

RESEARCH ARTICLE



Stakeholder preferences for pangolin conservation interventions in south-east Nigeria

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Abstract

1. The overexploitation of biological resources severely threatens many species, requiring urgent and effective conservation interventions. Such interventions sometimes require governance structures that incorporate pluralist perspectives and collaborative decision-making, especially in complex, multi-faceted and multi-scale issues like the illegal trade in pangolins.
2. We used Q-methodology to provide evidence to inform interventions for pangolin conservation in south-east Nigeria. We sampled stakeholder groups associated with pangolin use and protection, including hunters, wild meat traders and Nigeria Customs Service employees, to elicit their opinion and knowledge on the use and perceptions of pangolins and their preferences for interventions to reduce pangolin decline.
3. We found that the local consumption of pangolin meat as food is the primary driver of poaching in the region. This contradicts popular opinions that pangolins are specifically targeted for international trade, revealing an opportunity for site-level behaviour change interventions. The different stakeholder groups identified awareness-raising campaigns, law enforcement, community stewardship programs and ecotourism as preferred interventions, whose effectiveness we attempted to assess using reported case studies.
4. We observed different perspectives between people associated with pangolin poaching and use (predominantly those living around pangolin habitats, including hunters and wild meat traders) and those working to protect them (such as conservation organisations and Nigeria Customs Service employees). For example, the first group supported community stewardship programs, while the latter preferred awareness-raising and law enforcement efforts. This divergence in

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perspectives underpins the need for a combination of targeted interventions at the site level to engage different stakeholders while highlighting the potential challenges to collaborative decision-making for species threatened by illegal wildlife trade.

5. *Policy implications.* Our results stress the importance of targeted and context-specific conservation interventions.

KEYWORDS

behaviour change interventions, community-based conservation, conservation governance, illegal wildlife trade, Pholidota, poaching

1 | INTRODUCTION

The overexploitation of species drives biodiversity loss (IPBES Secretariat, 2019; Maxwell et al., 2016). Hunting for subsistence and commercial purposes, for example, is responsible for declines in tropical bird and mammal populations (Benítez-López et al., 2017), negatively impacting the diet, customs and livelihoods of millions of people (Brashares et al., 2014). Addressing unsustainable species harvesting is challenging (Ingram et al., 2021), often requiring interdisciplinary approaches to understand the social, political, ecological and economic factors (e.g. site-level governance) that shape conservation outcomes (Brashares et al., 2014; Reed et al., 2016).

Outcomes such as improved governance depend on an in-depth understanding of stakeholders' perspectives (Bennett, 2016), which can be used to formulate, implement and evaluate conservation policies and interventions (Young et al., 2013). Considered a 'fundamental prerequisite for the achievement of sustainable development' (UNCED, 1992; paragraph 23.2), stakeholder involvement in decision-making promotes legitimacy and trust in decision-making processes (Renn, 2006). Stakeholder involvement also increases the knowledge pool from which decisions are made (Svarstad et al., 2006), possibly informing more inclusive interventions. For example, awareness-raising, law enforcement, social sanctions, payments for ecosystem services and the application of new technologies are a suite of interventions that can help achieve desired conservation outcomes (Finer et al., 2018; Moore et al., 2018; Sachedina & Nelson, 2012; Thomas-Walters et al., 2022). However, these interventions must be applied appropriately to ensure public and stakeholder support and desirability (Reed, 2008). An essential component of intervention design is, thus, determining entry points (consensus) and areas of contention on the viability and adoption of different approaches (Carmenta et al., 2017). Fostering stakeholder participation is especially crucial when addressing complex, multi-layered conservation challenges such as illegal wildlife trade (or wildlife trafficking) involving various actors, many of whom operate discretely.

Pangolins (Pholidota: Manidae) are scaly small- to medium-sized African and Asian mammals that are negatively impacted by wildlife trafficking (IUCN, 2021). All pangolins are listed as either Vulnerable,

Endangered or Critically Endangered on the Red List of Threatened Species (IUCN, 2021), with African pangolins increasingly trafficked to Asia to supply demand for their scales used in traditional medicine (Emogor et al., 2021; Wang et al., 2020). The white-bellied pangolin *Phataginus tricuspis*, black-bellied pangolin *Phataginus tetradactyla* and giant ground pangolin *Smutsia gigantea* occur in Nigeria. It is illegal to hunt, consume and trade in pangolins in Nigeria (Endangered Species Act of Nigeria, 1985; 2016 amendment), with the country's signatory to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), prohibiting any international commercial trade of wild-caught pangolins (through their inclusion in Appendix I). Despite these, pangolins are illegally hunted in parts of the country for commercial and subsistence purposes (Bassey et al., 2010; Fa et al., 2006; Soewu et al., 2020). Nigeria also plays a pivotal hub role in this Africa-Asia pangolin trafficking, with scales from possibly millions of pangolins trafficked each year from or through the country (Emogor et al., 2021).

Given the multi-layered nature of pangolin exploitation, effective and sustainable interventions require an in-depth understanding of the perceptions of diverse actors associated with pangolin exploitation and protection (Bennett, 2016). Previous studies have investigated perceptions towards pangolins in south-west Nigeria (Abdulazeez et al., 2020; Soewu & Adekanola, 2011). However, this region is culturally dissimilar to the south-eastern part of the country (Anedo, 2019). Additionally, stakeholders' preferences for interventions to curb pangolin decline have not been previously researched across pangolin range states. To address these gaps, we asked two research questions: (a) how do the stakeholders (hereafter stakeholder groups) that are involved in pangolin exploitation and protection perceive pangolins? and (b) how does support for interventions to reduce pangolin decline differ across stakeholder groups?

To investigate these questions, we used Q-methodology (hereafter Q; Brown, 1980, 1993), which is useful for understanding varying viewpoints among stakeholders (Zabala et al., 2018). Q facilitates the elicitation of sensitive information, as participants are not required to explicitly state their actions, perceptions or perspectives (McKeown & Thomas, 2013). Thus, the method is ideal for investigating sensitive topics in conservation (Carmenta et al., 2017). We present the first application of Q to an illegal wildlife trade scenario,

providing crucial insights for informing future site-level conservation interventions and shaping governance mechanisms to better protect pangolins. Given Nigeria's primacy in pangolin trafficking (Emogor et al., 2021; Omifolaji et al., 2020), such interventions can considerably curb poaching and global trade.

2 | METHODS

2.1 | Study location

The primary study location was Cross River National Park in south-east Nigeria (5.5805°N, 8.7481°E; CRNP; Figure 1), where approximately 90% of participants lived or worked. We also recruited participants (border control officers) in the Abuja and Lagos metropolises. Cross River National Park is a biodiversity hotspot (Myers et al., 2000) of predominantly lowland and submontane forests. It is divided into the southern Oban Division (~3000 km²) and the northern Okwangwo Division (~920 km²). Two of the three pangolin species in Nigeria occur in the park (*P. tricuspis* and *P. tetradactyla*).

2.2 | Q method

Q is a semi-quantitative method where participants from diverse stakeholder groups independently rank the same set of items (written statements or pictures) on a continuum (Zabala et al., 2018). The final set of items, also called the Q-set, represents subjective opinions about a topic, which then becomes the 'Q-sort' when ranked by participants. The Q-set is subjective because its composition depends on the researcher, who is expected to present all possible and relevant opinions, perspectives and perceptions on the topic of interest (the concourse). Common approaches to developing a concourse include a literature review and expert consultation. Q can also incorporate post-sort interviews to support Q-sort interpretation. The method facilitates in-depth evaluation of the highly subjective perception-assessment domain, helping to reduce bias and ensuring systematic analysis of viewpoints that form broader opinions (Watts & Stenner, 2012). Given Q typically uses purposive sampling, findings from the method cannot be generalised to the wider population—the method mainly seeks to elicit the variety of viewpoints held within the population, irrespective of their dominance.

