

CONSUMING WILDLIFE - MANAGING  
DEMAND FOR WILDLIFE PRODUCTS

Perspective

PEOPLE  
NATUREBRITISH  
ECOLOGICAL  
SOCIETYWild assumptions? Questioning simplistic narratives about  
consumer preferences for wildlife productsAmy Hinsley<sup>1</sup>  | Michael 't Sas-Rolfes<sup>2</sup> <sup>1</sup>Wildlife Conservation Research Unit,  
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## Abstract

1. That wildlife consumers prefer wild products to farmed alternatives is a widely reported finding in the conservation literature. These reported preferences for wild products have been interpreted as evidence that farming and associated trade undermine conservation efforts. These conclusions have then been used to influence policy recommendations and the design of conservation interventions related to use of farming itself, as well as to underpin consumer behaviour change campaigns.
2. However, for many species and products, the wild versus farmed narrative is based on assumptions that over-simplify consumer behaviour and can lead to conclusions that do not recognize the complexity of real wildlife markets. These assumptions include the notions that consumers of the same products have homogeneous preferences, that wild and farmed are the only distinct product types available, and that these preferences do not change over time.
3. We highlight the difficulty in linking stated preferences and real-world behaviour, due to confounding factors. A consumer who typically prefers wild products may be deterred by factors such as legality, high prices or even simple availability.
4. We recommend that researchers embrace these complex markets rather than trying to simplify them, and clearly state the limitations of studies that try to make the connection between stated preferences and actual behaviour. This includes considering the full range of products available, what or who might influence the actual purchasing decision a consumer makes, and the diversity of people who may buy wildlife products.
5. Considering this complexity is likely to improve evidence-based recommendations for the design of large-scale conservation interventions and policy changes. This will ensure that these interventions are better able to reduce the negative impacts on biodiversity from illegal and unsustainable trade, and promote sustainable trade that can benefit both people and wildlife.

## KEYWORDS

captive breeding, conservation policy, consumer demand, consumer research, cultivation, illegal wildlife trade, stated preference methods, wildlife farming

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## 1 | WILD ASSUMPTIONS IN WILDLIFE TRADE DISCUSSIONS

Despite its name, wildlife trade does not always involve wild-sourced plants, animals or fungi. In fact, although certain species and their products in commercial trade are still primarily harvested in the wild (e.g. medicinal and aromatic plants; Jenkins, Timoshyna, & Cornthwaite, 2018), an increasing proportion of the so-called wildlife products in legal international trade are derived from artificially propagated or captive bred (hereafter referred to as 'farmed') sources (Harfoot et al., 2018). Wildlife farming enterprises emerge as an entrepreneurial response to provide persistent or growing consumer markets with products for which supply from the wild is in relative decline, or for which scaled-up production processes may otherwise make economic sense (Jiang, Li, Fang, Meng, & Zeng, 2007; Lueck & Torrens, 2019). This means that many consumers are increasingly faced with alternatives to wild-harvested products that may be cheaper, legal and easier to access.

In many cases, this increase in farming is at least partly driven by concerns over illegal or unsustainable wildlife trade. Increasing illegal trade in a species may lead to both greater regulation of wild-sourced trade through trade bans or quotas (e.g. establishment of a zero quota for international trade in wild saiga antelope; CITES, 2019) and/or specific promotion of farming as a conservation intervention for certain species (e.g. crocodilians; see Hutton & Webb, 2002). Whereas conservation successes have been reported in some cases, such as for alligators (Moyle, 2013), for most wildlife species that are farmed for trade, the impact on wild populations is not assessed or is extremely difficult to measure. Where farms take their stock directly from the wild, it can be easier to show the impact on wild populations (e.g. pythons in Indonesia; Lyons & Natusch, 2011). However, where farms do not directly remove individuals from the wild, there is some argument that they may still impact wild populations by stimulating consumer demand for wild products (Drury, 2011). Therefore, one way that researchers have attempted to examine this impact is to investigate consumer preferences, in an attempt to draw conclusions about purchasing behaviour. In these cases, expressed consumer preferences for 'wild' products that persist after the introduction of farming are often used as key indicator to infer that farming has not been successful in reducing unsustainable harvesting from the wild (Phelps, Carrasco, & Webb, 2014).

