Social science methods to study human-cheetah interactions

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14 **Abstract**

15 We are living in a new geological era – the Anthropocene - so called because of humanity's
16 far-reaching effects on the environment. As our population grows, threats towards
17 biodiversity, including those associated with human-cheetah conflict, also increase. Social
18 science research enables conservationists to understand and address the human dimensions of
19 these challenges. This chapter describes common social science paradigms, theories,
20 methodologies, methods and sampling strategies useful for studying human-cheetah
21 interactions, as these types of studies are lacking. We explain the advantages and
22 disadvantages of these methods, ethical and practical considerations, and use existing or
23 comparable examples to highlight their use in cheetah research and conservation. Social
24 science methods can be challenging to conduct, so we advise the importance for cheetah
25 ecologists and practitioners to collaborate with social science experts.

26 Key words: *human-cheetah interactions, human-wildlife conflict, qualitative methods,*
27 *quantitative methods, social science*

Social science is the study of human society, including its psychological, sociological, organizational, political and economic aspects (Blaikie, 2004). As humans are both the major cause of cheetah decline and drivers for conservation, social science can help understand the anthropogenic threats towards cheetahs and evaluate methods to mitigate these threats (Dickman et al., 2013). However, many previous human-cheetah coexistence (HCC) studies focused more on how environmental factors, such as seasonality or different habitats, influenced cheetah predation on livestock (see Chapter 13), without taking into account people's values, attitudes and knowledge, along with broader societal issues – hereafter referred to as the human dimensions (Marchini and Macdonald, 2012). Conservationists are becoming increasingly aware of the importance to involve social scientists in research and applied conflict mitigation. However, to date, there have been limited thorough human dimensions studies of cheetahs conducted, and even fewer in collaboration with trained social scientists.

Social science research methods can assist with understanding complex HCC issues (Manfredo and Dayer, 2004) and have proven essential when improving coexistence with wildlife. Research can include identifying values and attitudes towards cheetahs, rates and types of conflict and associated economic impacts, or receptiveness to or efficacy of new management practices. Examples of previous studies on the impact of social aspects on cheetah conservation have included using quantitative questionnaires with farmers, soliciting cheetah stories from children using qualitative methods, and employing a mixed approach to better understand the complexity of conflict (Boast, 2014; Hughes, 2013; Marker et al., 2003).

Due to the limited number of social science studies in cheetah conservation, this chapter aims to set the scene for how one might effectively design and undertake such a study. We briefly

describe some potentially useful social science paradigms and theories, followed by an overview of methodologies and methods conservationists can use to study HCC. Figure 1 shows a suggested process in designing a social science study, which we explain in proceeding sections.

<Insert figure 1>

Research Aims

Clear research aims/questions will direct what paradigm, theories, methodologies and methods are appropriate for the study. Literature reviews provide an understanding of what has been done in the past, what methods have worked, what ideas you can extract, and where gaps in knowledge exist. Commonly, human dimensions of cheetah conservation seek to understand the cause of conflict and how to address it but it is equally important to understand the efficacy and effect of mitigation, conservation educational and awareness raising programs.

Research Paradigms

Philosophical perspectives (i.e. belief systems of how the world is perceived) that guide data collection must be considered as part of the research paradigm. Positivism, interpretivism, and post-positivism are arguably the most accepted philosophical perspectives in social science (Grix, 2010). Positivism (e.g. experimental testing) tests a theory or hypothesis about the world via the scientific process using deduction and objectivity, and may be useful when measuring the effectiveness of certain conflict mitigation strategies. Interpretivism infers that the world is socially constructed, and each individual constructs his or her own reality. It could help explain how people's knowledge and experiences with cheetahs affects their

values and/or attitudes as researchers seek to interpret and understand relevant perceptions and meanings. Post-positivism can bridge these paradigms, where context and attending to researcher and other biases is important when interpreting the world. Blaikie (2007) provides more information on this topic, including contemporary paradigms, in social research.