2.3 | Stakeholder selection

We defined stakeholders as individuals, groups of people or formal organisations who influence and are influenced by actions or policies related to pangolin conservation and use, consequently qualifying as relevant contributors in decision-making processes (Freeman, 1984; Sterling et al., 2017). We targeted respondents based on a combination of stratified random, purposive and snowball sampling (Biernacki & Waldorf, 1981). We recruited a multi-layered

stakeholder composition, representing those who know about pangolins (i.e. can describe a pangolin), including their primary threat of overexploitation, and are knowledgeable about their conservation. We assessed respondents' knowledge about pangolins by first asking them to describe a pangolin verbally and sharing their thoughts about the conservation status of pangolins. All respondents we approached provided satisfactory morphological descriptions and linked hunting or poaching to pangolin survival.

We interviewed a total of 49 respondents (female = 9; male = 40) across seven stakeholder groups (seven per group), namely (i) hunter; (ii) small-scale farmer; (iii) civil servant; (iv) conservation organisation employee (management personnel of CRNP and Wildlife Conservation Society; WCS); (v) wild meat trader; (vi) CRNP ranger and (vii) wildlife unit of Nigeria Customs Service (NCS; see Table 1 for a description of stakeholder groups, location of participants from each group and rationale for group selection). We selected the stakeholder groups a priori to ensure contrasting representation of actors, that is, actors directly involved in pangolin conservation (ranger, WCS and NCS) and those involved in their exploitation (hunters and wild meat traders). We purposefully selected Lagos, Abuja and Calabar based on NCS and WCS staff presence. We then selected communities using a stratified random sampling technique, with each CRNP division split into four geographic quadrants. To account for the disproportionate sizes of the divisions, we randomly selected four communities in Okwangwo and nine in Oban. It was not always possible to cover all stakeholder groups in each community, but we attempted to ensure a comparable number across quadrants for the following groups: civil servants, farmers, hunters and wild meat traders. We received ethics approval from the Psychology Research Ethics Committee of the University of Cambridge (application number: PRE.2020.001), which mandated participant anonymity and free, prior and informed consent (we received written consent).

2.4 | Q statement selection

We used written statements for our study, separated into two thematic Q-sets entitled: (a) benefits, burdens and beliefs about pangolins (hereafter *Belief*) and (b) pangolin conservation interventions (hereafter *Intervention*). We developed both Q-sets together by first compiling a concourse with the following five topics: (a) general knowledge about pangolins; (b) perceptions and practices involving pangolins across their range states and beyond, paying attention to cultural values and issues around their harvesting, trade and use; (c) contemporary opinions about pangolins, such as their rumoured involvement in the origin and spread of COVID-19; (d) conservation efforts to curb direct and known threats to wild animals, which could be adopted for pangolins in CRNP and across Nigeria and (e) undocumented but probable drivers of threats to pangolins, such as their use as pets.

To select statements for each Q-set, we compiled two concourses using four primary sources: (a) scientific and grey literature;

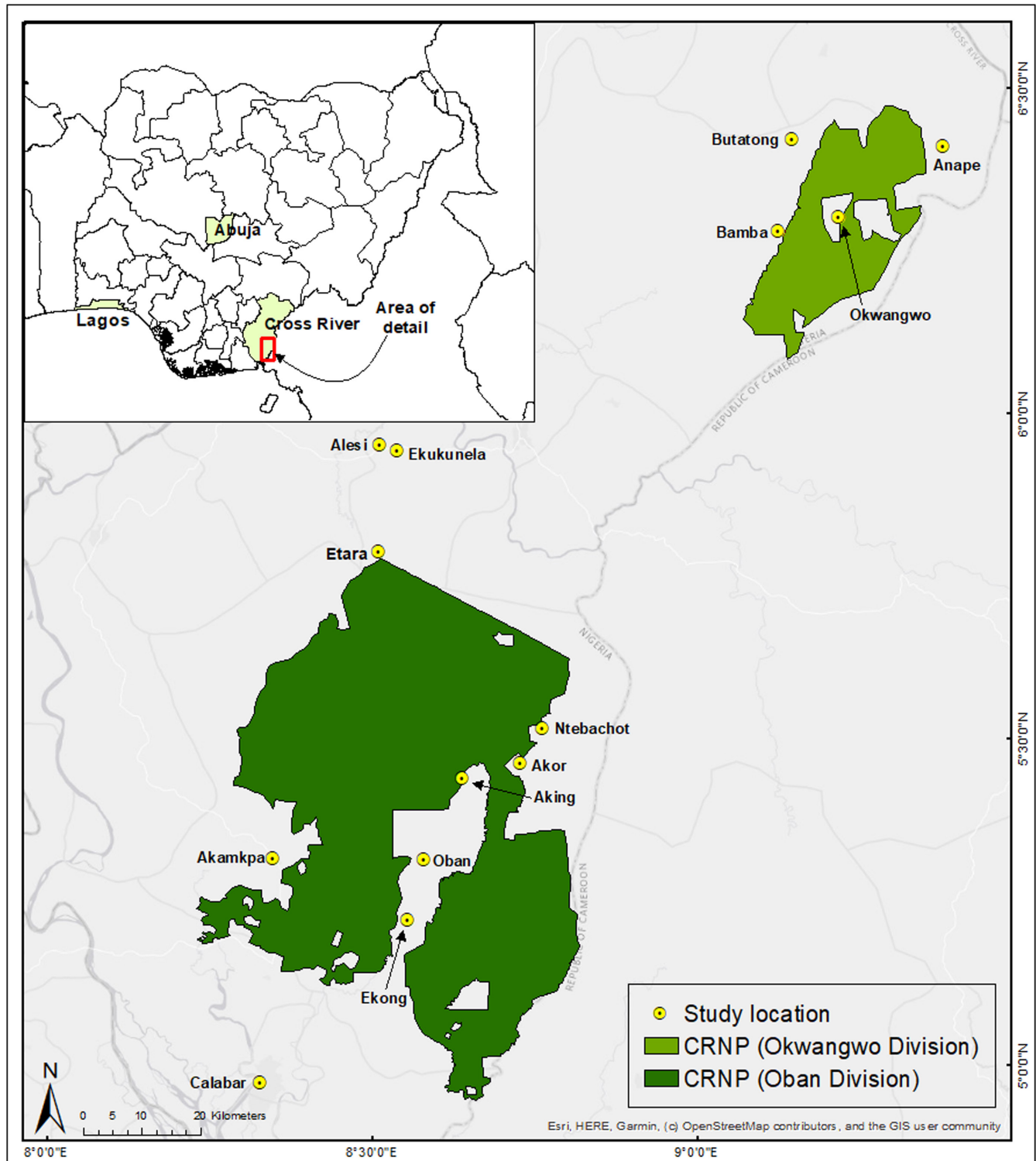


FIGURE 1 The three study locations, namely, Lagos, Abuja and Cross River, are highlighted in the insert (top left). Study sites in Cross River (yellow circles; $n = 14$) comprised the capital city, Calabar, and 13 communities (nine in Oban and four in Okwangwo) surrounding the Cross River National Park. Respondents in Abuja and Lagos were Nigeria Customs Service staff members.

(b) recommendations from experts specialising in synthesising evidence on conservation interventions (<https://www.conservationevidence.com/>); (c) knowledge of ongoing management strategies in CRNP and (d) preliminary findings from a scoping study we conducted with 10 participants from three stakeholder groups in May

2020. We then selected 37 and 25 short and simplified statements for *Belief* and *Intervention*, respectively, from the concourse (concourse curation protocol and selected statements are presented in Appendix S1). Following Watts and Stenner (2012), we prioritised statements directly relevant to the study objectives and location

TABLE 1 Description of selected stakeholder groups, location of participants for each group and rationale for group selection. Note that the locations we recruited park rangers represent their places of duty at the time of this study, not their residence.

