



Protected Area Rangers as Cultural Brokers? Implications for Wildlife Crime Prevention in Viet Nam

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The scope, scale, and socio-environmental impacts of wildlife crime pose diverse risks to people, animals, and environments. With direct knowledge of the persistence and dynamics of wildlife crime, protected area rangers can be both an essential source of information on, and front-line authority for, preventing wildlife crime. Beyond patrol and crime scene data collected by rangers, solutions to wildlife crime could be better built off the knowledge and situational awareness of rangers, in particular rangers' relationships with local communities and their unique ability to engage them. Rangers are often embedded in the communities surrounding the conserved areas which they are charged with protecting, which presents both challenges and opportunities for their work on wildlife crime prevention. Cultural brokerage refers to the process by which intermediaries, like rangers, facilitate interactions between other relevant stakeholders that are separate yet proximate to one another, or that lack access to, or trust in, one another. Cultural brokers can function as gatekeepers, representatives, liaisons, coordinators, or itinerant brokers; these forms vary by how information flows and how closely aligned the broker is to particular stakeholders. The objectives of this paper are to use the example of protected area rangers in Viet Nam to (a) characterize rangers' cultural brokerage of resources, information, and relationships and (b) discuss ranger-identified obstacles to the prevention of wildlife crime as an example of brokered knowledge. Using in-depth face-to-face interviews with rangers and other protected area staff ($N = 31$, 71% rangers) in Pu Mat National Park, 2018, we found that rangers regularly shift between forms of cultural brokerage. We offer a typology of the diverse forms of cultural brokerage that characterize rangers' relationships with communities and other stakeholders. We then discuss ranger-identified obstacles to wildlife protection as an example of brokered knowledge. These results have implications for designing interventions to address wildlife crime that both improve community-ranger interactions and increase the efficiency of wildlife crime prevention.

Keywords: community-based conservation, conservation crime, crime science, local knowledge, snaring, Viet Nam, collaborative stewardship

INTRODUCTION

Protected Area Rangers

With unique and direct knowledge of the persistence and dynamics of wildlife crime, protected area rangers can be both an essential source of information on, and front-line authority for, preventing wildlife crime. Ranger-collected patrol data, and their central role in law enforcement, has been crucial for mapping illegal activities, quantifying threats to wildlife, and improving patrol efficiency (Keane et al., 2011; Critchlow et al., 2015, 2017; Moore et al., 2018; Dobson et al., 2019). Beyond patrol and crime scene data collected by rangers, the conservation community can benefit more from understanding rangers' specific relationships with local communities. Rangers' ability and willingness to engage with community members, and the information they gather from informant networks and violator interviews, can help prevent wildlife crimes. Further, the formal guardianship provided by rangers can be integrated with the informal guardianship of communities to address wildlife crime (Viollaz et al., 2021, in preparation). Community members often hold local knowledge that is essential for productive conservation outcomes [Grech et al., 2014; United Nations Educational Scientific and Cultural Organization (UNESCO), 2016]. Although community involvement is widely seen as essential to conservation, the relationship between rangers and communities can be complicated by numerous factors, including the militarization of anti-poaching tactics, lack of trust, restriction of access to natural resources caused by the designation of protected areas over traditional use areas, and the degree of benefit-sharing between stakeholders (Massé et al., 2017; Moreto et al., 2017; Mutanga et al., 2017). A body of literature exists on ranger outreach, co-management, and the occupational motivations, stresses, and responsibilities of protected area rangers [Moreto, 2016; Moreto and Matusiak, 2017; Moreto et al., 2019; World Wildlife Fund (WWF), 2019]. This literature is primarily focused on ranger efficiency in responding to conservation crime.

In recognition of the important human dimension of rangers' work, recent scholarship has expanded upon rangers' motivations, relationships, and collaborations. This includes work on interactions between junior rangers and their supervisors (Moreto et al., 2021b), what motivates rangers to engage with conservation monitoring (Kuiper et al., 2021), rangers' sense of self-legitimacy (Moreto et al., 2021a), how rangers collaborate with scientists to improve monitoring of threatened species (Kuiper et al., 2020), and how to increase ranger capacity through competency, critical mass, and strong support systems (Woodside and Vasseleu, 2021). Studies have also specifically examined rangers' attitudes toward community-based conservation and outreach, as rangers often have detailed knowledge about the suitability of different community-based interventions to achieve conservation objectives (Montero-Botey et al., 2021). Rangers who support complements to traditional enforcement, such as community meetings, mention that these interventions are beneficial not just because of citizen education, but because they advance lines of communication between different stakeholders (Moreto and Charlton, 2021).

