM SPSS 22.0 to produce an index. This index was made by first carrying out descriptive statistics for all variables and then using a Principal Component Analysis to determine the weights to be given to each variable, after which the first component was used to assign each item a weight (see Vyas & Kumaranayake, 2006). Lastly all weights were summed per respondent. For subsequent statistical analysis, this wealth index was converted into categorical with two levels: one including values above, and the other values below or equal to the median wealth. Likert-scale statements were visualized using the Likert R package v.1.3.5 (Bryer & Speerschnieder, 2016). To compare

differences in agreement with statements on attitudes, social norms and key influencers between study groups, we used the Mann–Whitney–Wilcoxon test; this allows comparing distributions of answers in Likert items while accounting for independence between the two study groups (Jamieson, 2004).

To estimate behavior prevalence, generalized linear models in R 3.5.1 (R Core Team, 2018) were fitted only with card type (treatment or control). Then, UCT answers to sensitive questions were fitted with a dummy variable indicating whether the respondent received the baseline or the treatment card, the demographics, and interactions of the card membership dummy variable with each demographic (Holbrook & Krosnick, 2010); the interactions between sociodemographic variables and treatment status indicate differences between the reported number of behaviors in the two conditions for each predictor variable. Akaike information criterion (AIC) was used to select the most parsimonious models and to rank models according to their log-likelihood penalized for the number of parameters (Burnham & Anderson, 2002). When analyzing the number of reported activities to identify characteristics of individuals engaged in sensitive behaviors, only models with interactions included were considered for comparison. We averaged parameter estimates across models with $\Delta\text{AIC} < 4$ using the MuMIn package v.1.42.1 (Bartón, 2018). $\Delta\text{AIC} \geq 4$ indicates considerably less support for the model (Burnham & Anderson, 2002).

3 | RESULTS

3.1 | Study participants

Regarding the eight rural communities, we surveyed a total of 1,160 respondents. Between 73 and 378 households per community were sampled, with the number of surveys representing a mean 69% of total households per community. This is a conservative estimate given uncertainty in some community boundaries and unclear match to national census data. In addition, this average estimate is disproportionately influenced by the low proportion of households surveyed in Praia Gamboa (28%), an outcome due to hostility of local residents toward the subject of sea turtle conservation. Thirty respondents (2.6% of total sample size) did not provide answers to some of the sociodemographic questions and were removed from further analysis. While most nonresponse was due to the absence of respondents in many households, we unfortunately we did not collect data on response in the rural communities, due to a miscommunication with the field team, which hampers our ability to understand the importance of potential nonresponse bias.

Regarding the residents of São Tomé city, we approached 672 respondents of which 628 agreed to complete the questionnaire (nonresponse rate = 6.5%). Respondents were from 15 of the 17 neighborhoods of São Tomé city, with a mean of 42 ($SD = 7$) respondents per neighborhood. However, 15 surveys had missing demographic data and were discarded, putting the final sample size at 613. This sample represents about 1% of the population of São Tomé city according to the estimates of the 2012 national census (INE, 2012). A summary of key sociodemographic characteristics of participants for both study groups is provided in Supporting Information S4.

3.2 | Attitudes and social norms

Respondents from rural communities generally agreed with attitudinal statements regarding the need for enforcement and legislative measures as well as the need for sea turtle conservation, while statements about potential reasons justifying sea turtle use (e.g., cultural and food security) were more commonly disagreed with (Figure 3). While respondents generally agreed with statements about measures penalizing harvesters and sellers (e.g., 86% agreed that capture and sale of sea turtles should be outlawed and 76% agreed that arresting poachers is the best way to protect turtles), survey participants were more evenly split about penalizing consumers (e.g., 53% agreed vs. 45% disagreed with punishing those who eat turtle meat).

These findings were mirrored by our respondents in São Tomé city, with an even stronger tendency toward the need for tougher sanctions on those that break rules on use and trade of sea turtles. Urban respondents felt more strongly about penalizing consumers (e.g., 77% agreed with punishing those who eat turtle meat, in contrast with only 53% of rural respondents who agree with the same statement). The importance of the role of the government in terms of protecting sea turtles was generally agreed by both urban and rural study groups (88% for both groups).

While sea turtles were widely recognized as part of the Natural Heritage of São Tomé among both study groups, a substantial part of respondents in both urban (20%) and rural (31%) settings believed that eating sea turtle meat is part of the national culture; levels of agreement with this statement were identical between both study groups ($W = 347,330$, $p = .17$). The majority of respondents in rural communities strongly supported the statement that sea turtles will never go extinct, whereas urban respondents were nearly evenly divided on the topic. Moreover, there was alignment between rural and urban audiences, with overwhelming agreement that sea turtles were not a source of protein without which