| Stakeholder group | Description | Location (number of participants) | Rationale for inclusion |
|---------------------------|--|--|---|
| Civil servant | State and local government staff, including schoolteachers | Oban (1); Akor (1); Etara (1); Ekukunela (1); Alesi (1); Bamba (1); Anape (1) | Civil servants represent people with a stable income source and are integral to the social structure where pangolin poaching and trade occur. Their inclusion is important for a neutral perspective, given they are not directly involved in pangolin conservation or exploitation |
| Conservation organisation | The management staff of CRNP and Wildlife Conservation Society, both actively involved in conservation interventions in CRNP | Calabar (4); Butatong (2); Akamkpa (1) | These organisations are currently working to safeguard pangolin populations and will be actively involved in implementing recommended pangolin conservation interventions. Some participants in this group are also trained scientists (ecologists) |
| Nigeria Customs Service | A Nigerian parastatal under the Ministry of Finance that is responsible for regulating illegal importation and exportation of goods | Abuja (4); Lagos (3) | NCS is critical to detecting and intercepting illegal pangolin shipments entering or leaving Nigeria |
| Ranger | CRNP staff whose duties include conducting periodic anti-poaching patrols in the park | Butatong (2); Aking (3); Okwangwo (2) | Rangers are critical to current efforts to reduce pangolin decline. They apprehend poachers found in the park, possibly deterring illegal hunting |
| Subsistence hunter | People who hunt wild animals for local consumption and income when sold to consumers or vendors in local wild meat markets. They mostly use unsophisticated firearms and the income generated is usually for household maintenance | Oban (1); Akor (1); Ntebachot (1); Etara (1); Bamba (2); Anape (1) | Poaching is the main threat to pangolins. Thus, hunters are notable contributors to pangolin exploitation |
| Small-scale farmer | People who engage in agriculture mainly for subsistence | Oban (2); Akor (1); Etara (1); Alesi (1); Bamba (1); Anape (1) | Pangolin hunting does not require special skill or equipment and farmers kill pangolins they encounter in modified landscapes such as plantations |
| Wild meat trader | People who buy wild meat from hunters living in or around CRNP and sell them in rural or urban communities surrounding the park | Akor (1); Ntebachot (1); Ekong (1); Etara (1); Alesi (1); Bamba (1); Anape (1) | Wild meat traders are notable players in the illegal pangolin trade (a primary driver of pangolin decline) |

when choosing the Q-set. For example, we excluded 'Plant trees to improve pangolin habitats' as habitat loss is not the primary threat to pangolins—at least in CRNP. We also avoided double-loading of statements (i.e. ensuring statements addressed distinct issues).

2.5 | Q statement administration

We conducted in-person Q-sorts following the multiple-participant design (see Watts & Stenner, 2012) from July to September 2020 using cards bearing written statements and a steep nine-point distribution Q response grid (+4 to -4) for both Q-sets (Appendix S2). We chose a steep response grid to reduce the complexity during sorting, as not all our participants were pangolin experts or conservationists (Watts & Stenner, 2012). With zero as the reference, +4 represented 'most unimportant or most inappropriate', while -4 represented 'most unimportant or most inappropriate' (for *Belief*). For

Intervention, +4 denoted 'most preferred', with -4 signifying 'most unpreferred'. We chose a steep response grid (Figure 2) to reduce the complexity in sorting as not all our participants were pangolin experts or conservationists (Brown, 1980; Watts & Stenner, 2012).

During sorting, participants assigned a score to each statement by placing cards containing the statements within a cell. We arranged the cells below the +4 to -4 continuum, and because the grid followed an inverted normal distribution, there were limited spaces around the edges, which represented the highest consensus or disagreement (Figure 2). *Belief* statements were sorted based on whether participants thought the statements were important or true (scale of importance or truth), while *Intervention* statements were sorted based on preference, with a 10–20-min break between both sessions. Participants sorted *Intervention* statements based on preference and not importance or effectiveness to account for the knowledge bias across stakeholder groups about interventions that could be effective for pangolin conservation. Before sorting, we

| Disagree | | | | | Agree | | | | |
|----------|----|----|----|----|-------|----|----|----|--|
| -4 | -3 | -2 | -1 | 0 | +1 | +2 | +3 | +4 | |
| 3 | 4 | 10 | 28 | 13 | 11 | 14 | 16 | 37 | |
| | 5 | 17 | 27 | 31 | 19 | 35 | 24 | | |
| | 32 | 26 | 23 | 8 | 20 | 1 | 36 | | |
| | | 15 | 7 | 6 | 33 | 25 | | | |
| | | 30 | 18 | 9 | 2 | 34 | | | |
| | | | 12 | 21 | 29 | | | | |
| | | | | 22 | | | | | |

FIGURE 2 Example of a Q-sort on burdens, benefits and beliefs (*Belief*) associated with pangolins in south-east Nigeria. An employee of the Nigeria Customs Service completed this Q-sort. The shaded top row represents the scale of the response grid. The numbers (from -4 to +4) were imprinted on the grid before sorting began. The grids below the top row represent spaces where participants were required to place statements based on the instructions associated with the Q-set (importance and truth, in this case). The numbers displayed represent Q-statements in the *Belief* Q-set (see Table 1 in Appendix S2).

asked participants to group the statements into 'agree', 'disagree' and 'neutral' to enhance their familiarity with the statements. After sorting, we asked follow-up questions on their rationale for their rankings, focusing on the statements on the extremes of the grid. We read the statements to participants that could not read them.

2.6 | Data analysis

We analysed both sets of Q-sorts separately in two broad steps, following Brown (1980) and Zabala (2014). The first involved reducing the Q-sorts to factors (i.e. main viewpoints or perspectives). We used principal component analysis and varimax rotation (Brown, 1993), which involves identifying commonality among Q-sorts and grouping highly correlated Q-sorts across participants as distinct factors (see Brown, 1980; Watts & Stenner, 2012). The second step comprised three parts. The first part centred on flagging the Q-sorts that significantly loaded each factor. The Q-sorts that significantly load a factor are highly correlated with the factor, meaning that the statements that make up those Q-sorts are important contributors to defining and understanding the factor. We automatically flagged the Q-sorts that significantly loaded the factors and then manually inspected them for confounds (i.e. where a Q-sort has a similar correlation with more than one factor). In the second part, we estimated the scores of statements for each factor (i.e. z-scores and factor scores; metrics used to assess levels of participants' agreement with the statements). The z-scores are weighted averages of the scores assigned to a particular statement by the flagged Q-sorts. Their comparison highlights the similarity of the factors towards a given statement. On the other hand, the factor scores are the z-scores transformed to the scale of the sorting grid. Lastly, we compared factors to identify distinguishing and consensus statements. A statement was considered as distinguishing

if the absolute difference between the z-scores of the statement for each pair of factors was statistically significant (at 0.05 *p*-level). Conversely, a consensus statement showed no significant differences between any pair of factors. We conducted our analysis using *qmethod* package in R—version 4.1.0 (R Core Team, 2022; Zabala, 2014). Our Methods are summarised in Figure 3, with analytical details presented in Appendix S3.

3 | RESULTS

We extracted five *Belief* factors and four *Intervention* factors (see factor extraction criteria in Appendix S3). These factors explained 58% and 44% of the variance associated with *Belief* and *Intervention*, respectively. The extracted factors correspond to distinct perspectives, which we summarised under unique headings following the prominent statements (i.e. statements unique to the perspectives or those with high factor scores). For each factor (hereafter perspective), we first show the statements that shape the perspective—embodying statements that are unique to each factor—and then state the participants whose Q-sorts significantly load on each perspective. As obtainable in Q studies, we presented the perspectives shaped by the statements as reflective of each perspective (i.e. a shared view), not of individual participants whose sorts significantly loaded the statements. Note, however, that the perspectives are evidence representing participants' beliefs and opinions about the statements. We then used insights from post-sorting interviews to validate and contextualise our interpretation of the perspectives. The numerical z-scores and factor scores for *Belief* and *Intervention* are in Appendix S2, with a summary of the perspectives across both Q-sets presented in Table 2.

3.1 | Perspectives about benefits, burdens and beliefs associated with pangolins

At least six statements shaped each of the five perspectives about the *Belief* associated with pangolins. Only statement 14 (S14; Figure 4) was highlighted as a consensus statement (see Appendix S4 for results of pairwise factor comparisons). However, S24, S25 and S11 showed marginal consensus across the perspectives—none of them distinguished any perspective, with their z-scores clustered (Figure 4).