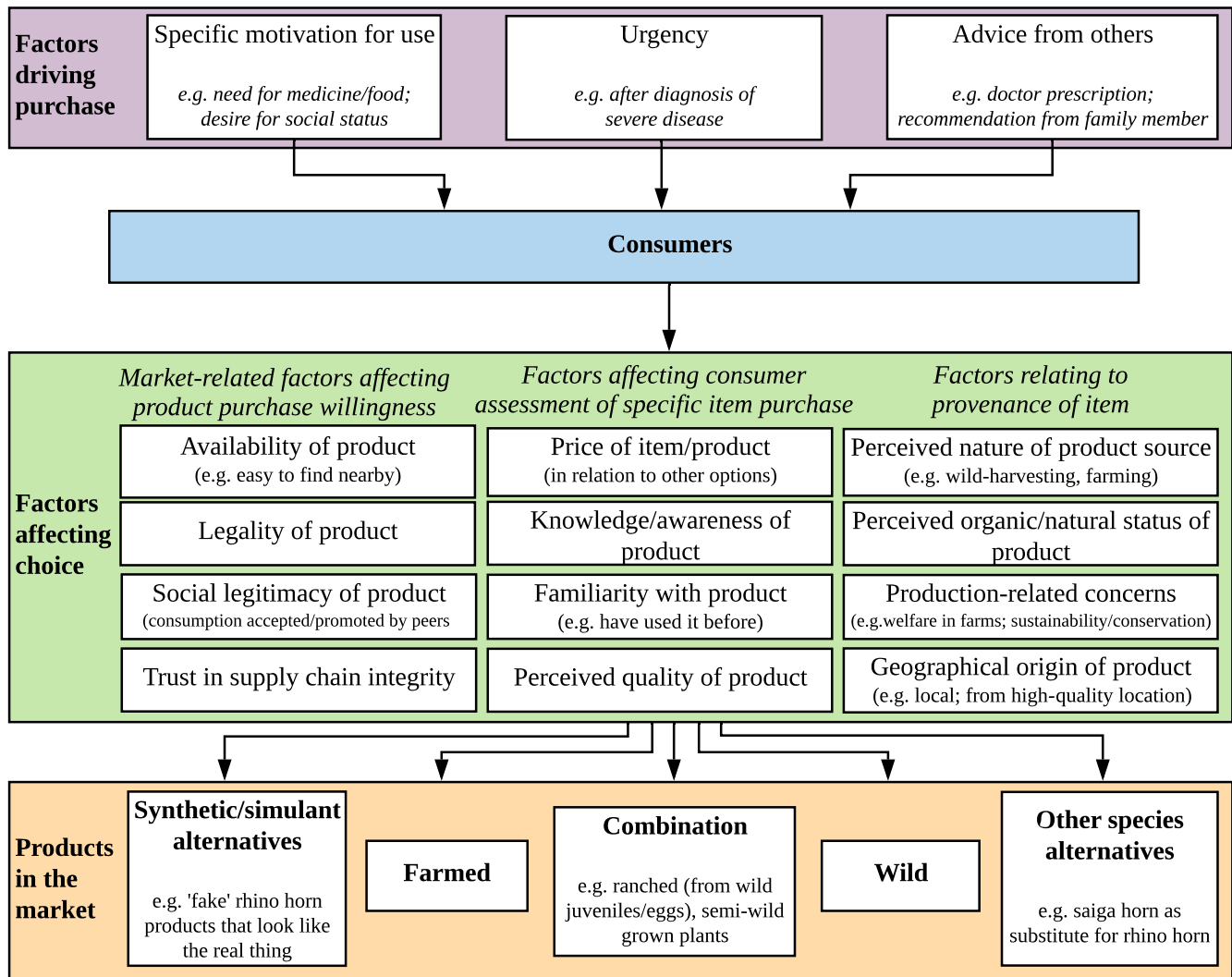
In contrast to findings of wild preferences, preferences for farmed products, where found, have not been used to suggest that farming should be promoted. For example, Moorhouse, Coals, D'Cruze, and MacDonald (2020) report some preferences for farmed tiger, lion and bear products among Chinese traditional medicine consumers, but the study does not conclude that farming has been successful. While we do not suggest that these studies produce data that can draw these conclusions, it is clear that this does happen when wild preferences are reported. For example, findings of expressed preferences for 'wild' have been used to strongly recommend that farming has not been a success and