Theoretical Perspectives

To date, there has been very limited attention given to the importance of clearly choosing and explaining the theoretical perspective for a HCC study. As such, the following section explains the different theoretical perspectives that could be employed in a HCC study. Theory seeks to explain social reality, such as how people perceive cheetahs and helps to describe or predict a topic or behavior. Initially, a researcher will identify their paradigm and determine what theoretical framework best meets their needs. This is an important reflective process which should be explicitly stated as part of social research studies but has been lacking in cheetah social research. Some theories potentially useful in HCC studies include:

- **Constructivism, or social constructivism** focuses on culture and context, where knowledge is built through experiences with the world and other people (Young and Collin, 2004). A qualitative study at the Cheetah Conservation Fund employed this approach, to learn how children participating in educational programs constructed their values for cheetahs (Hughes, 2008).
- **Symbolic interactionism**, focusing on interactions with people, objects and places (Aksan et al., 2009), could be used to help identify symbolic meanings farmers or others ascribe to cheetahs or livestock, and how this influences behaviors. This theory could be applied to understand perspectives or effectiveness on using cheetahs as a flagship symbol for conservation (e.g. Belbachir et al., 2015).

- **Political ecology** deals with relationships between political, economic and social aspects of the environment (Robbins, 2004). Research using political ecology has shown that instances of HCC in Namibia is influenced by the country's previous apartheid regime and associated inequality in land, wealth and education (Rust et al., 2016).
- **Theory of planned behavior** assumes human behavior is due to rational choices shaped by a person's attitudes, subjective norms and perceptions of control over that behavior (Ajzen, 1991). For example, research in South Africa used this theory to identify why farmers adopt or resist cheetah conservation measures (Reijneker, 2014).

Combining paradigms and theory can be challenging, so an example regarding available theories that can be applied to an interpretivism paradigm is provided below. To understand if and how people value cheetahs within an interpretivism paradigm, one could seek to understand how people experience cheetahs, and how this influences their behaviors. This paradigm can integrate social constructivism and symbolic-interactionism to theorize people construct their perceptions of cheetahs through direct, lived experiences as individuals and group interaction, and that behaviors towards cheetahs is influenced by what a predator, or other value objects such as livestock, means to them.

Methodologies of relevance to HCC

The choice of methodology is influenced by the researcher's paradigm, the context of the research and its aims, and the strengths and weaknesses of the available methods and analytic tools. There are a number of excellent textbooks guiding this process (Bernard, 2006; Newing et al., 2010). Though various methodological approaches may be useful in HCC studies (e.g. phenomenology or narrative inquiry; Wertz et al., 2011), we will only explain grounded

theory and ethnography, as they have not been widely used in HCC studies, yet have the potential to provide new and detailed insight.

Grounded Theory

Grounded theory (GT) is an iterative, inductive framework (Glaser & Strauss, 1967) where researchers start data collection before hypotheses are made; the theory is then generated from the collected data. Observations of a particular scenario are collected and immediately analyzed via understanding common themes and relationships, which providing a contextual understanding; this preliminary information guides assumptions and future research direction. Afterwards, detailed data is gathered which is immediately examined for possible connections.

GT may uncover previously overlooked findings given its ability to look afresh at problems. It has rarely been used in HCC studies, though Rust (2015) applied GT to understand underlying drivers of conflict between cheetahs and livestock farmers in Namibia. Qualitative interviews with farmers and their employees indicated that HCC was in part affected by the relationship between farmer and workers. The methodology is, however, time- and labor-intensive, requiring substantial knowledge of the techniques involved in collecting and analyzing data (Backman and Kyngäs, 1999).

Ethnography

Ethnography aims to find cultural understandings of a topic via long-term observation and participation in a specific study site (Atkins and Beschner, 1980). While not common to HCC studies, it can offer a detailed understanding of complex issues related to social, cultural and symbolic values of wildlife (Hill, 2015). Ethnography generally uses qualitative methods to

collect detailed descriptive data, which can be used to test theories and offer new perspectives on study subjects. Indeed, similarly to GT, building theory grounded in the data itself can be an outcome (Streubert & Carpenter, 1999). However, the researcher needs to use critical self-examination as it is particularly susceptible to subjective bias given the researcher's understanding and potential preconceptions of the topic (Hoholm and Araujo, 2011). It can be difficult to replicate ethnographic studies given context specificity, though mitigations include keeping extensive field notes on the context and reflections of the study. This methodology should be considered by HCC researchers when the aim is to provide a detailed picture of a conflict situation. For instance, Rust and Taylor (2016) used ethnography to understand the relationship between people and predators in Namibia and found that predators had been persecuted due to an "Othering" process that alienated predators by differentiating them from other species.