3.1.1 | Belief1: Interests in pangolin conservation

Statements 1, 4, 6, 9, 10, 15, 18, 19, 26, 31, 32 and 37 shaped this perspective (Figure 4). Q-sorts that significantly loaded the perspective were completed by the following: conservation organisation (*n* = 5), NCS (*n* = 7) and ranger (*n* = 1). The perspective suggests that pangolins' insectivorous feeding habits help to reduce ant and termite populations that would otherwise infest farmlands around CRNP (S1). The perspective further suggests that catching a pangolin

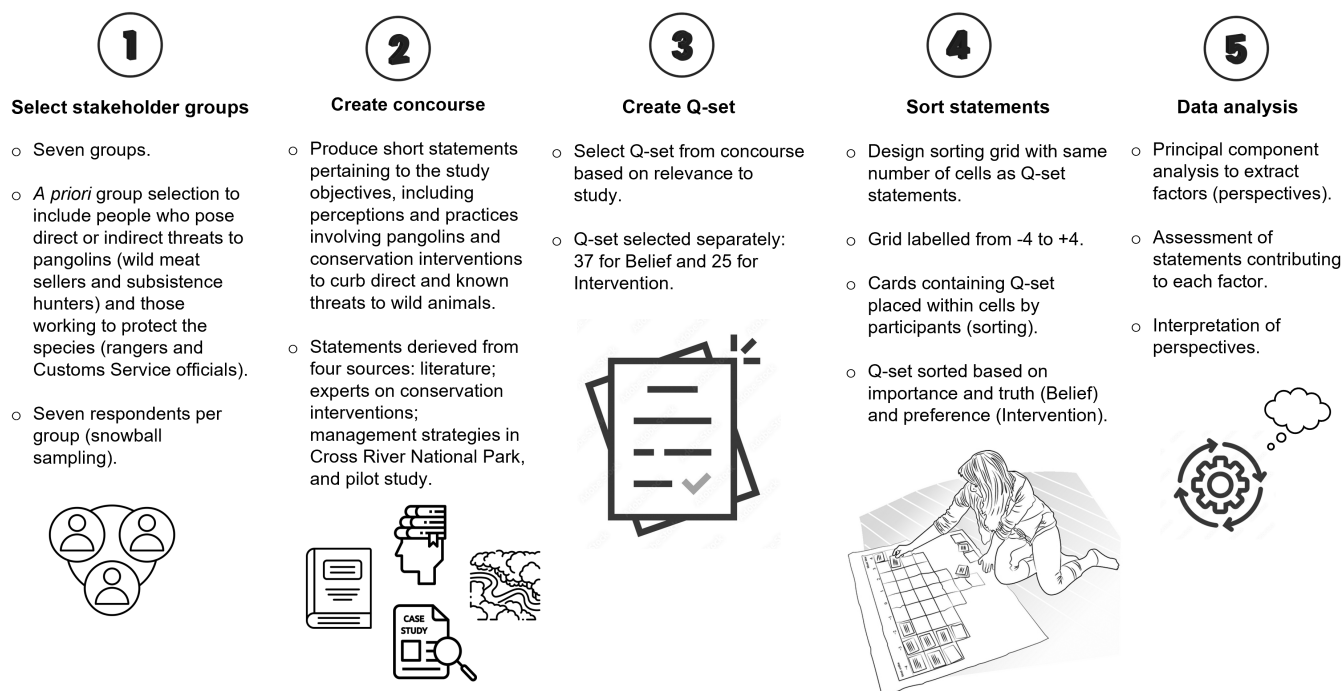


FIGURE 3 Summary of the Methods we used to (a) assess people's perceptions towards pangolins in south-east Nigeria (*Belief*) and (b) understand stakeholder groups' preferences for conservation interventions to reduce pangolin decline (*Intervention*). Depictions are from freeicons.io, flaticon.com and Ellingsen et al. (2014).

is not a sign of good luck (S4) and that Christianity does not forbid the killing or selling of pangolins (S6), adding that pangolins are not perceived as ugly animals (S10). This perspective agrees with S9 (Most people in my community think pangolin meat is delicious) and S26 (Pangolin meat is considered a luxurious or royal delicacy in my community), also submitting that pangolin scales are used locally for medicine (S15). The perspective holds that pangolin poaching is not exclusive to local hunters but that people not living around pangolin habitats visit these places to hunt them (S18), including paying hunters in these areas to do so (S19):

'People come [into CRNP] from Cameroon to hunt pangolin' (Interview; conservation organisation).

The remaining statements that defined this perspective centred on trends in pangolin populations and participants' willingness to support pangolin conservation. The perspective suggests that pangolin populations in CRNP have reduced compared with populations 5 years ago (S31) and believes that current hunting levels will not substantially reduce pangolin populations (S32). The perspective also shows people's willingness to contribute towards the conservation of pangolins (S37).

3.1.2 | Belief2: Unplanned, opportunistic poaching

Statements 2, 3, 4, 6, 10, 28 and 29 shaped this perspective. The Q-sorts that significantly loaded the perspective were completed

by the following: civil servant ($n = 1$), farmer ($n = 1$), hunter ($n = 2$), ranger ($n = 1$) and wild meat trader ($n = 2$). This perspective believes that pangolins are zoonoses carriers (S2). The perspective does not perceive pangolins as a bad omen (S3) but rather believes that catching a pangolin brings good luck (S4). During the post-sort interviews, participants residing in communities adjacent to pangolin habitats (hereafter local communities) stressed that seeing a pangolin during a hunting trip is considered a good sign because of their rarity. They added that catching the mammal is considered lucky because, in most cases, the action does not require a cartridge as the animal is commonly captured by hand or killed with a machete:

'Whenever someone goes to the forest or farm, especially those without hunting weapon(s), their prayer is to see and pick pangolin on the road; it shows that the trip will be favourable' (Interview; farmer). 'Pangolins are very difficult to catch, it's likely to hunt the whole of the rainy season without catching one. It is not easy, except you hunt in the night and luckily you catch one' (Interview; hunter).

Like *Belief1*, this perspective holds that Christianity does not forbid the killing of pangolins (S6) and that pangolins are not ugly animals (S10). The perspective suggests that pangolins are held locally as pets (S28) and that their hunting is opportunistic (i.e. hunting trips do not target pangolins but attempt to capture them when encountered; S29).

TABLE 2 Summary of the themes defining each perspective related to (a) benefits, burdens and beliefs associated with pangolins in south-east Nigeria (*Belief*) and (b) stakeholders' preferences for management interventions to curb pangolin decline in Nigeria (*Intervention*).

| Perspective | Main themes | Contribution across stakeholder groups (number of respondents) | Gender composition | |
|--|--|--|--------------------|------|
| | | | Female | Male |
| Belief1: Interests in pangolin conservation | <ul style="list-style-type: none"> There is external influence in pangolin poaching Current hunting levels are a threat to pangolin populations Pangolin scales are used in traditional medicine Interest in pangolin protection Pangolin insectivorous habit beneficial to farmers Pangolin meat is a luxurious commodity | Conservation organisations (5); NCS (7); ranger (1) | 1 | 12 |
| Belief2: Unplanned, opportunistic poaching | <ul style="list-style-type: none"> Pangolin poaching is opportunistic Seeing and killing pangolins bring good luck Pangolins are zoonotic disease carriers Pangolins are held locally as pets | Civil servant (1); farmer (1); hunter (2); ranger (1); wild meat trader (2) | 3 | 5 |
| Belief3: Pangolin consumption is (covid) safe | <ul style="list-style-type: none"> Pangolins are not linked with COVID-19 Continued pangolin consumption as food There is an external influence on pangolin poaching | Civil servant (2), farmer (2), ranger (1), wild meat trader (1) | 2 | 4 |
| Belief4: Pangolins unthreatened | <ul style="list-style-type: none"> It is taboo to kill and sell pangolins Pangolin populations are thriving No external influence on pangolin poaching | Civil servant (2); hunter (2); ranger (1); wild meat trader (1) | 0 | 6 |
| Belief5: Pangolins for food and a delicacy | <ul style="list-style-type: none"> Pangolins are primarily poached for their meat Pangolin meat is considered a luxurious or royal delicacy Pangolins have a high fecundity compared with African brush-tail porcupines | Conservation organisation (1); civil servant (2); farmer (1); ranger (1); wild meat trader (2) | 2 | 5 |
| Intervention1: Awareness and law enforcement rather than economic incentives | <ul style="list-style-type: none"> Raise awareness that killing and trading pangolins are illegal Implement and strengthen law enforcement interventions (but do not target local food vendors) Do not establish pangolin-related tourism and rehabilitation centres Do not implement community-based interventions (but reward communities for upholding anti-poaching regulations) | Civil servant (1); conservation organisation (5); farmer (2); hunter (1); NCS (3); ranger (5) | 2 | 15 |
| Intervention2: Promote ecotourism and support local advocates | <ul style="list-style-type: none"> Create pangolin-related ecotourism and rehabilitation centres Establish a local pangolin guardianship program Do not prohibit pangolin hunting and the use of their scales in medicine | Civil servant (1); farmer (2); hunter (1); NCS (2); wild meat trader (1) | 1 | 6 |
| Intervention3: Support communities to make anti-poaching by-laws | <ul style="list-style-type: none"> Support communities to make by-laws against pangolin poaching Train border enforcement personnel to increase pangolin-related confiscations but do not equip borders with modern technology | Hunter (2); ranger (1); wild meat trader (2) | 0 | 5 |