There has yet to be a systematic, theoretically informed typology of how protected area rangers interact with community members and how these various forms of interactions can be used to enhance wildlife crime prevention. The notion of cultural brokerage provides a lens through which to understand the complexity of rangers' relationships with community members and other stakeholders, such as park management and conservation organizations. The objectives of this paper are to use the example of protected area rangers in Viet Nam to (a) characterize rangers' cultural brokerage of resources, information, and relationships and (b) discuss ranger-identified obstacles to the prevention of wildlife crime as an example of brokered knowledge. As cultural brokers, rangers are in a unique position to identify obstacles to wildlife protection and to communicate that information between stakeholders, e.g., between community members and conservation organizations. In this paper, we aim to examine how information on obstacles to wildlife protection exemplifies the type of information brokered by rangers.

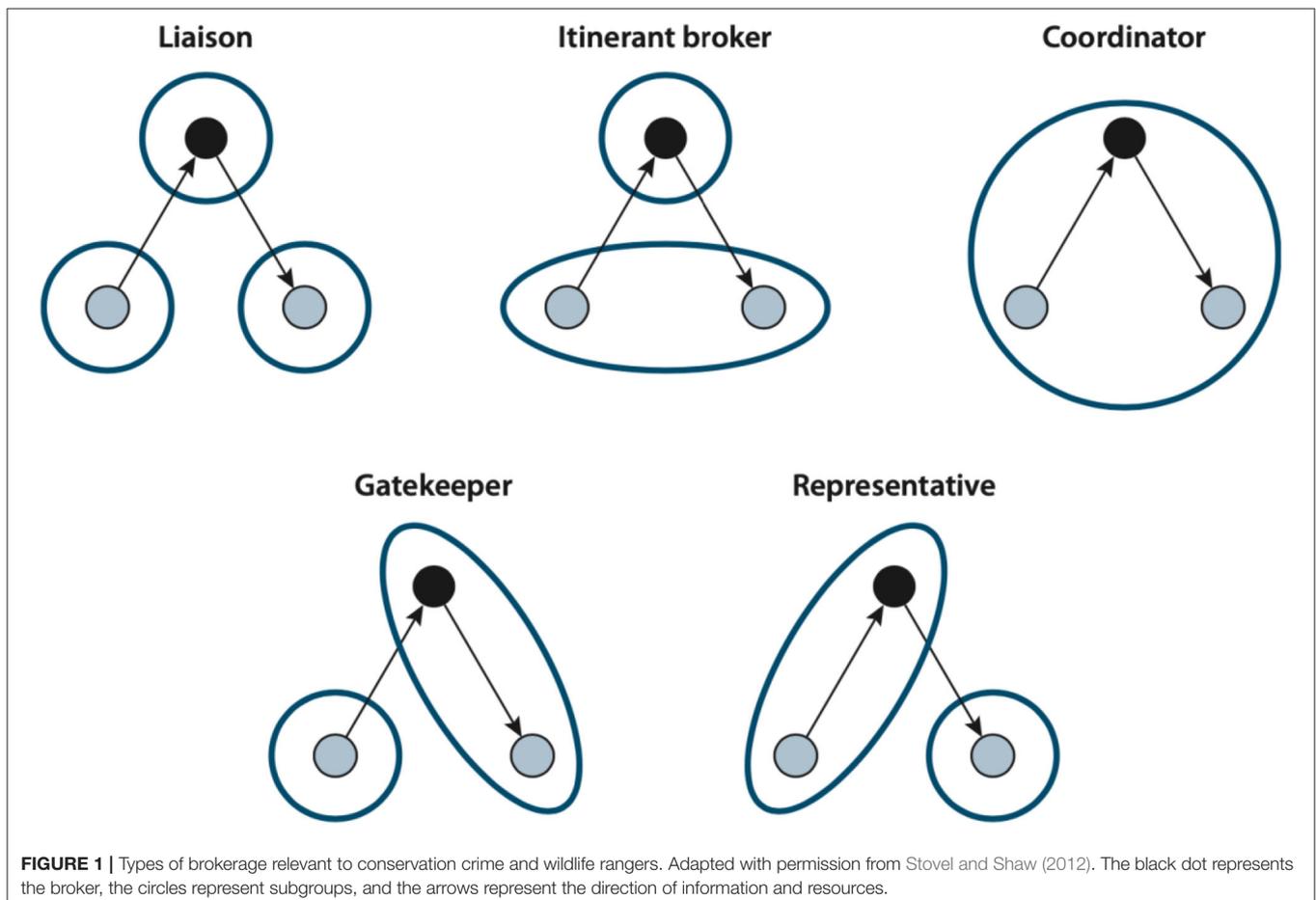
It is important to consider and categorize how rangers interact with other stakeholders because rangers often function as representatives for conservation; their behavior has the capacity to positively impact community responses to conservation initiatives and attitudes toward protected areas [Bango and Xelelo, 2017; Moreto et al., 2017; World Wildlife Fund (WWF), 2019]. Negative interactions may also occur, such as superior attitudes over local communities, corruption, or (at the extreme) human rights abuses. Any and all interactions can influence community-conservation partnerships [Moreto et al., 2015; World Wildlife Fund (WWF), 2020]. Such partnerships can affect responses to wildlife crime; interactions between rangers and community members can also facilitate effective wildlife crime prevention (Anagnostou et al., 2020). Rangers are often embedded in the communities surrounding the conserved areas which they are charged with protecting, which presents both challenges and opportunities for their work on wildlife crime prevention. Challenges included an increased risk of corruption due to pre-existing relationships with poachers or pressure or extortion from senior officials, as well as tension with family or community members, who may ostracize or threaten rangers due to their roles in crime prevention (Moreto, 2016; Massé et al., 2017). Importantly, communities often prefer to work with rangers who come from the communities they are responsible for protecting (and vice versa) and these relationships may offer novel opportunities for information-sharing that can enhance wildlife protection (Moreto et al., 2017; Anagnostou et al., 2020). Cultural brokerage provides one lens through which to categorize the different social roles performed by rangers and to examine how these various roles affect wildlife crime prevention.