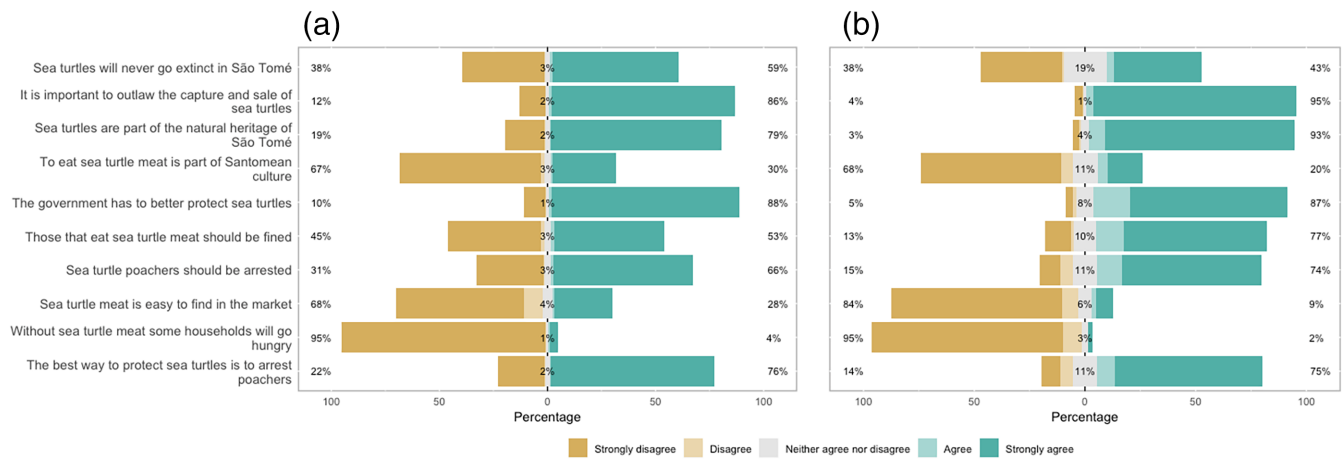


FIGURE 3 Self-reported levels of agreement among survey respondents according to attitudinal statements on sea turtle conservation and consumption for both study groups: (a) residents of rural communities and (b) residents of São Tomé city. Statements are shown in the order they were presented to respondents during survey. All questions were answered using a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Percentages represent: general disagreement (on the left; combining “strongly agree” and “agree”), neutral answers (central) and general agreement (on the right; combining “strongly disagree” and “disagree”)

communities may see their food security jeopardized; again, levels of agreement with this statement were identical between both study groups ($W = 343,250$, $p = .10$). In terms of availability, in both rural and urban contexts sea turtle was considered to be hard to find, although less so by rural respondents.

In relation to the normative statements, there was agreement among residents of rural communities that both the consumption of sea turtle meat and eggs is a minority behavior. The same was true of turtle poaching. Nonetheless, two-thirds of rural respondents and more than half (56%) of urban respondents agreed that sea turtle meat was a delicacy. The situation was however different for sea turtle eggs, with only a minority preferring them to chicken eggs, particularly in urban areas. In terms of the context where sea turtle meat is consumed, the perceived norm was that this was not restricted to special occasions; levels of agreement with this statement were identical between both study groups ($W = 361,060$, $p = .59$), with other normative statements presenting significant differences between study groups (all $p < .042$). It should be noted that urban dwellers demonstrated much more uncertainty in the responses, with some questions reaching 20% of respondents neither agreeing nor disagreeing, which may also account for some of the differences described above (Figure 4).

3.3 | Prevalence of sensitive behaviors

Regarding rural community residents, based on UCT, close to half (43%) of the respondents considered turtle

meat to be very tasty, a number that was reduced to about one quarter in São Tomé city (Figure 5). In terms of actual consumption of sea turtle meat, we estimate that about a quarter of rural respondents and 32% of urban respondents were consumers during the 12 months prior to the study. In terms of regular consumption, we estimate that about 16–20% of respondents in both areas consumed sea turtle meat more than once a month on average. The scenario changes when sea turtle eggs are considered with an estimated quarter of respondents in rural areas being consumers but virtually no consumption in urban areas (UCT produced an unrealistic negative prevalence, although overlapping with zero). The availability of sea turtle meat is estimated to be higher in rural communities, with about 25% of residents seeing the product for sale, a number 8% higher than that estimated for urban areas.

3.4 | Potential predictors of sensitive behaviors

In the context of rural communities, social norms and being or not a Programa Tatô target community were the most important variables explaining variation in involvement in target behaviors related to sea turtle consumption (Table 1; See Supporting Information S5 and S6). Level of agreement with social norm statements was a significant predictor of involvement in several target behaviors (Table 1); the stronger people agreed with these statements, the more likely they were involved in these behaviors. Furthermore, communities where