TABLE 2 (Continued)

| Perspective | Main themes | Contribution across stakeholder groups (number of respondents) | Gender composition | |
|---|--|---|--------------------|------|
| | | | Female | Male |
| Intervention4: Wildlife officials needed at borders | <ul style="list-style-type: none"> • Include wildlife officials in border inspection teams • Mobilise local people in community-science initiatives • Support communities to make by-laws against poaching pangolins but not their use in traditional medicine • Do not develop action plans for pangolins | Civil servant (2); farmer (1); hunter (1); wild meat trader (2) | 2 | 4 |

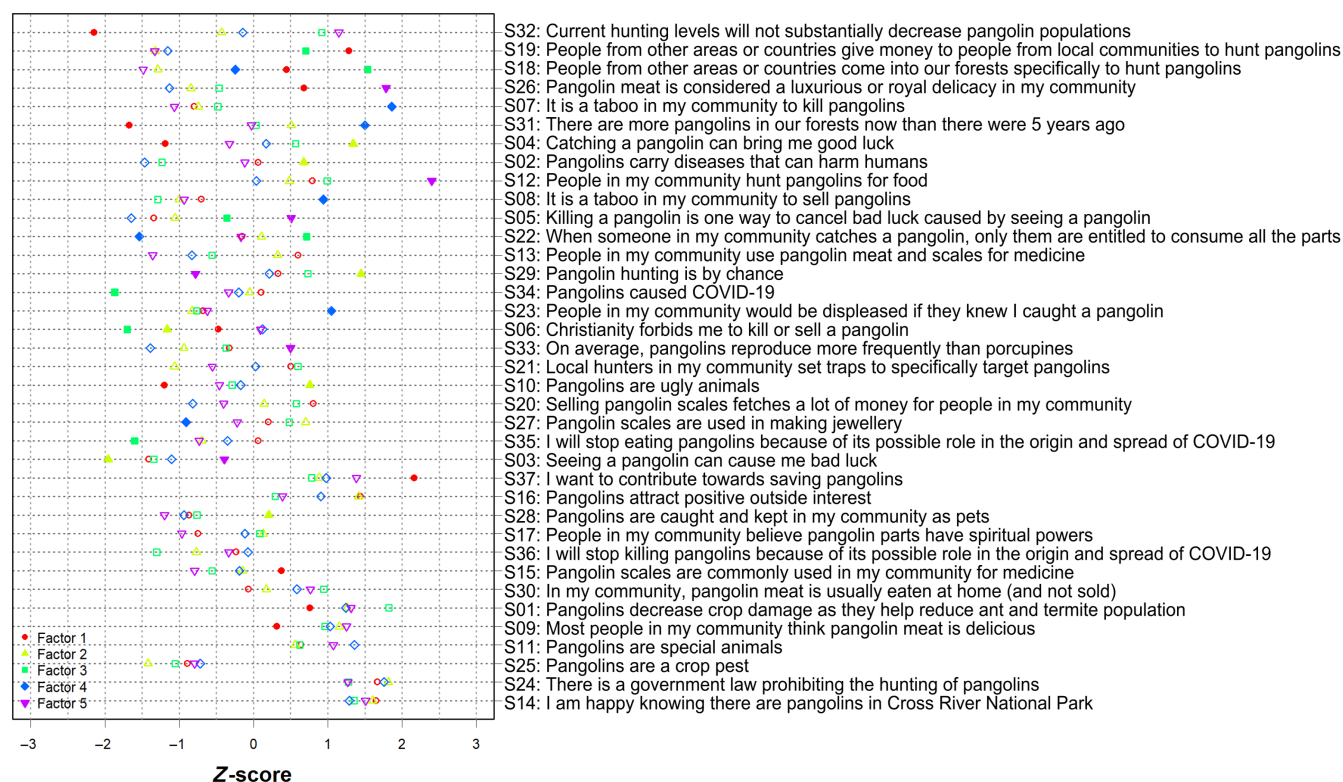


FIGURE 4 Q-set representing benefits, burdens and beliefs (*Beliefs*) associated with pangolins in south-east Nigeria. The symbols and colours correspond to the five extracted perspectives (bottom left). The z-score on the x-axis shows the weighted average by each perspective to a given statement. The z-score differences between factors determine the degree of agreement between statements, with an increase in the levels of agreement towards the statements by the factors from the top to the bottom of the plot. Filled symbols indicate the distinctiveness of the statement to the corresponding factor (perspective). The statements are sorted in descending order using the standard deviation of their z-scores for all factors.

3.1.3 | Belief3: Pangolin consumption is (COVID) safe

Statements 5, 6, 18, 19, 22, 34 and 35 shaped this perspective. The Q-sorts that significantly loaded the perspective were completed by the following: civil servant ($n=2$), farmer ($n=2$), ranger ($n=1$) and wild meat trader ($n=1$). This perspective supports *Belief1* by suggesting that people living outside pangolin range areas influence pangolin poaching by funding local hunters (S19); and people from other communities visit communities adjacent to landscapes where pangolin exists to hunt the animals (S18). The perspective

also disagrees that killing a pangolin can cancel bad luck caused by seeing one (S5), further submitting that Christianity does not forbid hunting and trade in pangolins (S6). This perspective holds that it is customary that the person who catches a pangolin has the exclusive right to use all the animal's parts (S22). The remaining statements that shape this perspective are related to people's opinions about consuming pangolin meat amidst the rumour of their involvement in the origin and spread of COVID-19. The perspective holds that pangolins were not involved in the spread and origin of COVID-19 (S34), suggesting people's intentions to continue consuming pangolin meat despite knowledge of potential health risks (i.e. zoonoses; S35):

'I have been eating pangolins from birth, and I have never seen anyone get sick for eating pangolin, so I will hardly believe COVID-19 is linked to pangolin' (Interview; civil servant). 'Until there is evidence between COVID-19 and pangolins, I will not stop eating pangolins' (Interview; hunter).

3.1.4 | Belief4: Pangolins unthreatened

Statements 7, 8, 18, 22, 23, 27 and 31 shaped this perspective. The Q-sorts that significantly loaded this perspective were completed by the following: civil servant ($n=2$), hunter ($n=2$), ranger ($n=1$) and wild meat trader ($n=1$). This perspective holds that it is taboo to kill (S7) and sell (S8) pangolins. It further suggests that people not part of local communities do not come to adjacent forests to hunt pangolins (S18) and that the current population of pangolins in the CRNP and surrounding forests far exceeds their population 5 years ago (S31). The perspective disagrees that people who catch pangolins are solely entitled to their parts (S22), adding that pangolin scales are not used in making jewellery (S27). The perspective also suggests displeasure towards community members who are found to have killed a pangolin (S23). The taboo associated with killing and selling pangolins and associated communal displeasure towards these actions were commonly expressed in Alesi during post-sort interviews. Members of this community believe that pangolins are sacred animals because during a communal clash several hundred years ago, pangolins helped their ancestors escape annihilation by stretching to form a bridge over a river so they could cross to safety:

'We believe that anyone who kills a pangolin will be cursed; scales like those on pangolins will grow over the person's skin' (Interview; wild meat trader).