should be banned (Crudge, Nguyen, & Cao, 2018), or that existing bans should be maintained (Gratwicke et al., 2008). In some cases, this has led to large-scale policy recommendations, such as IUCN Recommendation 139 in 2012 to end Asian bear farming, which was in-part based on wild preferences reported by Dutton, Hepburn, and MacDonald (2011). As these findings are clearly being used to influence both policy and conservation practice, it is essential that such studies are carried out in a rigorous way. However, consumer behaviour in the wildlife trade is highly complex and multifaceted, and the basic 'wild versus farmed' narrative, although widespread, is likely to be too simplistic to provide useful evidence for large-scale changes in policy. Here, we explore the assumptions underpinning this narrative, and assert that they should be carefully considered. We argue that more rigorous assessments of consumer behaviour must be carried out to disentangle the markets for wild-harvested and farmed wildlife products. By doing this, we can provide clear evidence for the best methods for improving the situation for wild species, whether they be the promotion of legal trade, consumer behaviour change interventions or improved regulation and enforcement.

## 2 | COMPLEX ASPECTS OF CONSUMER CHOICE

When considering consumer preferences in the wildlife trade, it is worth contemplating some of the assumptions that are often made about the complex factors that can influence purchasing decisions (Figure 1). In particular, some of the likely nuances in the 'wild' versus 'farmed' consumer decision framework are typically overlooked. The first point to note is that, contrary to popular perception, in practice there are often unclear boundaries between wild and farmed. For example, some farms may still source stocks from the wild (e.g. porcupine farms in Vietnam; Brooks, Robertson, & Bell, 2010); in other cases, there are hybrid forms of production that defy simple classification along a captive-wild continuum (e.g. wildlife ranching in South Africa; see Child et al., 2019). Furthermore, consumer perceptions of what is 'wild' do not necessarily align with the reality of what is actually wild-harvested (Fabinyi & Liu, 2014), perhaps due to marketing and information provided by sellers (Drury, 2011).

Another crucial point is that relative preferences for 'wild' and 'farmed' may vary, not only among consumers but also between species (Shairp, Verissimo, Fraser, Challender, & MacMillan, 2016), and even between products derived from the same species, being further influenced by both prices and qualitative factors (e.g. physical appearance). Product price and quality differences between wild-harvested and farmed products are affected by relative production methods and costs, which may also vary with geography and over time as technologies and other factors evolve. Consumers, and their consumption habits, are accordingly also unlikely to be either homogeneous or static. The real-life situation is therefore often highly complex; stable dichotomous choices and preferences



**FIGURE 1** The factors that are likely to influence wildlife consumer choice in a market with both farmed and wild products

between wild-harvested and farmed products are by no means the norm.

The specific motivation for consuming a wildlife product will tend to affect preferences (Thomas-Walters et al., 2019). Consumers buying ingestible wildlife products for food or medicine may select wild-harvested products for perceived naturalness, persuaded by notions of organic health or vitality, whereas others might prefer farmed products that comply with certain health and safety standards (e.g. control for zoonotic disease). For consumers buying ornamental or clothing products, such as a crocodile skin handbag, farming allows for more quality control and breeding for desired aesthetic characteristics, although some consumers might also appreciate the novelty or distinctiveness associated with wild-harvested products. There may be instances in which a species yields both an ingestible product (e.g. meat) and an ornamental product (e.g. hide) for which, for example, even the same consumer might prefer to ingest the wild version but prefer the farmed product as an ornament.

Some consumers may also be conscious of issues such as sustainability and effects of management and harvesting techniques (Fischer, 2004). In the case of animals in particular, consumers may

be concerned with the welfare implications of certain harvesting or farming practices. They may also be influenced by perceptions of endangerment in the wild (Liu et al., 2016). Those who are more motivated by conservation concerns might shun the products of endangered species, whereas others who are more motivated by consumer prestige might prefer a product that they know is rare. The extent to which these other concerns and motivations relate to whether a product was wild-harvested or farmed is not always obvious.