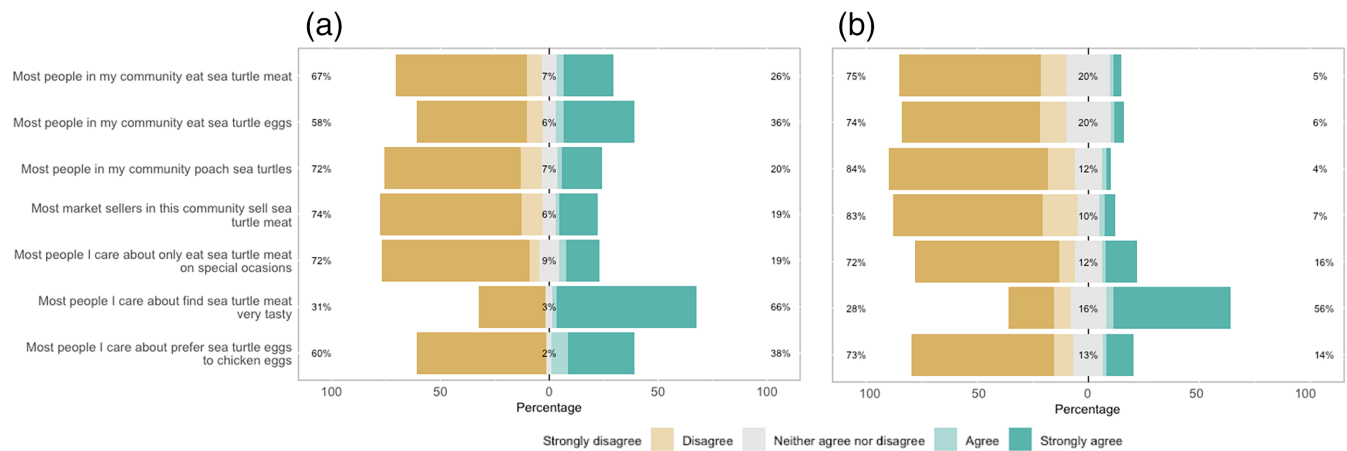


FIGURE 4 Levels of agreement among survey respondents according to normative statements on sea turtle conservation and consumption for both study groups: (a) residents of rural communities and (b) residents of São Tomé city. Statements are shown in the order they were presented to respondents during survey. All questions were answered using a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Percentages represent: general disagreement (on the left; combining “strongly agree” and “agree”), neutral answers (central) and general agreement (on the right; combining “strongly disagree” and “disagree”)

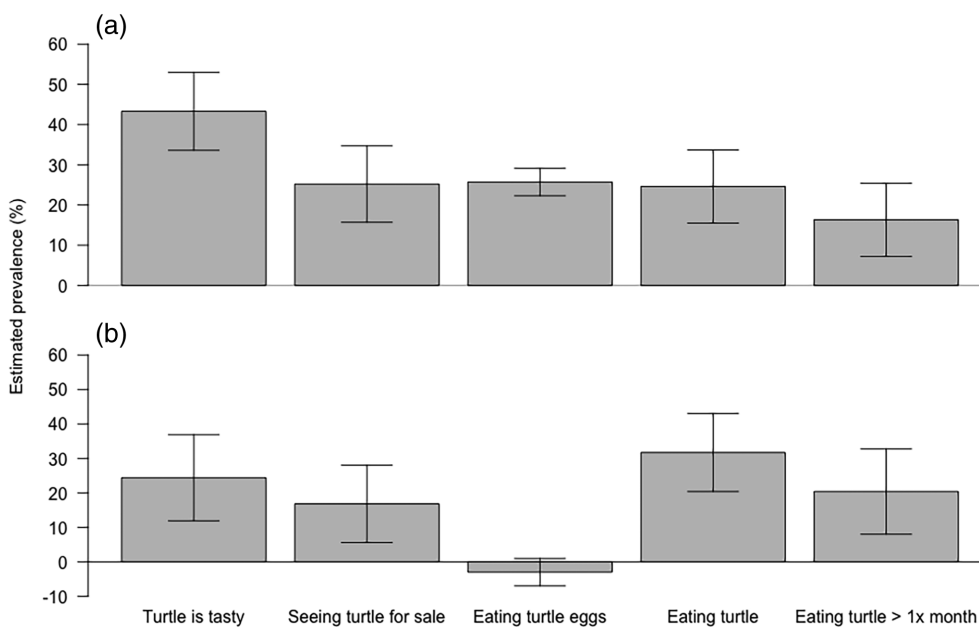


FIGURE 5 Estimated prevalence (SE) of sensitive behaviors and attitudes related to the sale and consumption of turtle meat and eggs during the 12 months prior to the study among: (a) residents of rural communities and (b) residents of São Tomé city. Behaviors presented from potentially least sensitive (“turtle is tasty”) to potentially most sensitive (“eating turtle > 1x month”)

Programa Tatô had worked previously were more likely to consume sea turtle eggs. This scenario changed when it came to respondents in São Tomé city, where no variables were significant at the 5% level (See Supporting Information S6).

3.5 | Key influencers and communication channels

When asked to rate their levels of trust on multiple information sources, rural community residents selected

radio, teachers, television, and religious leaders as the most trusted sources, with 87% or more of respondents reporting trusting these groups, while less than 8% reported distrusting them (Figure 6). At the other end of the spectrum, politicians were the least trusted group, with 46% of respondents reporting distrust. Surprisingly, “friends” were also scored low, although having the highest prevalence of neutral respondents (22%).

Regarding the residents of São Tomé city, the levels of trust were generally lower, with teachers and NGOs with 63% or more of respondent stating that they trust them. It should be noted however that for religious leaders the

TABLE 1 Effects (Unconditional estimates, *SE*) of sociodemographic variables on estimated prevalence of sensitive behaviors related to the sale and consumption of turtle meat and eggs during the 12 months prior to the study for both study groups: residents of rural communities and residents of São Tomé city