3.1.5 | Belief5: Pangolins for food and a delicacy

Statements 3, 5, 12, 26, 29 and 33. The Q-sorts that significantly loaded this perspective were completed by the following: conservation organisation ($n=1$), civil servant ($n=2$), ranger ($n=1$) and wild meat trader ($n=2$). The perspective holds that seeing a pangolin does not cause bad luck (S3) but it suggests that killing a pangolin can cancel out bad luck caused by seeing the animal (S5). This perspective also suggests that pangolins are hunted for their meat, which is consumed for food (S12), adding that pangolin meat constitutes a luxurious or royal delicacy (S26). In addition to suggesting that pangolin poaching is targeted (S29), the perspective holds that, on average, pangolins reproduce more frequently than African brush-tailed porcupines *Atherurus africanus* (S33):

'People hunt pangolin for food, and that is the major reason we hunt' (Interview; civil servant). 'Pangolins

can reproduce four to five [young] whereas porcupines reproduce two to three' (Interview; farmer).

3.2 | Perspectives on pangolin conservation interventions

At least nine statements shaped the four perspectives on stakeholders' preferences for pangolin conservation interventions. None of the statements was labelled as consensus, although S11 showed marginal agreement across the perspectives, suggesting that the stakeholder groups agreed on their view about the usefulness of research for pangolin conservation (S11; Figure 5).

3.2.1 | Intervention1: Awareness and law enforcement over economic incentives

Statements 2, 3, 4, 5, 6, 9, 10, 12, 14, 15, 16, 18, 19 and 23 defined this perspective. The Q-sorts that significantly loaded this perspective were completed by the following: civil servant ($n=1$), conservation organisation ($n=5$), farmer ($n=2$), hunter ($n=1$), NCS ($n=3$) and ranger ($n=5$). The perspective shows strong support for awareness-raising campaigns (S14) but not for interventions that require local communities to make by-laws to prohibit pangolin hunting (S3) and the use of their parts in traditional medicines (S2). It also strongly opposes interventions whose sole emphasis is to pay hunters to stop hunting pangolins (S04):

'Giving poachers money to stop killing pangolins will create more poachers because they will all need money and the numbers will increase...when the money stops coming, they will go back to poaching' (Interview; conservation organisation).

The perspective similarly opposes interventions that centre on recruiting people living around pangolin habitat to become whistle-blowers, that is, informing law enforcement about violations (S6), but it shows support for the provision of communal infrastructure such as health and educational services when communities uphold anti-poaching laws (S5). The perspective strongly opposes the establishment of pangolin-harvesting quotas in local communities (S9), similarly opposing increased enforcement on local food vendors and restaurants that sell pangolin meat (16). It does not prefer the establishment of rehabilitation centres for pangolins rescued from illegal trade (S15) and opposes pangolin-related tourism (S23). The perspective nonetheless favours the inclusion of wildlife experts in border inspection teams to increase the detection rate of trafficked pangolin materials (S10), an increase in the number of rangers conducting anti-poaching patrols to bolster pangolin protection in the wild (S19) and the strengthening of penalties associated with poaching pangolins (S12) and trafficking (S18):

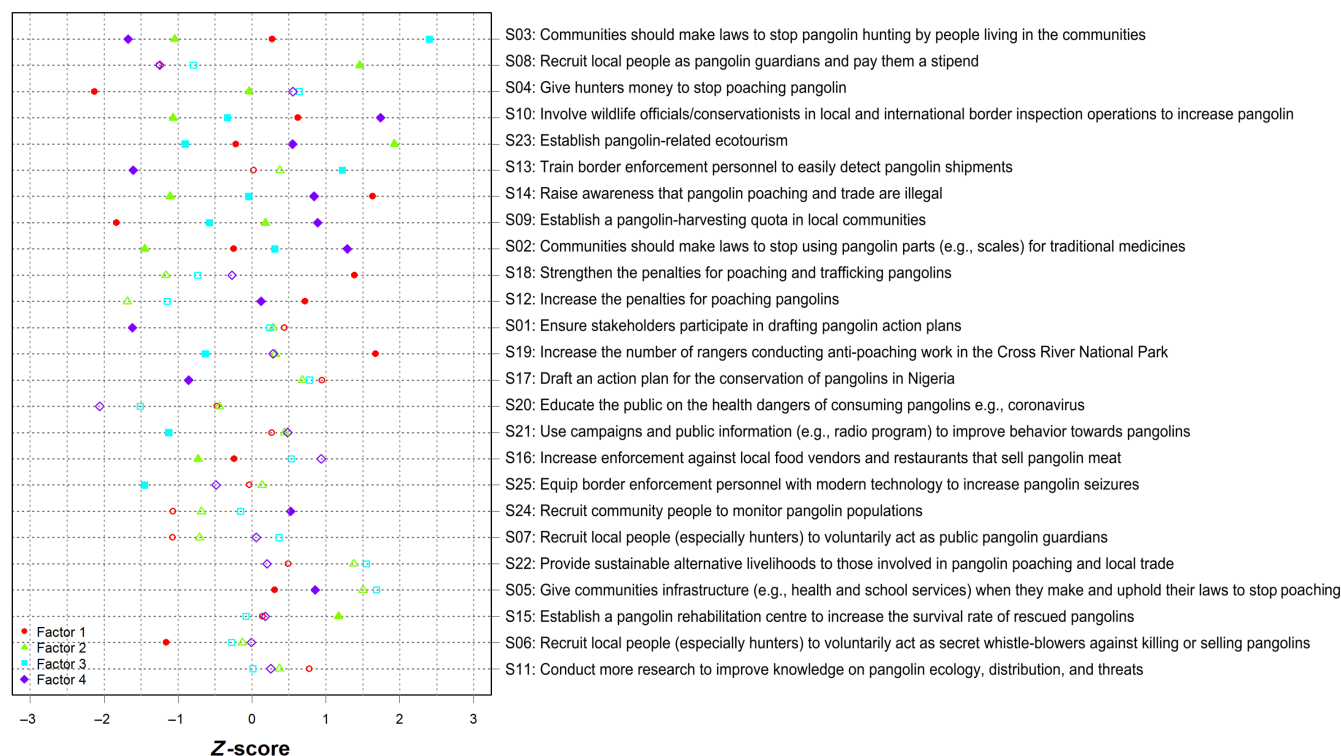


FIGURE 5 Q-set representing conservation interventions for pangolins in south-east Nigeria. The symbols and colours correspond to the five extracted perspectives (bottom left). The z-score on the x-axis shows the weighted average by each perspective to a given statement. The z-score differences between factors determine the degree of agreement between statements, with an increase in the levels of agreement towards the statements by the factors from the top to the bottom of the plot. Filled symbols indicate the distinctiveness of the statement to the corresponding factor (perspective). The statements are sorted in descending order using standard deviation of their z-scores for all factors.

'You cannot create laws to stop pangolin hunting without creating awareness of the dangers. People would like to know why they should stop pangolin hunting' (Interview; NCS). 'We already have the penalties on the ground; all we need to do is to strengthen the penalties by enforcing them' (Interview; NCS).

3.2.2 | Intervention2: Promote ecotourism and support local advocates

Statements 2, 3, 4, 8, 9, 10, 14, 15, 16 and 23 shaped this perspective. The Q-sorts that significantly loaded this perspective were completed by the following: civil servant ($n=1$), farmer ($n=2$), hunter ($n=1$), NCS ($n=2$) and wild meat trader ($n=1$). Like *Intervention1*, this perspective does not support community-centred laws prohibiting pangolin poaching (S3) and also does not support the use of pangolin parts in traditional medicines (S2). Furthermore, it does not support interventions centred on financially compensating hunters not to kill pangolins (S4). The perspective does not prefer the establishment of a harvesting quota for pangolins (S9), the involvement of wildlife experts in border inspection duties (S10), awareness-raising campaigns on the status of pangolins (S14) and increased enforcement on local

food vendors (S16). This perspective strongly prefers community-based interventions where people living in local communities are recruited as stipendiary advocates for pangolin protection (S8). The perspective also supports pangolin-related tourism (S23) and establishing rehabilitation centres for pangolins rescued from the illicit pangolin trade (S15).