Methods for studying human-cheetah coexistence

Theory and methodology should guide method choices, as these will influence data collection and analytics. A wide variety of methods are available to study HCC with choices depending on: the focus of the research question; the extent of prior knowledge about the study's topics; whether conventional thinking is to be challenged; and possible study constraints, e.g., budget, time, cultural or ethical considerations (Newing et al., 2010). The main methodological approaches are qualitative, quantitative and mixed methods. To explore sensitive topics in HCC (e.g., poaching) specific quantitative methods, such as randomized response technique and unmatched count technique are particularly useful tools. These methods are discussed below.

172 *Qualitative methods*

173 Qualitative methods (Table 1) gather rich descriptions of social phenomena typically from
174 direct contact with research participants (e.g., interviews), and sometimes through qualitative
175 content analysis of documents (Elo and Kyngäs, 2008). Results are typically analyzed
176 descriptively using themes. These methods can be used to explore values, emotions, cultures
177 and relationships towards cheetahs. For example, storytelling has been used to understand
178 how children relate to cheetahs (Hughes, 2013). Qualitative methods can also be used to gain
179 in-depth knowledge on rarely explored topics, such as negative consequences to cheetahs of
180 poor game-farm management in South Africa (Cousins et al., 2008).

181 Qualitative data are context-specific, where analysis seeks to identify themes or patterns of
182 socially-constructed meaning. Kent (2011) used informal interviews and participant
183 observation to explore local perceptions of cheetahs and other carnivores in rural Botswana.
184 This research highlighted some respondents' mistrust in the government's ability to
185 effectively manage wildlife, in turn affecting the ability of the government to accurately
186 monitor livestock depredation and lethal predator control.

187 <Insert table 1>

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189

190 *Quantitative methods*

191 Quantitative methods (Table 2) generate numerical data (e.g., via questionnaires), which are
192 analyzed statistically to explain phenomena under investigation. If data are randomly
193 sampled, findings can be extrapolated. Selebatso et al. (2008) determined farmer perceptions

of cheetah conservation in Botswana using questionnaires, identifying that farmers generally tolerated cheetahs.

Changes of specific variables over time (usually decades) can be tracked quantitatively by using a panel/longitudinal study. While preferable to use the same individuals over time, it is not necessary as long as random sampling is used. Panel studies can be useful when aiming to understand changes in attitudes, behavior or knowledge over time, especially when combined with evaluating the effect of a conflict mitigation intervention in this time frame. As an example, a study of nearly 1,900 individuals in the US showed that attitudes towards wolves became less positive over an 8-year period, with respondents reporting an increase in fear and inclination to poach wolves (Treves et al., 2013).

<Insert table 2>

Mixed methods

Mixed methods (Table 3) combine elements of both techniques in data collection and analysis, but it is not simply an addition of qualitative to quantitative techniques. Rigorously-designed mixed approaches yield both internal and external validity by combining statistics with rich narratives, with the aim to result in a deeper understanding of the research problem. Using mixed methods can be useful when researching the efficacy of HCC strategies. For example, Rust (2016) used a mixed-methods approach in a novel decision-making exercise to determine whether farmers and conservationists could agree on cheetah and other predator management strategies on Namibian farmland. The study built on data previously collected from a content analysis of newspapers (Rust, 2015b), along with interviews, participant observation and focus groups informed the implementation of the exercise.

217 *Randomized Response Technique and Unmatched Count Technique*

218 The frequency of illegal killing of cheetahs is challenging to assess as respondents may be
219 unwilling to share sensitive information (Tourangeau and Yan, 2007). One way to circumvent
220 this problem is to use methods specifically designed to illicit information on illegal behavior.
221 Two common indirect questioning methods that quantify sensitive information are
222 randomized response technique (RRT) and unmatched count technique (UCT).