Cultural Brokerage

Cultural brokerage refers to the process by which intermediaries, like rangers, facilitate interactions between relevant stakeholders such as communities and other government officials. These stakeholders are groups or actors that are discrete yet geographically close, or that lack access to, or trust in, one another (Gould and Fernandez, 1989). The role of the broker

is to facilitate interaction, or to be a “go-between,” two or more stakeholders. This may take the form of relationship-building, information-sharing, or resource exchange. Brokerage can take multiple forms depending upon the configuration of the broker and the other stakeholders, who are known as principals in the brokerage literature. The most common forms are liaison, itinerant broker, coordinator, gatekeeper, and representative (Figure 1). These forms are distinguished both by the pre-existing alliances or subgroups that exist as well as the direction of information and resources. In the liaison form, the broker’s role is to link two separate groups without having a previous alliance to either group. In the itinerant broker variation, the initiator and receiver are part of the same subgroup; the broker is an outsider but temporarily facilitates a brokerage relation between the initiator and the receiver. When the broker functions as a coordinator, all the actors belong to the same group and thus the broker is internal to the group. In the gatekeeper form, the broker is aligned with the receiver of the brokerage relation and negotiates the initiator’s access to the receiver. Finally, when the broker is a representative, the broker is aligned with the initiator of the brokerage relation and represents their interests to the receiver. Each form of brokerage offers different pathways for creative innovations in conservation.

These differentiations are important because they affect issues of trust, information bias, and group cohesion. All of these factors influence both the accuracy of the information exchanged as well as the stability and functioning of the brokered relationship. In the brokerage framework, bias refers to the degree to which the broker is relationally, socially, or informationally closer to one stakeholder than the other; cohesion characterizes the level of internal solidarity among actors linked by the broker (Stovel and Shaw, 2012). Brokerage is a well-known concept in the social science literature but has yet to be applied to conservation situations, and we need additional information on how brokerage manifests in specific cultural and geographic contexts. Although there are sporadic references to rangers as coordinators, liaisons, gatekeepers, and other forms of brokers in the ranger literature [Mutanga et al., 2017; World Wildlife Fund (WWF), 2019], these descriptions have not been coalesced into a comprehensive, theoretically informed typology of cultural brokerage. Identifying individuals who can function as brokers is a priority for protected area management and wildlife crime prevention. Brokerage has the potential to increase legitimacy and trust, yield informal social control measures, and build upon community values, all of which aid in wildlife crime prevention (Moreto et al., 2017). Brokerage may also help ranger-community



teams function more effectively in preventing conservation crime (e.g., share resources, information).