3.2.3 | Intervention3: Support communities to make anti-poaching by-laws

Statements 2, 3, 9, 10, 13, 14, 19, 21, 23 and 25. The Q-sorts that significantly loaded this perspective were completed by the following: hunter ($n=2$), ranger ($n=1$) and wild meat trader ($n=2$). This perspective shows a strong preference for community-centred laws that prohibit pangolin hunting (S3) and the use of their parts in traditional medicine (S2). The perspective supported one law enforcement intervention: additional training of border enforcement officials to increase the detection of smuggled pangolins and their derivatives (S13). The perspective does not support the inclusion of wildlife experts in border inspection work (S10) and the provision of modern technologies to border enforcement personnel to help increase the detection of trafficked pangolins specimens (S25):

'Government should focus on the source; if we are comfortable and stop killing pangolins, there will be no need to buy scanners for borders' (Interview; hunter).

The perspective further disagrees with the following: increasing the number of rangers conducting anti-poaching patrols (S19), behaviour-change interventions involving information exchange (S21 and S14), pangolin-related tourism (S23) and pangolin harvesting quota (S9).

3.2.4 | Intervention4: Wildlife officials needed at borders

Statements 1, 2, 3, 5, 9, 10, 12, 13, 17, 23 and 24 shaped this perspective. The Q-sorts that significantly loaded this perspective were completed by the following: civil servant ($n=2$), farmer ($n=1$), hunter ($n=1$) and wild meat trader ($n=2$). The perspective supports the involvement of wildlife experts in border inspections (S10) and the establishment of community laws to prohibit the use of pangolin parts in traditional medicine (S2) but not the creation of laws by local communities to prohibit pangolin hunting (S3). This perspective prefers the establishment of community science programs, where people in local communities are involved in monitoring pangolin populations (S24). The perspective also supports awareness-raising campaigns (S14), the establishment of a harvesting quota (S9), the provision of communal infrastructure to communities as a reward for upholding poaching regulations (S5) and pangolin tourism (S23). The perspective does not support creating an action plan for pangolins in Nigeria (S17 and S1) and training border enforcement personnel on techniques to detect pangolin trafficking (S13). It also does not support strengthening the penalties associated with pangolin poaching (S12).

4 | DISCUSSION

We used Q to elicit perspectives towards pangolins and stakeholders' preferences for management interventions for pangolins in south-east Nigeria. We extracted five perspectives associated with *Belief* and four with *Intervention*, identifying consensus statements in both Q-sets. Our findings accounted for 58% and 44% of the variance related to *Belief* and *Intervention*, respectively. These results surpass the 35%–40% range recommended by Watts and Stenner (2012) and are similar to the results of other Q studies (Carmenta et al., 2017; Gannon et al., 2020). Despite attempts to recruit a comparable number of males and females, we struggled to recruit more females partly because of the snowball and purposive sampling methods we used.

4.1 | Leveraging consensus across stakeholders

Only one statement in each of the Q-sets stood out as consensus statement, meaning that all the stakeholder groups shared a common

view of the statements (two other statements showed marginal consensus). The low consensus (four of 62 statements) possibly arose from the inherent dichotomy among stakeholders, that is, contributors to pangolin conservation and those who directly or indirectly threaten them, except for civil servants, who, in theory, represented a neutral group. For *Belief*, stakeholders reported that they were happy about the presence of pangolins in CRNP (S14), expressing their awareness of Nigerian laws prohibiting pangolin hunting (S24). Stakeholders also agreed that pangolins do not pose a threat to crops cultivated around pangolin habitats (S25). For *Intervention*, there was consensus on the need for more pangolin-centred research, albeit without much emphasis.

The knowledge that stakeholders, especially those in rural communities, are happy that pangolins occur in CRNP presents an opportunity for behavioural scientists to further understand the different stakeholders' values, motivations and emotions and then design behaviour change interventions that effectively leverage these. We did not assess the reasons for the excitement about the occurrence of pangolins in the park. However, we suspect that the excitement of local communities stems from the cultural and socioeconomic value associated with wild meat harvesting (i.e., food and income; see Coad et al., 2019). The public's knowledge of the laws prohibiting pangolin killing (S24) suggests that the continued hunting of pangolins (Fa et al., 2006; Meseko et al., 2020; Tengwood Organisation, 2018) is not because of ignorance of the legislature forbidding their hunting. Cultural, socioeconomic and political factors, such as injunctive norms, the dietary and monetary values of pangolins to local populations and weak law enforcement (Atuo et al., 2020; Ed et al., 2020), are probably facilitating pangolin exploitation, underpinning the need for context, site-specific and nuanced policies (Chausson et al., 2019). The only consensus statement for *Intervention* suggests more pangolin-centred research to improve our understanding of the conservation status and threats to pangolins.

4.2 | The diversity and complexity of perceptions towards pangolins

We identified five dominant perspectives on *Belief* associated with pangolins. These perspectives differ substantially across topics, including the nature and primary driver of pangolin exploitation and the role of disease transmission in eating wild animals—a debate boosted by COVID-19. As captured distinctively in *Belief1*, the interest in contributing to pangolin conservation is associated with the perceived decline in wild pangolin populations (Table 2), supporting the notion that knowledge or perceptions about species decline strongly affect policy responses (see Rodrigues et al., 2006). However, *Belief1* harbours a representation bias. It is formed only by the viewpoints of stakeholders directly or indirectly involved in pangolin conservation or protection (Table 2). Thus, despite the interest from those in the conservation sector, stakeholders who directly threaten pangolins did not show interest in protecting the

species. Given the consensus on awareness of the laws prohibiting pangolin poaching, the apparent lack of interest might reflect the socioeconomic situation of members of the stakeholder groups living around pangolin habitat (e.g. wild meat traders and hunters), who may prioritise pangolin exploitation over the conservation of the animal, perhaps because of the opportunity cost of giving up killing and trading in pangolin.

Another dominant viewpoint of *Belief1* is the likelihood of external influences in pangolin poaching. This viewpoint was also captured by *Belief3* formed by respondents living or working in CRNP, strongly suggesting that people visit communities adjacent to CRNP to poach pangolins, including financially incentivising hunters to poach them. Such external influences on pangolin poaching have been observed to varying degrees in other places, including China (Nash et al., 2016) and the Democratic Republic of the Congo (Malimbo et al., 2020). We did not assess the extent of any external influence in our study site. However, *Belief5*, formed largely by viewpoints from stakeholder groups living and working directly around CRNP (Table 2), suggests that local demand for pangolin meat drives their poaching. This indicates that pangolin scales from this region, if they end up in Asia-bound shipments, are predominantly by-products of local consumption for food. Our study, thus, presents new evidence on the nature and extent of threats to pangolins, which is crucial in designing suitable and effective conservation interventions (Balmford et al., 2021). Our finding underpins the need for context-specific behaviour change interventions (Chausson et al., 2019), which in this case, can help foster positive attitudes towards pangolins and ultimately safeguard them from external pressure (urban demand and international trade). The contradiction between *Belief3* and *Belief5*, with similar respondent composition (people in local communities), hindered a decisive conclusion about whether pangolin poaching in the region is targeted or opportunistic.

The belief of good luck associated with finding or catching a pangolin (*Belief2* and *Belief3*) is linked to the difficulty in seeing the animal. This belief contrasts perceptions in central Cameroon, where giant pangolins are perceived as bad luck (Mouafo et al., 2021). Stakeholder groups living around pangolin habitat considered the rumoured implication of pangolins in the origin and spread of COVID-19 as specious and insufficient to deter them from consuming pangolin meat (*Belief3*). The same group of stakeholders believes that pangolins are zoonotic disease carriers (*Belief2*), mirroring earlier findings that only 26% of respondents in south-eastern Nigerian communities take protective measures when handling wild animals, despite the knowledge of zoonoses among 55% of respondents (Friant et al., 2015). Although there is no evidence linking pangolins to the coronavirus pandemic (Xiao et al., 2021), the impact of zoonotic diseases underpins the need for effective awareness-raising campaigns regarding the apparent dangers of consuming wild meat (Hilderink & de Winter, 2021). The fourth *Belief* perspective showed the cultural relevance of pangolins, specifically the taboo associated with killing or selling them—similar to parts of Cameroon where the animals are considered sacred (Mouafo et al., 2021).