223 RRT enhances the accuracy of estimating sensitive behavior by in effect anonymizing the
224 response of the participant through a randomization process. Randomizing devices such as
225 dice or spinners are often used (Warner, 1965). RRT relies on the principle that fixed
226 responses (regardless of their veracity) are given by the respondent for certain outcomes of
227 the randomizing device, while truthful responses are given for other outcomes: for example,
228 the respondent must say “yes” to the statement “I have illegally killed a cheetah in the last 12
229 months” if a die lands on 1 or 2, “no” if it lands on 3 or 4; and responds truthfully if it lands
230 on 5 or 6. Crucially, the interviewer is unaware of the number on which the die lands, thereby
231 giving privacy to the respondent. Because the randomizing device has a known probability of
232 landing on each number, the probability of answering truthfully can be quantified. This
233 method increases response rates to sensitive questions (Lensvelt-Mulders et al., 2005) but
234 requires a large sample size as response variance is high (i.e., high standard error and
235 deviations), and it is particularly difficult to estimate relationships between the sensitive
236 behavior and other variables with RRT (Tourangeau and Yan, 2007). RRT has been used to
237 estimate illegal killing of cheetahs in South Africa (St John et al., 2012) and Botswana
238 (Boast, 2014), and to understand the extent of carcass poisoning to kill predators in Namibia
239 (Santangeli et al., 2016).

UCT was developed to overcome some pitfalls of RRT, including respondents feeling tricked or confused by RRT. UCT presents two very similar lists of activities, both of which contain an identical list of unthreatening activities, and one contains an additional sensitive activity, such as cheetah poaching. Two groups of comparable respondents each receive one of the lists and are asked how many (but not which) items apply to them. By comparing answers from each group, a rough estimate of the frequency of illegal behaviors within a population can be calculated. The challenge is that this method does not always yield more honest answers about the sensitive behavior than direct questions (e.g., Tourangeau & Yan, 2007). UCT also requires complex data analysis and is unable to precisely quantify illegal behaviors due to large standard errors. UCT has been employed to estimate poaching of wildlife in the Serengeti (Nuno et al., 2013). For a more thorough discussion on asking sensitive conservation questions, see Nuno and St John (2014).

Practical considerations

There are a number of practical considerations that need to be taken into account when designing a social science study. Quantitative techniques can be administered in person, via telephone, mail, SMS or online, while qualitative techniques are usually administered in person or via telephone. The most appropriate format depends entirely on the study's context (e.g., if a mail-out is appropriate or Internet is available) and constraints (e.g., budget, time, research permits). Response rates influence the best administration method. Face-to-face questionnaires usually provide the best response rates but can be more time-consuming and expensive. If the study participants speak another language, can you learn the new language or will you use a translator? Both approaches have strengths and weaknesses (Ervin and Bower, 1952) that should be considered. Learning a language requires time but may allow for better integration into the community and help better understand cultural nuances. Using a

translator can lead to information being mistranslated. Non-verbal body language cannot be captured remotely, yet is important to note in data collection as it may indicate emotions of the respondent. What is your budget? Collecting social science data can be very costly, particularly if you need to pay field assistants' salaries or for mail-out surveys to hundreds or thousands of participants. Is the study culture different to yours? If so, will this affect your integration into the community and potentially influence the results? In a new area, it can be useful to spend a number of months in the local community learning about the culture and context to better understand the norms and ensure questions are relevant. How will interviewer and participant education levels affect data collection? Participants with very limited education may not be able to complete written questionnaires and field assistants may not be able to conduct them. Also, while many academic institutions have rigorous ethics training and protocols for research involving human subjects, other agencies or organizations may not. It would be beneficial for researchers to familiarize themselves with ethical considerations (Sieber, 1982) when undertaking HCC studies as they involve human subjects.

Sampling

Sampling considerations for face-to-face recruitment for HCC studies include physical location and time of day, community layout, anonymity and confidentiality, informed consent and, in some cases, if participant incentives are necessary. Ensuring representative participation, particularly amongst marginalized individuals, is vital when the aim is to engage the entire community. Challenges include finding enough participants, particularly in remote locations with low population density or in communities suspicious of researchers. Therefore, it is recommended that key local informants are used to help recruit participants, though researchers must be aware this can bias types of respondents. Larger samples tend to be more representative, but are not always required for qualitative research. Smaller samples

can be useful for in-depth interviewing but one must take care not to generalize findings as data are likely to be context-specific. Sample size needs vary dramatically from 10-100 for an in-depth qualitative study, and 100-1,000s for quantitative questionnaires. Choice of sampling depends on research aims and fulfilling criteria such as repeatability, validity, credibility, and so on. Ensuring personal data are anonymized - for example using unique codes (e.g., P1, P2...) - helps protect participants' identity in case there are concerns that identification may put them at risk (e.g., when admitting to illegal killing of cheetahs). In cases where identifying individuals may be necessary, participants must be told in advance so they can make an informed decision to participate. For more information on sampling in social science, including reducing bias, see Newing et al. (2010).