Brokerage has thus far primarily been applied to economics, political science, anthropology, and sociological issues such as migration (Stovel and Shaw, 2012). This research examines the aims of brokerage, the structure of brokerage (e.g., how aligned the broker is to each of the two parties), potential benefits to brokers themselves, and the disadvantages of brokerage. Brokerage can take numerous forms (see **Table 3**) which differ in terms of information flow and alignment with the other parties. One practical and potential disadvantage of brokerage is that, because brokers straddle two communities, one or more of these communities may view the broker as immoral or disloyal to the value system of the community. This can create issues with trust which can leave the brokerage system unstable (Stovel and Shaw, 2012). However, this position of being “in-between” both groups can also free brokers to act in a novel manner rather than be bound to the norms of a single community (Stovel and Shaw, 2012).

Although brokerage is rarely applied to the conservation literature, there are a few examples of its application to conservation-based tourism. For example, Perry et al. (2019) examines how members of the National Park Service function as cultural brokers to increase the relevance of National Parks among urban citizens in the US. Brokers can also function as assemblers who “fit together” different actors to achieve development goals; this includes brokerage between environmentalists and other actors (Koster and van Leynseele, 2018). Although brokerage has been applied to protected areas in the context of tourism and development, it has yet to be used to examine wildlife crime within protected areas. Given the plurality of actors involved in wildlife crime, their divergent motives (Kahler and Gore, 2012), the complexity of wildlife trade networks, and the frequent role of middlemen in facilitating or intercepting wildlife crime (Ayling, 2013), brokerage is applicable to this topic. The absence of research on brokerage in wildlife crime is a significant gap. This paper applies cultural brokerage theory to the case of wildlife crime in a protected area in Viet Nam and characterizes rangers’ brokerage of wildlife crime prevention knowledge and strategies to and from conservation stakeholders.

METHODS

Data was gathered through informal face-to-face interviews conducted in 2018 with rangers and protected area staff ($N = 31$) at ranger stations in Pu Mat National Park, Nghe An Province, Viet Nam. This method is appropriate for this form of research, which prioritizes ranger-generated narratives and information. Qualitative methods, particularly semi-structured interviews which allow respondents to expand on researchers’ questions, are well-suited to the exploration of complex processes and can generate insider information that might be excluded by a pre-set quantitative research instrument (Drury et al., 2011; Rust et al., 2017).

The sample was gathered through snowball sampling (Handcock and Gile, 2011). The research was undertaken as

TABLE 1 | Sample ($N = 31$).

Role of respondent	<i>N</i>	Percentage of sample
Ranger or Forest Patrol	22	71%
Head or Deputy of Ranger Station	4	13%
Police or Frontier Army Soldier	3	10%
Scientific Director	1	3%
Director of Park	1	3%

part of a Re:wild wildlife crime prevention assessment for Pu Mat National Park. A non-governmental organization (the NGO Fauna & Flora International) visited the park to train rangers on a new monitoring technology: SMART (Spatial Monitoring and Reporting Tool). As part of this training, the researchers spoke with rangers, who then suggested others among themselves to speak to and facilitated meetings with the researchers. The interviews were conducted in an informal manner, as was appropriate to the cultural context. While most of the interviews were individual, four interviews were with teams composed of multiple individuals (sometimes with different affiliations: see **Table 2**). Although based at different locations within the park, all of the respondents worked within Pu Mat National Park. Therefore, all of the interviewees were well-positioned to speak to wildlife crime prevention interventions and enforcement within the park. The respondents were diverse in their roles (**Table 1**) and in their affiliations and responsibilities (**Table 2**). This generated a rich data set that encompassed the different forms of forest patrol work within the park. In this paper, we use the term “rangers” to refer to our sample as a whole (since rangers or forest patrol staff composed the majority of our respondents), but it is important to emphasize that our interviewees had diverse roles and responsibilities (**Tables 1, 2**).

All respondents were Vietnamese and were male, which is indicative of the unbalanced gender composition in the ranger profession in Viet Nam and elsewhere [World Wildlife Fund (WWF), 2019; Seager et al., 2021]. The ranger field tends to be overwhelmingly male due to culturally entrenched gender norms about gender-appropriate work (Seager et al., 2021). The trend toward militarization in conservation patrols, the perception of wildlife crime as a predominantly male enterprise, and the gender disparity in policing has, as a whole, further alienated women from the ranger profession (Agu and Gore, 2020; Seager et al., 2021). There is also a disparity in which roles rangers are assigned due to gender. For example, at our study site, female members of the Forest Protection Department (FPD) are given clerical rather than field work.