Parameter	Residents of rural communities							Residents of São Tomé city						
	Eating turtle	Turtle is tasty	Eating turtle > 1x month	Seeing turtle for sale	Eating turtle eggs	Eating turtle	Turtle is tasty	Eating turtle > 1x month	Seeing turtle for sale	Eating turtle	Turtle is tasty	Eating turtle > 1x month	Seeing turtle for sale	Eating turtle
Community: Programa Tatô target area	-0.27 (0.18)	0.36 (0.20) ⁺	-0.05 (0.18)	-0.08 (0.19)	0.35 (0.07)**	Not included	Not included	Not included	Not included	Not included	Not included	Not included	Not included	Not included
Social norms	0.18 (0.08)*	0.18 (0.09)*	0.10 (0.08)	0.10 (0.08)	0.07 (0.03)*	0.15 (0.17)	0.18 (0.18)	0.24 (0.18)	0.30 (0.17) ⁺	0.03 (0.11)	0.03 (0.11)	0.30 (0.17) ⁺	0.03 (0.11)	-0.01 (0.01)
Gender: Female	-0.03 (0.10)	0.01 (0.14)	-0.01 (0.14)	-0.02 (0.12)	0.01 (0.02)	0.05 (0.15)	-0.01 (0.05)	0.03 (0.11)	-0.16 (0.23)	-0.01 (0.01)	0.01 (0.01)	-0.16 (0.23)	0.41 (0.45)	0.15 (0.09) ⁺
Age	-0.01 (0.01)	0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.02 (0.02)	-0.01 (0.01)	0.01 (0.01)	—	-0.01 (0.01)	0.01 (0.01)	—	—	-0.01 (0.01)
Education level ^a														
Primary	-0.66 (0.38) [†]	0.24 (0.37)	-0.38 (0.35)	-0.55 (0.37)	—	-0.06 (0.26)	0.01 (0.19)	—	—	—	—	—	—	—
Secondary or above	-0.50 (0.42)	0.28 (0.40)	-0.09 (0.38)	-0.30 (0.39)	—	—	—	0.25 (0.40)	0.41 (0.45)	—	—	—	—	0.03 (0.10)
Main occupation: Other ^b	0.01 (0.01)	0.14 (0.20)	-0.01 (0.04)	-0.01 (0.07)	0.01 (0.03)	—	0.07 (0.21)	-0.03 (0.14)	0.10 (0.25)	0.10 (0.25)	0.16 (0.16)	0.10 (0.25)	0.16 (0.16)	0.16 (0.16)
Wealth: Above median	0.01 (0.01)	-0.01 (0.06)	-0.01 (0.04)	0.06 (0.14)	0.01 (0.02)	-0.01 (0.11)	0.08 (0.25)	-0.04 (0.24)	-0.18 (0.23)	-0.01 (0.11)	-0.04 (0.24)	-0.18 (0.23)	-0.01 (0.11)	-0.01 (0.5)
Religion ^c	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Evangelical	—	0.08 (0.22)	0.14 (0.26)	—	—	—	—	—	—	—	—	—	—	—
Other	—	0.05 (0.15)	0.06 (0.16)	—	—	—	—	—	—	—	—	—	—	—

Notes: For the social norm's category, we used the mean of the seven items in the category to obtain a score per respondent. Only averaged estimates from interactions between variables and treatment status in the linear mixed models fitted to UCT answers are presented, indicating differences between the reported number of behaviors in the two conditions for each predictor variable. Statistical significance is coded as ****p* < .001, **p* < .05, [†]*p* < .1; “—” represents absent from the best performing models.

^aReference level is no formal education.

^bReference level is fisher or fish seller.

^cReference level is Catholic.

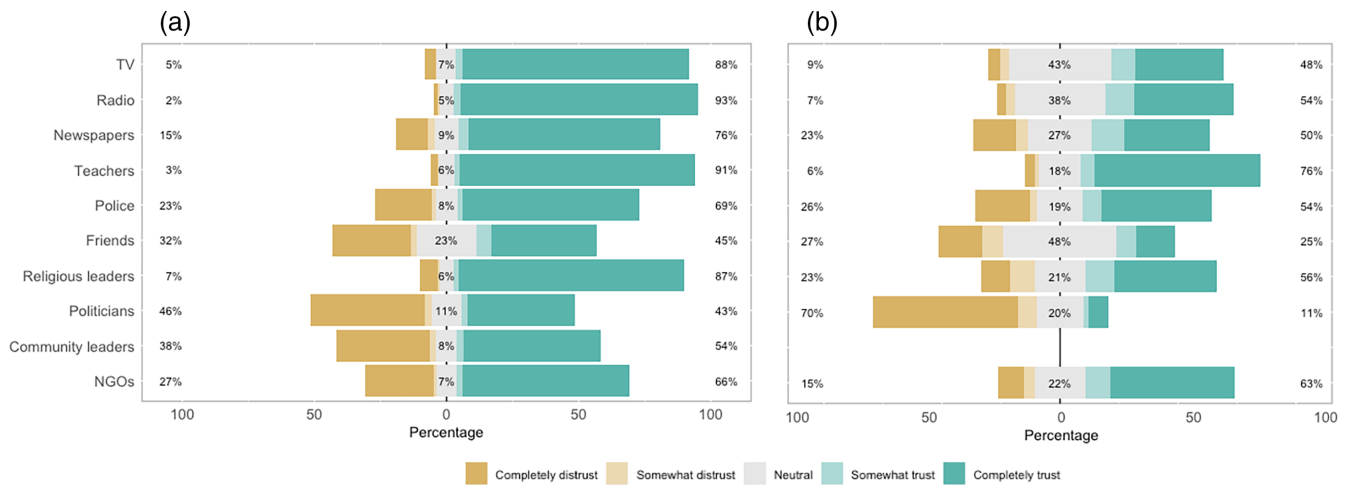


FIGURE 6 Self-reported levels of trust according to types of information sources for both study groups: (a) residents of rural communities and (b) residents of São Tomé city. Statements are shown in the order they were presented to respondents during survey; “community leaders” were not included as potential key influencer in city surveys. All questions were answered via a Likert scale ranging from 1 (completely distrust) to 5 (completely trust). Percentages represent: general distrust (on the left; combining “completely distrust” and “somewhat distrust”), neutral answers (central) and general trust (on the right; combining “completely trust” and “somewhat trust”)

levels of distrust were also quite high with 23% of respondents distrusting them. Interestingly, and as noted above, friends and politicians ranked last also in the urban context, being the only groups which more people distrusted. Similarly, to the attitudinal and normative statements, urban dwellers demonstrated much more neutrality in their responses. Levels of trust in NGOs by both study groups were identical ($W = 345,190, p = .38$), while other statements regarding potential influencers presented significant differences between study groups (all $p < .01$).