Conclusion

We have described some of the more common social science paradigms, theories, methodologies and methods for use in HCC studies. However, there are many other options available (see Outhwaite & Turne, 2007). Designing a social science wildlife study requires detailed considerations to ensure the approach accurately answers the study aims. Other important factors briefly described, but requiring more thorough examination, include the explicit consideration of context, ethics and researcher reflexivity, discussed in more detail in various textbooks e.g. Anyansi-Archibong, 2015, Bernard, 2006. Close collaboration with expert social scientists is strongly advised to ensure that approaches are appropriately chosen, designed, undertaken and analyzed; the choice of appropriate approaches is a prerequisite to obtaining reliable results.

314 As human populations grow, expanding into more wild land where conflict between humans
315 and predators such as cheetahs is likely to become more prevalent, it has never been more
316 important to find ways in which people and large carnivores can coexist. Social science
317 studies are vital to finding paths to coexistence.
318

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Table 1. Common qualitative methods

Method & Description	Strengths	Weaknesses
<p>Informal interviews: unplanned conversations between participants and researchers</p> <p>Unstructured interviews: prearranged with a set topic; researcher loosely guides conversation</p> <p>Semi-structured interviews: researcher uses an interview guide that outlines questions or themes to be explored</p>	<p>Helps design data collection of other methods, e.g., questionnaires.</p> <p>Sets initial study scene.</p> <p>Helps triangulate data.</p> <p>Useful for identifying future respondents.</p> <p>Can reveal unexpected information.</p>	<p>Takes time to elaborate on answers.</p> <p>Analysis should include contextual information and verbal communication, e.g., context and body language.</p>
<p>Focus groups: a group interview; researchers set topic(s) in advance</p>	<p>Highlights interaction between participants; shows issues of contention and consensus.</p>	<p>Less powerful/dominant participants can be uncomfortable participating.</p> <p>Bias towards vocal participants.</p> <p>Complicated to implement.</p>
<p>Participant observation: relatively unstructured; study people in their</p>	<p>Helps explain hidden values, beliefs, attitudes and intangible motivations</p>	<p>Time and constraints of immersing oneself in study site.</p>

environment, describing how and why they do things. Researchers live and undertake activities in the community	that are otherwise unobtainable via structured interviews. Researcher not limited to respondent's recall. Can assist with building positive researcher-participant relationships.	Misunderstandings and miscommunication could lead to misrepresentation. External validity is minimal. Conclusions are strongly dependent on the researcher's interpretation.
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Table 2. Common quantitative methods

Method & Description	Strengths	Weaknesses
Questionnaires: interviews using fixed, structured questions (but can also use open-ended questions)	<p>Used to answer a specific set of questions, or to quantify a problem or solution.</p> <p>Useful towards the end of data collection once the focus of the research topic has been refined, information has been gathered about the topic to produce appropriate questions, and rapport has been built with the study population.</p> <p>Advantageous when recording openly-discussed facts such as husbandry methods or demographic details.</p>	<p>Difficult to determine if questions are relevant or biased without prior research.</p> <p>Limited chance of follow-up questions.</p> <p>Using cross-cultural questionnaires can be problematic.</p> <p>Less helpful when asking “why” questions.</p> <p>Some information is culturally or socially sensitive, rendering this method inappropriate.</p>

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Table 3. Common mixed methods

Method & Description	Strengths	Weaknesses
Participatory Research: researchers work with study site individuals to collaboratively design and analyze research	Co-produces knowledge. Useful for marginalized groups, as power is placed with the community.	Participants guide research, which may not be in the researchers' desired direction. Susceptible to oversimplifying challenges with participation and power.
Multi-criteria analysis: differentiates, ranks or analyses trade-offs and scenarios	Helps understand the effect(s) decisions have on outcomes or impacts. Systematically allows decision-makers to transparently critique options. Integrates social values and local knowledge.	Can lack transparency. Problems with weighting responses to ensure participant views are accurately represented. Challenges with power and bias, which influences fairness and representativeness.

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437 Captions for figures:

438 **Figure 1.** Process of designing your social science methods, with examples of each step

439 **Figure 2.** Using storytelling to understand children's perceptions of cheetahs