Interviews were led by three members of the research team. One researcher was Vietnamese and the other two interviewees were American and French, from an American-based university. The interviews were either conducted exclusively in Vietnamese or in Vietnamese and English (with the Vietnamese member of the team acting as translator). The research members who did not lead the interview took observational notes. All three members

TABLE 2 | Types of Rangers/Forest Patrol in Pu Mat National Park.

Affiliation	Acronym	Number in Sample*	Responsibilities/powers
Fauna and Flora International Community Conservation Team	FFI's CCT	4	The FFI CCTs have specific objectives such as gibbon monitoring. They offer support with snare removals if they detect them. These individuals are monitoring and snare removal staff but not "front-line" rangers. They always operate with the FPD
Forest Protection Department	FPD	19	The FPD are the "official" rangers of Pu Mat National Park and are part of the Vietnamese Government. These individuals constitute the majority of rangers within the Park. However, the FPD rangers <i>only</i> have powers of authority within the park and can only detain offenders for a short time period before the poacher must be handed over to the police
Police/Frontier Army	FA	3	Although Frontier Army soldiers and police officers are not rangers, they sometimes form joint operations with the FPD rangers
Save Vietnam Wildlife	SVW	1	SVW employ "rangers," but they do not have powers of authority. The SVW teams help to increase presence in the park by conducting patrols, always together with FPD rangers who have the authority. They can plan their own operations but must do so together with FPD. The FPD lacks an operational budget, so SVW fills a niche by providing support to increase activity in the field

*Two interviews were with teams there were composed of both CCT and FPD individuals. These interviews are recorded under both the CCT and FPD rows.

compared their handwritten notes after the interview. Although handwritten notes can introduce bias, these three sets of notes were compiled after the conclusion of the interviews, which allowed for the triangulation of data and helped reduce bias. Although these interviews were not recorded or transcribed, this is not always necessary for quality data collection. In some cases, handwritten notes are superior as they allow for in-the-moment thoughts and contextual cues by the interviewer (Halcomb and Davidson, 2006). Due to the cultural context, in which the respondents preferred informal interviews to recorded ones, handwritten notes were viewed as the most appropriate method.

The interview protocol was developed in the early stages of fieldwork and was designed to fit the constraints and opportunities of informal interviews with the rangers and other field staff as they conducted their duties. The questions centered upon rangers' (a) knowledge of the drivers of wildlife crime, (b) experiences with the communities in their patrol area, (c) knowledge of poachers' motivations and methods and (d) how rangers reacted to address wildlife crime. Questions were intentionally broad and open-ended to allow for ranger-generated data. While the questions did not center explicitly upon cultural brokerage, cultural brokerage emerged as a relevant framework for the data during the analysis phase. This research was reviewed and approved as exempt by The Human Subjects Protection Program at Michigan State University's Institutional Review Board under 45 CFR 46.101 (b)2 (Study ID STUDY00000372).

Interview data was analyzed through the use of grounded theory and thematic analysis (Chapman et al., 2015). Grounded theory is an inductive research method through which a theoretical framework is developed or applied based upon participant-driven data and narratives; at the center of grounded theory is the progressively detailed classification of themes from the data (Chapman et al., 2015). This is particularly appropriate for research focused on social or cultural issues. A research team member read through each interview separately and highlighted relevant themes. Themes relevant to cultural brokerage emerged frequently in the interviews. In particular, two common themes pointed to the salience of cultural brokerage. First, the respondents often mentioned being an intermediary between the community members and other actors (such as conservation organizations). While the dynamics of this "go-between" role shifted between and within respondents' answers, the notion of rangers as an intermediary was prevalent. Second, the cultural differences between the groups that rangers encountered (e.g., the various motivations of community members, conservation organizations, etc.) was a persistent theme. The combination of cultural factors and rangers' intermediary role suggested the appropriateness of cultural brokerage. After cultural brokerage was identified as a theoretical framework relevant to the data, the researcher re-visited the interview notes and coded the data for specific forms of cultural brokerage.

RESULTS: RANGERS AS CULTURAL BROKERS

Our results found that respondents regularly shift between forms of cultural brokerage. As social roles, these types of cultural brokerage are fluid, and the same individual can function as a different type of broker in various situations (Gould and Fernandez, 1989). All five types of brokerage were evident in the sample (Table 3).