4 | DISCUSSION

In São Tomé as is the case with most sea turtle conservation projects worldwide, sea turtle conservation efforts have focused most of the research effort on the biological aspects of conserving sea turtle populations (Campbell & Society, 2010). The present research aims to showcase how a structured and rigorous approach to social science can help conservationists obtain key insights on the threats impacting sea turtles. In this study we documented not only a large-scale demand for sea turtle meat in both rural and urban communities but also a high demand for sea turtle eggs in rural communities. We also uncovered evidence that sea turtle meat is seen as a delicacy by more than half of urban and rural residents, with about 20% of them consuming it regularly. These results suggest that there is the need to tackle this trade, likely integrating more active law enforcement and voluntary behavior change, if the Santomean populations of sea turtles are to be viable in the long term.

4.1 | Attitudes and social norms

In terms of attitudes, although there was general support for increased enforcement around the capture and sale of sea turtle products, urban dwellers were more supportive of fines for consumers than their rural counterparts. This can likely be explained by a large proportion of the rural population, particularly that living on the coast, being consumers themselves, a hypothesis supported by our UCT results. This expression of support seems, however, to contradict the idea held by a substantial part of the population that sea turtles will never be extinct. It is also worth noting here that the use of a Likert scale with a mid-point could have made our research potentially more vulnerable to social desirability bias, by allowing those who were not keen to express their actual views to choose a neutral option (Chyung, Roberts, Swanson, & Hankinson, 2017).

According to our results, sea turtle meat does not play an important role in terms of food security with only 4% of rural inhabitants and 2% urban dwellers stating that families would go hungry without it. This finding is supported by other research which suggested that sea turtle meat and eggs are consumed in what is an overall very low volume in the context of all other food sources in the diet of the target communities (Pinto, 2013), and by the fact that sea turtle availability does not coincide with the times of most food scarcity. This is an important consideration as there had been concerns around food security that have been previously raised in some of the sampled communities (Pinto, 2013). Behavior change interventions around wildmeat should more broadly include these types of ethical

considerations in their design process to ensure that target audiences do not incur unintended negative impacts. Equally, two-thirds of respondents, both rural and urban, agree that sea turtle consumption is not part of Santomean culture, which mitigates concerns around potential social and cultural engineering (Eagle, 2009).

In terms of access to sea turtle meat, unsurprisingly rural communities had greater access than urban respondents, with only 10% of the latter declaring to have easy access. This discrepancy points to a smaller scale trade, localized in and around the communities where sea turtles are found, a pattern that was also been found in the context of terrestrial wildmeat in São Tomé (Carvalho et al., 2015). Our findings also suggest that although enforcement is likely to have a role to play in mitigating this trade, its role will be secondary in this context as decentralized and informal local markets are harder to regulate than the centralized urban one in São Tomé city. This also follows from the weak support for fines to consumers among rural communities, while urban communities were largely supportive of this measure and of arresting poachers. Voluntary behavior change will therefore likely play a key part of any substantive efforts to conserve sea turtles in São Tomé.

Social norms around sea turtle consumption were stronger for urban audiences than for rural ones. Based on Centola, Becker, Brackbill, and Baronchelli (2018) whose experimental work point to a 25% tipping point below which minority points of view tend to fail to spread, it is clear that in rural communities these norms are more vulnerable to change than in urban contexts where respondents were in broader agreement. In the urban context two norms that seem established are around the small proportion of people involved in the poaching and selling of sea turtles. In any case, it should be highlighted that the majority's preference in both rural and urban contexts for chicken eggs over sea turtle ones opens the way to potential substitution effects in the future, although that will require the support of the expansion of chicken rearing practices in the island, with all the challenges that would entail.

4.2 | Prevalence and drivers of consumption

In terms of prevalence of consumption, our results support the idea that sea turtle meat consumption is common in both rural communities and in urban contexts. With about one quarter of inhabitants of rural community estimated to having consumed sea turtle meat and eggs in the last year, it is clear that despite being illegal, this behavior is still prevalent. The higher estimate for

consumption in the capital city, where law enforcement is at its most robust in the national context, suggest that despite sea turtle trade and possession being illegal there have been very limited efforts to curb this activity.

While the use of UCT allows for the minimization of social desirability biases, the results of this technique commonly suffer from wide standard errors making them less straightforward to interpret. Although this is often a feature of UCT as a technique, and the sample sizes used were substantial compared to other studies, there is potential for future research on this area to improve on this issue by conducting more detailed piloting of this technique and exploring, for example, negative correlations between items in the list to reduce the error of the estimates (Glynn, 2013).

In terms of drivers, few of the demographic and psychographic variables tested were found to be predictors of the different sensitive behaviors of interest. This is surprising as demographic variables such as wealth have been found by other studies to be predictors of wildmeat consumption elsewhere in the Gulf of Guinea (East, Kumpel, Milner-Gulland, & Rowcliffe, 2005), but it also reinforces the weak predictive power of commonly examined variables such as age or gender in the context of wildmeat consumption (Ordaz-Németh et al., 2017). In terms of psychographic variables, and in the context of rural communities, social norms were important predictors of demand and consumption of consuming sea turtle meat and eggs, although this effect was not present for urban dwellers. These insights together with the higher proportion of respondents who found sea turtle meat tasty, which suggests potential unmet demand in rural communities and suggest those locations should be geographically prioritized for future demand reduction actions.