Consumer preferences for wildlife products are also likely to be influenced by knowledge of legality and perceptions of social legitimacy (these are two distinct attributes; see 't Sas-Rolfes, Challender, Hinsley, Verissimo, & Milner-Gulland, 2019). Law-abiding consumers will shun illegal products; this may be because they regard legality as guide to legitimacy, but also may be to simply avoid the risk and potential penalties associated with enforcement efforts. However, some consumers may ignore legality and still desire illegal wildlife products that maintain social legitimacy within their social groups—there is even evidence that in some social circles access to certain illegal products actually boosts social status (Fabinyi & Liu, 2014; Hübschle, 2017).

Related to issues of legality and legitimacy, many consumers are concerned with product authenticity, given the prevalence of fake products in illegal markets. Some consumers are willing to pay higher prices for products with certification labels, or those that come from local sources (Brayden, Noblet, Evans, & Rickard, 2018). Trust in supply chain integrity to guarantee the provenance of wildlife products is therefore likely to be a significant influence on consumer purchases. Again, the way in which such concerns over legality, social legitimacy and authenticity relate to choices between wild and farmed sources may vary.

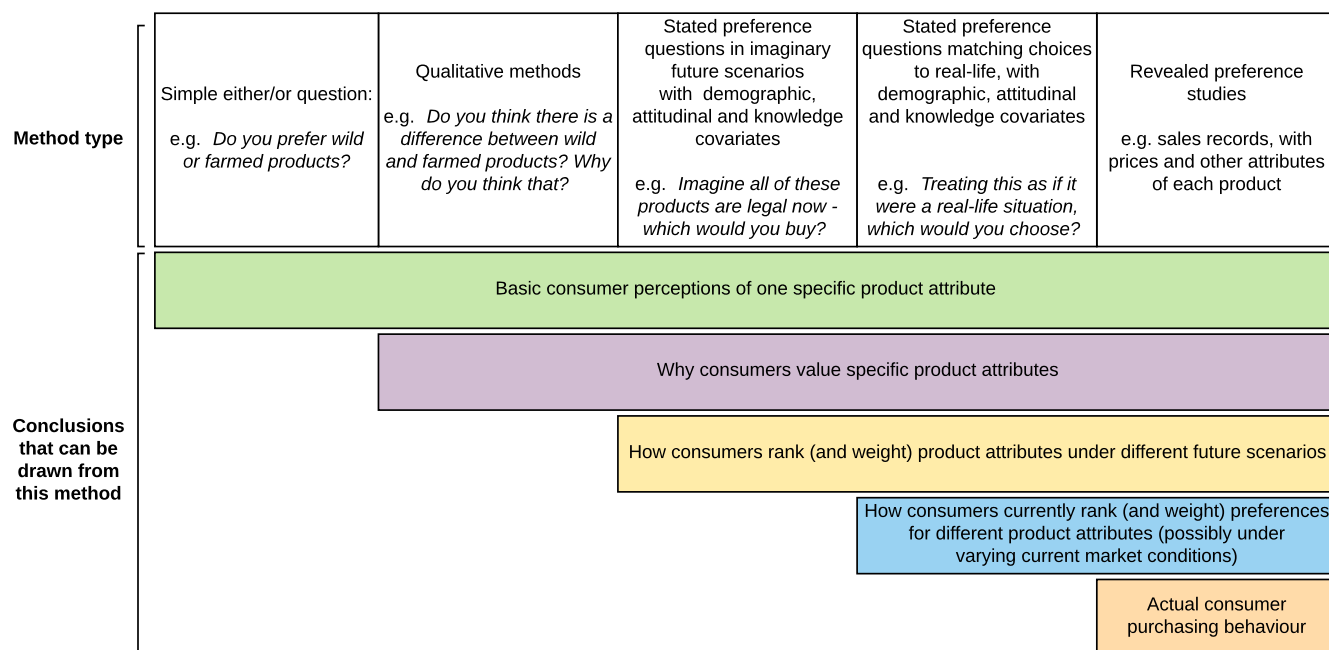
Relatively, little is known about how preferences vary over time as consumers face changing conditions, learn new information (including through changing price differences), or are exposed to different and novel products. In some circumstances, preferences may change rapidly for large numbers of people, due to an extreme event. For example, the 2020 COVID-19 pandemic may have rapidly changed consumer preferences for wild products, due to the reported health risks of consuming wild animals. However, changes in preferences usually occur on much smaller scales, affecting individual consumers at different times. For example, consumers who traditionally buy wild products may begin to prefer farmed products if they learn that a species is threatened in the wild, or that purchasing an illegal wild product could lead to prosecution. In other cases, consumers may switch frequently between purchasing farmed and wild products for medical purposes, depending on factors such as specific health conditions which may require different forms of treatment, or trends in their social circle. Finally, new products may become available that aim to shift some consumers away from both wild and farmed products of a certain species, such as the introduction of alternative wildlife products (e.g. herbal alternatives for bear bile; Appiah et al., 2006; Moorhouse et al., 2020), or the