Coordinator

Rangers function as coordinators through collaboration with other agencies and authorities. For example, ranger stations within the national park cooperate with local police and

TABLE 3 | Definitions of brokerage, adapted from Gould and Fernandez (1989), and interview-based examples of how respondents function as different forms of brokers.

Form of brokerage	Definition	Examples from interview data
Coordinator	All the actors belong to the same group; the broker is internal to the group	Rangers coordinate with other members of the community to identify “middlemen” (outsiders) as threats to wildlife protection
Gatekeeper	The broker is aligned with the receiver of the brokerage relation and negotiates the initiator’s access to the receiver	Based on aspects of the crime, such as whether the poacher is from a poor household, the species poached, etc., the ranger uses his discretion about whether or not to make a record
Itinerant broker	The initiator and receiver are part of the same subgroup. The broker is an outsider but temporarily facilitates a brokerage relation between the initiator and the receiver	Rangers know which people in the village are frequent poachers and will check up on them regularly to see if these people are home. If these people are not at home, the rangers will reach out to the village management board to ascertain their whereabouts
Liaison	The broker’s role is to link two separate groups without having a previous alliance to either group. The broker is an outsider with respect to both the initiator and the receiver of the brokerage relation	Community informants provide the rangers with information to pass on to other authorities
Representative	The broker is aligned with the initiator of the brokerage relation and represents its interests to the receiver	Rangers take part in community meetings to hear about the community’s needs

implemented joint operations when they knew of any local illegal behavior in the park. Rangers expressed interest in further collaboration with police, the Frontier Army, and district-level authorities in the future. They plan on holding workshops at various government levels, namely the village, commune, district, and national level, to develop these collaborations in order to protect the forest. In this case, the rangers are brokering relationships, information, and patrol effort between members of the same subgroup (forest authorities); this is an example of coordination.

Gatekeeper

Rangers can also function as gatekeepers between poachers and the authorities. Although they are associated with the authorities, the rangers are able to select which poachers enter the criminal justice system. There are numerous examples of how ranger discretion affects their responses to poaching. The respondents noted that, when they catch a poacher, they verify whether or not that person belongs to a poor household. If no, they will fine

that person; if yes, they will release the poacher without a fine. Further, this decision is informed by safety issues and by the type of infraction. Rangers stated that when they encounter offenders, they consider the ratio of the number of rangers to the number of offenders before deciding which action to take and whether to write up the offense and make a record. Rangers also consider the nature of the crime. If the infraction is serious, the rangers bring the poacher into the ranger station and/or headquarters and then transfer the case to the police. Overall, the rangers evaluate aspects of the poaching incident, such as the poverty of the poacher, the safety of the rangers, and the poached species, and use this information to inform the brokerage relation. In principle, rangers reported that when they are able to safely apprehend a poacher of a protected species who does not belong to a poor household, they broker a connection between this person and the criminal justice system.

Itinerant Broker

Rangers can act as itinerant brokers when they facilitate interactions between two actors in a subgroup, such as two segments of the community. For example, rangers know which people in the village are frequent poachers and will check up on them regularly to see if these people are home. If these people aren’t at home, the rangers will reach out to the village management board to ascertain their whereabouts. In this way, the rangers broker information between two segments of the community, the poachers and the management board, in an effort to prevent wildlife crime.

Liaison

It is also common for rangers to function as primary liaisons through their work with community informants. Community informants provide the rangers with information that can then be vetted and potentially passed on to other authorities. For example, local community members will sometimes give rangers information on when and where poachers are planning to hunt. The community members often don’t stop poachers directly because they are afraid to damage interpersonal relationships. The brokerage relationship allows them to intervene indirectly through the provision of confidential information to the rangers.

Representative

The final form of brokerage is representative; rangers serve as representatives for both the community and for the authorities. At times, the rangers associate themselves with the community and communicate the community’s needs to other stakeholders, such as park management. For example, respondents mentioned participating in community meetings in order to listen to what local community members want and need. Rangers would often give their contact information to community members to be more easily available to them. Members of the CCT team noted that there are certain community commitments that sometimes prevent them from going on patrol. For example, if there is a death or a wedding in the village, they cannot leave the village for 2–3 days per tradition. This respect for tradition shows that these rangers are well-embedded in the community. This pro-community brokerage can provide benefits to communities.

For example, one interviewee mentioned an area of the park where rangers have good relationships with the local community. The family forest owners' allocation program exists in this area, and the beneficiaries of this program help provide rangers with crucial information; in return, the rangers provide compensation. In this case, the rangers are aligning themselves with the community in order to procure information for other parties (e.g., park management).