4.3 | Preferences for pangolin conservation interventions

4.3.1 | Awareness-raising campaigns

Raising awareness of the threatened status of species is a common conservation intervention. Except for wild meat sellers, individuals from all stakeholder groups strongly preferred awareness-raising interventions aimed at increasing knowledge about the legal and conservation status of pangolins (*Intervention1*; Table 2). There are no studies on the effect of awareness-raising campaigns on human behaviour towards pangolins. However, evidence on the Philippine crocodile *Crocodylus mindorensis* suggests that increasing public knowledge could help reduce the intentional killing of species outside protected areas (van der Ploeg et al., 2011). As highlighted in a post-sort interview with a farmer (see *Belief2*), not all pangolin poaching incidents occur within park boundaries.

Furthermore, awareness-raising interventions can yield a greater impact when combined with other interventions (Smith et al., 2020). An effective awareness-raising strategy could be to target children living in the landscape, which could facilitate biocentric reasoning towards pangolins from a young age (i.e. promote the ideology of the intrinsic value of pangolins that is separate from their worth as a commodity; Špur et al., 2020; Kahn & Kellert, 2002). This approach could also foster protective attitudes towards pangolins among adults (Damerell et al., 2013).

4.3.2 | Law enforcement

Law enforcement appeared in three of the *Intervention* perspectives (*Intervention1*, *Intervention3* and *Intervention4*) and was dominant within the following groups: conservation organisation, NCS and ranger. Killing or trading a pangolin in Nigeria attracts a penalty of NGN5,000,000 (approximately US\$12,000; at US\$1=NGN411) for the first offence and 1-year imprisonment without the option of fines for subsequent offences (Endangered Species (Control of International Trade and Traffic) (Amendment) Act, 2016). However, Nigeria's prosecution rate of pangolin-related offences is low (Emogor et al., 2021), suggesting that relevant authorities are not enforcing existing laws. The preferred law enforcement options across perspectives comprised: an increase in the number of rangers conducting anti-poaching patrols to improve coverage within CRNP (*Intervention1*), strengthening penalties associated with pangolin poaching and trafficking (*Intervention1*), training of border enforcement personnel to increase pangolin-related confiscation (*Intervention3*) and including wildlife officials in border inspection teams (*Intervention4*).

Intensifying anti-poaching patrol efforts—which can reduce poaching-related threats (Jenks et al., 2012)—could be achieved by establishing ranger stations in remote areas within pangolin habitats (Moore et al., 2018). Further, regularly training customs officials on illegal wildlife trade issues can improve the detection of wildlife

contraband (Anagnostou & Doberstein, 2022; Chan et al., 2015; Emogor et al., 2021). *Intervention3* did not prioritise equipping borders with modern technology to increase detection. As expressed in the post-sort interviews, unless law enforcement agents know wild-life specimens with trade restrictions, such specimens may still be successfully trafficked through Nigeria despite the use of modern technologies, which underscores the importance of increased training of customs officers on IWT issues and collaboration between wildlife experts and customs officials during border patrols.

4.3.3 | Community stewardship programs

The central theme of *Intervention2* was the establishment of pangolin guardianship programs where people in local communities are mobilised to advocate for pangolin protection. This perspective was dominated by stakeholders living around the protected area and included two NCS employees. As shown in over 100 cases globally, such community-led interventions are primarily effective in combating illegal wildlife trade because they target the root of the commodity chain (Wilson-Holt & Roe, 2021). Such programs can also improve law enforcement efforts and promote positive behaviour towards species (Silva & Mosimane, 2014).

Another community-level initiative highlighted in our study is the creation of by-laws against pangolin poaching. Such by-laws differ from conventional laws as they are made and upheld by local authorities, perhaps with external technical or financial support. Given that hunting is intertwined with rural economies, rural communities must co-design such by-laws (example: Master Plan for Wildlife in Sarawak; Bennett & Tisen, 2001). Such community-based initiatives can foster collaborative conservation, promote positive behaviour towards pangolins (Schumann et al., 2008) and reduce hunting through adequate enforcement of the laws, especially if institutional constraints and bureaucracy are removed (Williams et al., 1999). These interventions may involve financially compensating communities, so they must be properly designed to ensure public compliance with the by-laws. Attempts should be made to assess the overall effectiveness of such interventions to guide future actions (Nielsen et al., 2021).

4.3.4 | Ecotourism

Pangolin-related ecotourism was preferred by all stakeholder groups except conservation organisations and rangers. Ecotourism can benefit conservation, including promoting local support for conservation (Diedrich, 2007; Lindsey et al., 2005; Stronza et al., 2019). Although the contributions of ecotourism to the survival of threatened species have been shown to outweigh associated costs in most cases (Buckley et al., 2016), such programs must be carefully developed to minimise adverse effects on biodiversity: reduction in species richness through increased trail use (Lei et al., 2022), degradation of habitat through infrastructure development and zoonotic disease

transfer (Shannon et al., 2017). Possible pangolin-centred tourism must also strive to incorporate local communities in the design and implementation phases (Stronza, 2008).

5 | CONCLUSIONS

This study presents a novel application of Q in assessing people's perceptions of illegal wildlife trade issues. We have shown the diverse viewpoints that the different stakeholder groups hold towards pangolins and their conservation, providing insights into stakeholder support and the desirability of viable interventions to curb pangolin decline. Our application of the method to investigate the sensitive topic of pangolin poaching and trade facilitated the recruitment of certain respondents (hunters and wild meat traders), as they were not required to state their actions. Most participants from the groups above declined to partake in post-sort interviews, suggesting a possible challenge in data collection if we used conventional qualitative interviews. However, Q only seeks to highlight the prominence and diversity of opinions within groups, and the findings from the method cannot be generalised across the broader populations because of the non-random sampling.

Our study indicates that local demand for meat drives pangolin exploitation—a proposition requiring further empirical scrutiny. This new evidence is contrary to popular opinion that hunters specifically set out to kill pangolins, suggesting that pangolin scales from south-east Nigeria that may end up in international shipments are remnants of subsistence hunting for their meat. Our results underscore the need for targeted interventions compared with places where international demand may drive pangolin poaching. Implementing behaviour change interventions to prevent hunters from killing pangolins may, thus, be more cost-effective because the opportunity cost of not killing a pangolin is relatively lower compared with regions where poaching is driven by international demand for scales.

Our results on preferences for pangolin interventions suggest a spatial divergence: people living around CRNP largely supported community-centred initiatives (such as anti-poaching by-laws, community-science programs and payment for ecosystem services), while those living away from the park markedly favoured awareness and law enforcement interventions. This underpins the need to consider all relevant stakeholders' perceptions, values and perspectives when making conservation policies (Cook et al., 2013). Our results showcase the challenge of collaborative decision-making and highlight the importance of implementing complementary interventions to engage different stakeholders. We recommend further research on the perspectives of international actors in wildlife trafficking and the effectiveness of the above-preferred interventions.

AUTHOR CONTRIBUTIONS

Charles A. Emogor: conceptualisation, methodology, investigation, formal analysis, writing—original draft, funding acquisition. **Aiora Zabala:** methodology, visualisation, formal analysis, writing—original draft, supervision. **Patience O. Adaje:** methodology, investigation,

writing—original draft. **Douglas Clark**: conceptualisation, methodology, writing—original draft. **Kristian S. Nielsen**: writing—original draft. **Rachel Carmenta**: conceptualisation, methodology, writing—original draft.

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CONFLICT OF INTEREST STATEMENT

Charles A. Emogor is a non-stipendary fellow of the Wildlife Conservation Society that financially contributed to this work. Staff members of WCS were interviewed for this study.

DATA AVAILABILITY STATEMENT

We have uploaded our study data to the Mendeley data repository. You can access the data using this link <https://doi.org/10.17632/2rrshpdsn8.1>.

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SUPPORTING INFORMATION

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

Appendix S1: Concourse development.

Appendix S2: Statement results.

Appendix S3: Q-sort analysis.

Appendix S4: Distinguishing and consensus statements.

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