development of synthetic alternatives for rhino horn (Mi, Shai, & Vollrath, 2019). Recent work to understand consumer choices between different species alternatives suggest that these shifts are highly complex and context specific (Moorhouse et al., 2020). To date, the extent to which consumer studies and their associated policy recommendations have accounted for such potential shifts in preferences is limited.

### 3 | DESIGNING EFFECTIVE AND USEFUL DEMAND STUDIES

The first step in assessing the utility of demand studies to determine wild versus farmed preferences is to examine the methods used, which can take many forms, varying in complexity and the information that they can generate (Figure 2). In some cases, consumers are asked to rank different products or select which type they prefer, or which they think is 'best', based on no other information apart from the source. For example, Gratwicke et al. (2008) asked survey respondents 'Which is more valuable [as a medicine], wild or farmed tigers?' However, without further context, survey questions such as these tell us little about the values underlying these preferences or how easily they are influenced by various other factors. While more nuanced qualitative approaches can be used to understand these values (Drury, 2009), recent studies still appear to have framed questions about consumer preferences as a simplistic dichotomous choice (e.g. Fabinyi & Liu, 2014, bear bile; Moorhouse et al., 2020).

This is not to suggest that the answers to these basic questions have no use at all in planning conservation interventions. Answers to either/or questions can provide data on how different consumers perceive different product types, which can, in turn, tell us more



**FIGURE 2** Conclusions that can be drawn from different methods used for asking questions about consumer preferences for wild and farmed products

about the product information or market conditions that they are exposed to. This may be useful in the early stages of the design of behaviour change campaigns to identify the perceptions or social influences that may underpin preferences for illegal products (Davis et al., 2016). However, beyond these broad conclusions, inferring how perceptions about different products may translate into real-life behaviour can be problematic. This is especially true when no attempts are made to cross-correlate expressed preferences for wild or farmed products with other attributes such as provenance, production method, legality or a perceived social status benefit. In particular, preferences are often not measured with reference to variable prices, which are extremely important in driving actual consumer purchasing decisions, and may provide an indication of the relative strength of one preference over another.

If consumers are not asked to consider price when reporting their preferences, it can lead to unrealistic answers. For example, Gratwicke et al. (2008) reported no relationship between income and stated preference for wild tiger parts, even though lower-income consumers would be unlikely to be able to afford to buy these expensive products in real life. Moreover, without further information to understand their decision, it is impossible to know whether the source type of the product is the attribute driving their answer, or whether it is incidental to another preference that is much more important for them. For example, consumer preferences for wild or farmed edible fish were shown to be related to their perceptions of how each type of fish fitted their requirements relating to other factors, such as availability, ease of preparation or freshness (Güney, 2019). Ideally, multiple consumer preference attributes should thus not only be ranked but also weighted (preferably using prices) to determine their relevance (Figure 2).