However, at other times, the rangers are seen as representatives of the nongovernmental organizations or governmental authorities that fund their patrols. For example, several rangers mentioned the importance of uniforms with logos that identify them as authorities; this communicates to the community their role as a representative and helps them better support law enforcement through encouraging the local community members to take their authority seriously.

RESULTS: RANGER-IDENTIFIED OBSTACLES

As front-line representatives of conservation, rangers have unique perspectives and abilities to identify both obstacles and solutions to wildlife poaching and efficient community-park partnerships. Our respondents identified obstacles to crime prevention that they believe could be improved: deficiencies in data collection (and the associated issues of employee turnover and lack of resources), knowledge gaps, and the dangers posed by poachers. Obstacles to wildlife crime prevention are one form of information brokered by rangers.

Deficiencies in Data Collection, Employee Turnover, and Lack of Resources

Some respondents ($n = 5$) identified difficulties with data collection protocols. One respondent noted that some CCT teams are not following protocols related to their datasheets, e.g., not recording all significant field data. Another respondent reported that there are too many different entities that train them on SMART, sometimes using different data models and datasheets. This is a potential issue because this data is used to inform anti-poaching initiatives and to distribute resources such as manpower. Some teams do not adhere to the protocols for data collection and patrolling. They do not always use recording protocols when they see something of note in the field. The team members report sometimes having trouble remembering the information when they finally can write it out in the station. There are several factors that contribute to these data collection issues. First, since the patrol locations are remote, it is difficult to make copies of the datasheets. The rangers note that they don't always have enough room on the datasheets to write all the information they collect.

Second, the high turnover of team members among some anti-poaching patrols can cause inconsistent data collection procedures. There is a consistent need to train (and retrain) new members on data collection techniques due to turnover. Turnover is a problem that is often not reported to higher-level management, often non-governmental organizations. For

example, one respondent noted how one team frequently changed composition without management knowledge. This stems from the CCT patrols, where members of the community change who attends the monitoring exercises even though there are specific individuals employed to patrol. Low salary and the long distances they have to patrol are two core reasons that cause some rangers to quit. Although these can be difficult phenomena to manage, perhaps because of lack of resources, respondents discussed them as important factors to consider.

Lack of resources, in various forms, was also a common theme discussed by respondents. These resources include monetary compensation (e.g., adequate salaries) as well as supplies such as vehicles, batteries, and patrol necessities. Resources were mentioned as a mechanism for improved patrol efficacy. For example, respondents noted that additional supplies could help them travel further into the forest and thus spend both more time on patrol and access more remote areas of the forest. These obstacles (e.g., lack of resources) are linked to brokerage in that they facilitate interactions between rangers and other groups. If rangers have additional resources to patrol different or more remote areas of the forest, this will alter both who they encounter in their work and what information is gathered.

Knowledge Gaps

The need for knowledge on conservation matters was also discussed as a current obstacle. The rangers noted that, when on patrol, they sometimes are not sure whether the wildlife they see are protected under the law. They are also unclear on how they should respond in situations where they discover injured wildlife, because they are not trained to evaluate the level of injury well. Several respondents also discussed issues with awareness-raising of conservation issues, an integral part of their work with communities. They requested more training on awareness-raising skills as well as the provision of books and a projector to support awareness-raising on species identification. The rangers noted that community members should get similar conservation training because, currently, it is hard for communities to understand conservation principles given how their educational background differs from that of the rangers. Finally, the respondents discussed an overlooked but crucial problem with the current awareness-raising process. They mentioned how, when awareness-raising is implemented, most of the attendants are women, because the men delegate their wives to attend. However, most of the poachers are men, so it is difficult for awareness-raising sessions to impact poachers. Since there is currently low poacher attendance at these meetings, one respondent suggested offering poachers monetary incentives to attend these awareness-raising sessions. Whether or not a monetary incentive is the solution remains to be seen, but it's clear that attendance at these sessions, and not only attendance numbers but the composition of attendees, is a crucial issue. In providing information on this obstacle, rangers function as representatives of the community; they are communicating community-level issues (e.g., the composition of attendance) that was not apparent to other protected area management.

Dangers Posed by Poachers

The dangers associated with tracking and apprehending poachers was a final obstacle mentioned by the respondents. The rangers noted that poachers often carry large knives to make snares and cut vegetation. They have encountered pangolin poachers who use these knives to defend themselves from arrest, and also experienced a situation where illegal loggers surrounded them and held them with weapons. Therefore, the rangers requested tools for protection such as pepper spray, Tasers, and training in martial arts and first aid. While this is a request, it may not be an ideal solution as it could yield an escalation of violence in ranger-community encounters (e.g., de-escalation training might be a more useful solution).