Nevertheless, the overall lack of predictive power of the variables considered may be related to the widespread nature of this consumption, although the importance of social norms in this context suggests that psychographic variables should be further investigated when it comes to audience segmentation. One path forward could be the more extensive use of qualitative research methods, with being ethnography a particularly promising approach. This would allow for a better understanding of the nuances of the psychographic dimensions that may determine whether an individual consumes sea turtle meat and eggs, and which would thus be key in audience segmentation.

4.3 | Key influencers and communication channels

Overall, levels of trust were higher in rural communities, where even the least trusted channels had 42% of people's

trust. There were also marked differences between urban and rural dwellers on their choice of trusted sources, with the exception of teachers that ranked high on both samples. It should also be noted that urban and rural respondent seemed to have used the scale differently with trust scores being overall higher in rural settings and even the lowest ranked social actors having similar proportions of respondents' trusting and distrusting them. In contrast in an urban context, the most trusted actor, teachers, enjoyed 76% favorable opinion but the lowest, politicians, enjoyed only 11% favorable opinion. It also worth highlighting that law enforcement enjoys positive views in both urban and rural contexts, particularly the later.

4.4 | Informing the design of behavior change interventions

The results of this research provide key audience insights for the design of behavior change campaigns aimed at reducing the demand for sea turtle meat and eggs. First it is clear that the focus should be on the consumption of sea turtle meat as this practice has higher prevalence and higher environmental impact. Furthermore, there is relatively large group of respondents in rural communities, over 40%, and São Tomé city, 25%, that expresses a positive preference for sea turtle meat, an attitude that will need to be taken into account. Still our results come with a few methodological caveats. In the Praia Gamboa community enumerators faced some hostility leading to less than a third of households being sampled. In the sampling of São Tomé city, two out of 17 neighborhoods were not sampled.

In terms of messaging, there is widespread support for sea turtle protection in the country and highlighting this broad consensus could be a strategic to increase support even further. There is also a large consensus over fact that sea turtles are part of the natural heritage of the country, although it should be noted that 31% of rural respondents and 20% of urban respondents also consider eating sea turtle part of Santomean culture, thus the message framing will need to highlight sea turtles in a less utilitarian value. Our results also show that there is an ingrained notion that sea turtles will never go extinct, particularly in rural communities where 59% of respondents share this belief. This is a fact to bear in mind when defining campaign messages for future demand reduction efforts. Regarding potential communication channels and messenger, teachers will be likely pivotal messengers for both urban and rural contexts, whereas mass media will likely play a role in rural communities and religious leaders in urban contexts. The use of mass media may bring with it cost constrains although in the case of São

Tomé the access to TV and Radio stations is easier and their access in turn to an audience is greater given the lack of a competitive media market.

5 | CONCLUSION

Designing behavior change interventions is a complex task that can only be accomplished through having an in-depth understanding of the people that we aim to influence, as well as the social, cultural, and physical contexts of the behaviors of interest. Consumer research is a key part of gaining the audience insights, by allowing not only for a better understanding of the prevalence of the behavior of interest but also by understanding attitudes and social norms driving that behavior and the communication channels and influencers that can be used to move effectively reach a target audience. These insights increase the probability of success of behavior change interventions and minimize the risk of unintended harmful outcomes. In the context of issues as complex as the consumption of wildmeat, where influencing consumers is likely to become a cornerstone of biodiversity conservation efforts, we see comprehensive and rigorous consumer research as a precursor to conservation success that needs wider adoption by conservation researchers and practitioners.

ACKNOWLEDGMENTS

The authors would like to thank Gabriel Oquiongo, Aristides Monteiro, Antunes Pina, Desidério Paquete, Litoney Oliveira, Maria Branco, and Yedda Oliveira for the support during field work, and Victor Jiménez Guri for support throughout the research. This research was supported by a Rufford Small Grant (18821-1). AN acknowledges the support of the Darwin Initiative. DV acknowledges the support of the Oxford Martin Programme on the Illegal Wildlife Trade. SV acknowledges the support of Oceanário de Lisboa and U.S. Fish and Wildlife Service.

CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

AUTHOR CONTRIBUTIONS

D.V., S.V., and J.H. conceptualized the study, S.V. and D.M. managed the data collection process, A.N. led the data analysis, D.V. led the writing with major input from A.N., S.V., and J.H. All authors contributed to revision and preparation of the final manuscript.

DATA AVAILABILITY STATEMENT

The survey data underlying this research can be found in anonymized form at <https://osf.io/sjnb6/>