To better understand the role of wild or farmed sources in influencing choice in relation to multiple other attributes, more sophisticated methods are necessary, applying principles of conjoint analysis (Green & Srinivasan, 1990; Rao, 2014). The gold standard would be a revealed preference study, where real-life purchasing decisions are recorded or observed directly in the actual context in which they are occurring. However, these are difficult to carry out for wildlife markets where some products are illegal and at least some purchasing behaviour is covert. For example, Nuno et al. (2018) used revealed preference data (in combination with several other methods) to look at markets for wild and farmed turtle meat but this was based only on farmed sales. While observational data have been used to attempt to incorporate sales of both wild and farmed products into conclusions about preference, sample sizes are small (e.g. Phelps et al., 2014) or primarily involve supply data with actual purchases not observed (Gale et al., 2018). Therefore, stated preference methods are often the best approach available (Johnston et al., 2017). These include contingent valuation and choice modelling based on field experiments (i.e. choice experiments); both have been used extensively in environmental economic evaluation and consumer market research (List & Price, 2016; Mogas, Riera, & Bennett, 2006; Nguyen, Haider, Solgaard, Ravn-Jonsen, & Roth, 2015).

These methods can vary in their complexity, and in their attempts to replicate a realistic situation. In some cases, attributes are

carefully chosen to be as realistic as possible (e.g. Williams, Gale, Hinsley, Gao, & St. John, 2018), whereas in others, a hypothetical situation is deliberately constructed to draw conclusions on how consumer choice may be influenced by potential future scenarios (Dutton et al., 2011). The less realistic the stated preference question, the higher the chance that the results will be influenced by hypothetical bias, which causes respondents to give unrealistic answers, often by overstating the price they would be willing to pay (Hensher, 2010). In these cases, we have less confidence that the preferences expressed will be reflected in real-life consumer behaviour. For example, Dutton et al. (2011) asked respondents to imagine that wild bear bile in China was legal and sustainably sourced, before choosing between products based on source and price alone. As wild bile is illegal in China, it is inadvisable to extrapolate from these results to draw inferences on relative markets for farmed and wild bile in real life.

More complex and realistic stated preference studies that incorporate multiple different attributes and scenarios are likely to provide a more accurate view of consumer preferences and actual purchasing behaviour. As an example, Brayden et al. (2018) surveyed seafood preferences, selecting source (wild or farmed), certification (organic and/or sustainably harvested), geographical origin and price as relevant attributes. They demonstrated good survey practice by running a pilot study with focus groups to ensure that the defined attributes were consistent with consumer understanding. Their results showed that although consumers expressed preferences for wild-harvested products, they also displayed significant previously unrevealed preferences relating to certification and geographical origin.

Hanley, Sheremet, Bozzola, and MacMillan (2018) conducted a similar study on traditional medicinal users of rhino horn in Vietnam by presenting respondents with choice sets that included four attributes: wildness, rarity, harvesting method and price, under two different scenarios (continued trade ban and legalization). Their results also confirm that wildness is not the only decisive factor in consumer decision-making—all four factors were influential. Even these results can only be viewed as a partial indication of how consumer preferences relating to wild or farmed sources might change in response to trade legalization. This is because a significant proportion of the rhino horn market relates to carved ornaments that are not ingested, and traditional medicinal consumption is often at least partly determined by prescribing practitioners rather than end users (Cheung, Mazerolle, Possingham, & Biggs, 2018).

Finally, where wildlife purchases involve rule-breaking or are sensitive in some way, even the most sophisticated questions will face an additional challenge of social desirability bias (Nuno & St. John, 2015). For wildlife trade, this sensitivity could come from the illegality of wild-sourced purchases, or in certain cases from consumers' awareness of controversies about animal welfare. Addressing these biases is important but not widely considered in the literature. A simple approach that has been shown to improve honesty is requiring respondents to swear a 'solemn oath' that they will answer in a way that reflects a real choice (Jacquemets, Joule, Luchini, & Shogren, 2013). Going further than this, Nuno et al. (2018)

designed a multi-stage survey to look at turtle meat consumption, combining revealed and stated preference data plus a specialized technique for asking questions about illegal or sensitive behaviours (the Unmatched Count Technique: UCT; see Nuno & St. John, 2015). In this case, although the UCT did not produce conclusive results, prevalence information and sales data derived from the multi-disciplinary approach was used to interpret stated wild preferences from some consumers (Nuno et al., 2018).