ORCID

Diogo Veríssimo  <https://orcid.org/0000-0002-3519-6782>

REFERENCES

- Ajzen, I. (1991). The theory of planned behavior. *The Theory of Planned Behavior. %J Organizational Behavior Human Decision Processes*, 50, 179–211.
- Albuquerque, C., & Cesarini, D. (2009). Plano de Manejo do Parque Nacional Obô de São Tomé. ECOFAC. São Tomé, São Tomé and Príncipe. Retrieved from <https://arleciosoaes13.wordpress.com/documentos/>.
- Aquatic Mammals Working Group of the Convention of Migratory Species. (2017). Aquatic Wild Meat. Convention of Migratory Species. UNEP/CMS/COP12/Doc.24.2.3/Rev.1. Retrieved from <https://www.cms.int/en/document/aquatic-wild-meat>.
- Barber, J. S. (2012). The theory of planned behaviour: Considering drives, proximity and dynamics. *Vienna Yearbook of Population Research*, 2011(2011), 31–35.
- Bartoń, K. (2018). MuMIn: Multi-model inference. R Package Version, Version 1.42.1. Retrieved from <https://CRAN.R-project.org/package=MumIn>.
- Brashares, J. S., Arcese, P., Sam, M. K., Coppolillo, P. B., Sinclair, A. R., & Balmford, A. (2004). Bushmeat hunting, wildlife declines, and fish supply in West Africa. *Science*, 306, 1180–1183.
- Bryer, J., & Speerschneider, K. (2016). Likert: Analysis and visualization Likert items. R Package Version 1.3.5. Retrieved from <https://CRAN.R-project.org/package=likert>
- Burnham, K. P., & Anderson, D. R. (2002). *Model selection and multi-model inference: A practical information-theoretic approach*. New York, NY: Springer Verlag.
- Campbell L & Society. (2010). Studying sea turtle conservation and learning about the world: Insights from social science. *Conservation and Society*, 8, 1.
- Carvalho, M., Palmeirim, J. M., Rego, F. C., Sole, N., Santana, A., & Fa, J. E. (2015). What motivates hunters to target exotic or endemic species on the Island of São Tomé, gulf of Guinea? *Oryx*, 49, 278–286.
- Castroviejo, J., Juste, J., Pérez, J. D. V., Castelo, R., & Gil, R. (1994). Diversity and status of sea turtle species in the Gulf of Guinea islands. *Biodiversity and Conservation*, 3, 828–836.
- Centola, D., Becker, J., Brackbill, D., & Baronchelli, A. (2018). Experimental evidence for tipping points in social convention. *Science*, 360, 1116–1119.
- Challender, D. W., & MacMillan, D. C. (2014). Poaching is more than an enforcement problem. *Conservation Letters*, 7, 484–494.
- Chausson, A. M., Rowcliffe, J. M., Escoufflaire, L., Wieland, M., & Wright, J. H. (2019). Understanding the sociocultural drivers of urban Bushmeat consumption for behavior change interventions in pointe noire, republic of Congo. *Human Ecology*, 47, 179–191.
- Chaves, W. A., Valle, D. R., Monroe, M. C., Wilkie, D. S., Sieving, K. E., & Sadowsky, B. (2018). Changing wild meat consumption: An experiment in the Central Amazon, Brazil. *Conservation Letters*, 11, e12391.
- Chyung, S. Y., Roberts, K., Swanson, I., & Hankinson, A. J. P. I. (2017). Evidence-based survey design: The use of a midpoint on the Likert scale. *Performance Improvement*, 56, 15–23.
- Cosentino, A. M., & Fisher, S. (2016). The utilization of aquatic Bushmeat from small cetaceans and manatees in South America and West Africa. *Frontiers in Marine Science*, 3. <https://www.frontiersin.org/articles/10.3389/fmars.2016.00163/full>
- Douglas, L. R., & Winkel, G. (2014). The flipside of the flagship. *Biodiversity and Conservation*, 23, 979–997.
- Eagle, L. (2009). *Social marketing ethics*. National Social Marketing Centre. Retrieved from <http://www.nsmcentre.org.uk/component/repository/NSMC-Publications/Social-Marketing-Ethics>.
- East, T., Kümpel, N. F., Milner-Gulland, E., Rowcliffe, J. M. J. B. C. (2005). Determinants of urban bushmeat consumption in Rio Muni, Equatorial Guinea. *126:206–215*.
- Fairbrass, A., Nuno, A., Bunnefeld, N., & Milner-Gulland, E. (2016). Investigating determinants of compliance with wildlife protection laws: Bird persecution in Portugal. *European Journal of Wildlife Research*, 62, 93–101.
- Frazier, J. (1980). Exploitation of marine turtles in the Indian Ocean. *Human Ecology*, 8, 329–370.
- Garland, K. A., & Carthy, R. R. (2010). Changing taste preferences, market demands and traditions in pearl lagoon, Nicaragua: A community reliant on green turtles for income and nutrition. *Conservation and Society*, 8, 55.
- Glynn, A. N. (2013). What can we learn with statistical truth serum? Design and analysis of the list experiment. *Public Opinion Quarterly*, 77, 159–172.
- Graff, D. (1996). Sea turtle nesting and utilization survey in São Tomé. *Mar. Turtle Newsl*, 75, 8–12.
- Greenfield, S., & Veríssimo, D. (2019). To what extent is social marketing used in demand reduction campaigns for illegal wildlife products? Insights from elephant ivory and rhino horn. *Social Marketing Quarterly*, 25, 40–54.
- Holbrook, A. L., & Krosnick, J. A. (2010). Measuring voter turnout by using the randomized response technique: Evidence calling into question the method's validity. *Public Opinion Quarterly*, 74, 328–343.
- Instituto Nacional de Estatística de São Tomé e Príncipe. (2012). Recenseamento Geral da População e Habitação de 2012. Cidade de São Tomé.
- Jamieson, S. (2004). Likert scales: How to (ab) use them. *Medical Education*, 38, 1217–1218.
- Kotler, P., & Armstrong, G. (2010). *Principles of marketing - global edition*. Upper Saddle River, NJ: Pearson Prentice Hall.
- Kotler, P., & Zaltman, G. (1971). Social marketing: An approach to planned social change. *The Journal of Marketing*, 35, 3–12.
- Lapinski, M. K., & Rimal, R. (2005). An explication of social norms. *Journal of Communication Theory*, 15, 127–147.
- Lefebvre, R. C., & Kotler, P. (2011). Design thinking, demarketing and behavioral economics: Fostering interdisciplinary growth in social marketing. In *The sage handbook of social marketing* (pp. 80–94). Thousand Oaks, CA: SAGE.
- Middleton, V. T., Fyall, A., Morgan, M., Morgan, M., & Ranchhod, A. (2009). *Understanding the consumer: Tourism motivations and buyer behaviour. Marketing in travel and tourism*. Oxford, UK: Elsevier.
- Milner, T., & Rosenstreich, D. (2013). A review of consumer decision-making models and development of a new model for financial services. *Journal of Financial Services Marketing*, 18, 106–120.
- Noel, H. (2009). *Basics marketing 01: Consumer behaviour*. Lausanne, Switzerland: AVA Publishing.