## 4 | FUTURE RESEARCH PRIORITIES

With increasing attention being paid to the growing challenges associated with the illegal wildlife trade, it is vital that we do not jump to inappropriate conclusions on the best way to address it—this includes avoiding simplistic assessments of the conservation impacts of wildlife farming. Whereas the economic costs of farming relative to wild harvesting may be a critical factor (Gentry, Gaines, Gabe, & Lester, 2019), conservation success will also depend in large part on consumer preferences and related purchasing behaviour. To date, some questionable assumptions have been made about both the magnitude and the nature of consumer demand for wildlife products (Margulies, Wong, & Duffy, 2019), which may have led to an underestimation of the potential for farmed products to displace demand for illegally harvested wild products (Gentry et al., 2019; Moyle, 2013).

Concluding definitively whether farming has failed or succeeded for a particular species would ideally need a robust study that triangulated from several different methods and sources (e.g. field surveys of wild populations, enforcement data, sales data, robust consumer behaviour studies) to go beyond simple inferences based on correlations. While this might not always be possible, especially in conservation where resources may be limited, simplistic interpretations of complex wildlife markets may be leading policymakers astray, and we urge researchers to carefully consider how they design, interpret and report their results in the future.

A key priority should be for scientists and decision-makers to be clearer about the limitations and strengths of the methods that they use. For example, simple 'farmed or wild?' questions cannot be used to draw definitive conclusions that farming has failed or succeeded but it can reveal consumers' perceptions of wild or farmed products, and how this varies between different groups of people. This can then be used to compare the influence of factors such as knowledge and cultural context on perceived effectiveness or quality, which can underpin the design of more robust studies, ideally in relation to price variability (see Figure 2). As well as declaring methodological limitations, researchers must be clear about their own potential biases in interpretations of their data, especially when communicating their findings to decision-makers. Debates over trophy-hunting have recently led to calls for scientists to be clearer about their funding sources and conflicts of interest (Berg, 2019). We propose that this should become the norm in studies related to highly polarized wildlife farming issues, with studies funded by pro-farming (e.g.

governments of countries where the species is farmed) or anti-farming (e.g. animal welfare) sources clearly stating this to readers.

A second priority should be in the design of studies, which should carefully consider the complexity of wildlife markets where both farmed and wild products are sold, and the way in which consumers deal with them. These complexities should form the basis of the design of preference studies and aim to match real-life situations as closely as possible, with a view to assessing the viability of alternative interventions (e.g. certification and labelling) to address sustainability concerns. This includes designing surveys or interviews to understand the range of motivations for consumption, and the relative (i.e. ranked and weighted) importance of real factors likely to influence purchasing decisions. Basing study design on simple, broad assumptions about consumer behaviour (e.g. all consumers want the same thing) should be avoided. Although revealed preference studies should be carried out where possible, stated preference studies can be strengthened by triangulating the findings of both qualitative and quantitative approaches, as well as specialized methods to ask sensitive questions, where these are appropriate (Nuno et al., 2018).

Finally, we need to better acknowledge and address existing biases in studies of consumer preferences, to allow comparison between different markets and taxonomic groups to be carried out. This includes prioritizing studies into more diverse taxa, products and regions to broaden our understanding of how preferences differ between markets. For example, multiple studies of consumer preferences for bear bile in Asia exist (Crudge et al., 2018; Davis et al., 2016; Dutton et al., 2011; Moorhouse et al., 2020) but no work has been carried out on preferences in markets for highly traded taxa such as cacti and succulents (Goettsch et al., 2015). With so many species threatened by illegal and unsustainable wildlife trade, we must move beyond wild assumptions, and base decisions about the most effective interventions on robust evidence, collected using appropriate methods.

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## CONFLICT OF INTEREST

The authors declare no competing interests.

## AUTHORS' CONTRIBUTIONS

Both authors developed the idea for the paper and contributed equally to writing, editing and revising it. A.H. made both figures with input from M.t.s-R.

## DATA AVAILABILITY STATEMENT

This paper did not use any data.

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## SUPPORTING INFORMATION

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

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