- Nuno, A., Blumenthal, J., Austin, T., Bothwell, J., Ebanks-Petrie, G., Godley, B., & AJCb, B. (2018). Understanding implications of consumer behavior for wildlife farming and sustainable wildlife trade. *Conservation Biology*, 32, 390–400.
- Nuno, A., & St John, F. A. V. (2015). How to ask sensitive questions in conservation: A review of specialized questioning techniques. *Biological Conservation*, 189, 5–15.
- Ordaz-Németh, I., Arandjelovic, M., Boesch, L., Gatiso, T., Grimes, T., Kuehl, H. S., ... Junker, J. (2017). The socio-economic drivers of bushmeat consumption during the west African Ebola crisis. *PLoS Neglected Tropical Diseases*, 11, e0005450.
- Pinto, J. N. (2013). *Linha de base de Segurança Alimentar e Nutricional. Comunidades pesqueiras de São Tomé e Príncipe no quadro do Projeto*. Madrid, Spain: PROFOPESCA - Fortalecimento da Sociedade Civil como estratégia de desenvolvimento económico e social no sector das pescas. Instituto de Estudios del Hambre.
- R Core Team. (2018). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing Retrieved from <http://www.R-project.org/>
- Ripple, W. J., Abernethy, K., Betts, M. G., Chapron, G., Dirzo, R., Galetti, M., ... Machovina, B. (2016). Bushmeat hunting and extinction risk to the world's mammals. *Royal Society Open Science*, 3, 160498.
- Schenck, M., Effa, E. N., Starkey, M., Wilkie, D., Abernethy, K., Telfer, P., ... Treves, A. (2006). Why people eat bushmeat: Results from two-choice, taste tests in Gabon, Central Africa. *Human Ecology*, 34, 433–445.
- Schultz, P. (2011). Conservation means behavior. *Conservation Biology*, 25, 1080–1083.
- Shairp, R., Verissimo, D., Fraser, I., Challender, D., & MacMillan, D. (2016). Understanding urban demand for wild meat in Vietnam: Implications for conservation actions. *PLoS One*, 11, e0134787.
- van Velden, J., Wilson, K., & Biggs, D. (2018). The evidence for the bushmeat crisis in African savannas: A systematic quantitative literature review. *Biological Conservation*, 221, 345–356.
- Verissimo, D. (2013). Influencing human behaviour: An under-utilised tool for biodiversity management. *Conservation Evidence*, 10, 29–31.
- Verissimo, D. (2019). The past, present, and future of using social marketing to conserve biodiversity. *Social Marketing Quarterly*, 25, 3–8.
- Verissimo, D., Schmid, C., Kimario, F., & Eves, H. (2018). Measuring the impact of an entertainment-education intervention to reduce demand for bushmeat. *Animal Conservation*, 21, 324–331.
- Verissimo, D., & Wan, A. K. (2019). Characterizing efforts to reduce consumer demand for wildlife products. *Conservation Biology*, 33, 623–633.
- Vieira, S., Jiménez, V., Besugo, A., Costa, S., Miranda, F., Hancock, J., ... Oliveira, L. (2016). Participative approach to discuss novel law implementation strategies in São Tomé and Príncipe. *African Sea Turtle Newsletter*, 5, 15–20.
- Vieira, S., Jiménez, V., Hancock, J., Lima, H., Loloum, B., & Oliveira, L. (2016). Teaming up with a local Mobile phone service provider in order to Spread Sea turtle conservation messages. *African Sea Turtle Newsletter*, 5, 13–14.
- Vyas, S., & Kumaranayake, L. (2006). Constructing socio-economic status indices: How to use principal components analysis. *Health Policy and Planning*, 21, 459–468.
- Wright, A. J., Verissimo, D., Piffold, K., Parsons, E., Ventre, K., Cousins, J., ... McKinley, E. (2015). Competitive outreach in the 21st century: Why we need conservation marketing. *Ocean & Coastal Management*, 115, 41–48.
- Wright, E. M., Bhammar, H. M., Gonzalez Velosa, A. M., & Sobrevila, C. (2016). *Analysis of international funding to tackle illegal wildlife trade*. Washington, DC: World Bank Group Retrieved from <http://documents.worldbank.org/curated/en/695451479221164739/Analysis-of-international-funding-to-tackle-illegal-wildlife-trade>

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

How to cite this article: Verissimo D, Vieira S, Monteiro D, Hancock J, Nuno A. Audience research as a cornerstone of demand management interventions for illegal wildlife products: Demarketing sea turtle meat and eggs. *Conservation Science and Practice*. 2020;2:e164. <https://doi.org/10.1111/csp2.164>