Further, respondents mentioned that outside middlemen influence local community members and poachers to be aggressive with rangers. Jurisdiction issues often limit rangers' abilities to prosecute middlemen, as their legal authority is limited to arresting people whom they find hunting within the protected area borders. However, there is evidence that poachers from outside the community are engaged in extensive poaching. This is one example where rangers function as a coordinator (Table 3) in that they align themselves with community members in their identification of middlemen as problematic.

DISCUSSION

Rangers function as cultural brokers in the face of both conservation-related obstacles and successes. We have discussed how, through their interactions with community members, other conservation stakeholders, and poachers, rangers act as brokers of various forms. In these relations, rangers have the ability to broker resources, relationships, and information. For example, rangers broker communities' access to government-held resources, such as forest land, as well as governments' access to community-based offenders through intelligence, reports, and enforcement actions.

Our results provide crucial information for designing initiatives to address wildlife crime. Prior literature has noted that brokerage has the potential to increase legitimacy and trust, yield informal social control measures, and build upon community values, all of which aid in wildlife crime prevention (Moreto et al., 2017). Even if rangers already use brokerage in their work, understanding the dynamics of brokerage, such as the forms of brokerage and the relationships between actors, could help them more effectively address the obstacles they encounter in the field. Issues of bias and cohesion are central to the brokerage model (Stovel and Shaw, 2012). Bias indicates the extent to which the broker is relationally, socially, or informationally closer to one stakeholder than the other; cohesion describes the level of internal solidarity among actors linked by the broker (Stovel and Shaw, 2012). This could help explain why communities and rangers sometimes give differential responses to the same survey questions [see World Wildlife Fund (WWF), 2019], as information may be communicated or interpreted differently by these groups depending upon where they fit within the brokerage relation.

Our results link to the broader literature on rangers, which emphasizes both the importance of community-ranger relationships and the diverse roles that rangers inhabit in their work. The development of mutual trust between communities and rangers is essential to establishing the social relevance of protected areas (Singh et al., 2021). Relationships with community members are an essential component of ranger capacity (Woodside and Vasseleu, 2021). Community trust and respect, as well as moral alignment with communities, have been found to have statistically significant effects on ranger self-legitimacy (Moreto et al., 2021a). Rangers themselves have identified the need to augment traditional law enforcement strategies and to include community-ranger relationships within the crime prevention toolbox (Moreto and Charlton, 2021). This is especially important for a spatially broad, complex issue such as wildlife poaching (Moreto and Charlton, 2021).

The overlap between communities and rangers has been referred to as collaborative stewardship (see Woodside et al., 2021). This concept emphasizes the diverse and fluid roles of rangers and communities; collaborative stewardship emerges from collective leadership, shared values and structures, and trust built through competence and communication (Woodside et al., 2021). Woodside et al. (2021) stress that the ranger-community relationship is dynamic and shifts depending upon the cultural and conservation context. This fluidity extends to the nomenclatures and responsibilities assigned to rangers, which makes it difficult to formalize the responsibilities and rights of those who work in this sector [World Wildlife Fund (WWF), 2019; Woodside and Vasseleu, 2021]. The classification system of cultural brokerage is a mechanism for identifying and organizing the different roles of rangers across countries and contexts. This offers further precision to the dynamic nature of rangers' work; it allows us to specify their different roles and how these roles relate to larger informational and social systems.

This paper also contributes to the knowledge base on ranger-based monitoring of natural resources and wildlife crime. Rangers have access to unique information about both wildlife and the communities in which they are embedded, and thus have an important perspective on which community-based interventions may or may not prevent wildlife crime (Montero-Botey et al., 2021). This ranger-generated information is distinct from, and complementary to, the knowledge gained through scientific models of poaching (Kuiper et al., 2020). However, in order to ensure accurate data, it is essential to understand how rangers perceive and interact with the data collection process. For example, rangers' attitudes toward monitoring technology affects how engaged they are in the reporting process and how useful and easy they find the technology to be (Sintov et al., 2019). While technology is one aspect of ranger-based monitoring, another component is how, and from whom, rangers gather information. For example, if rangers are utilizing community informants as sources of data, it is important to understand how rangers fit within the larger social system of the community. Further, as with any human-generated data, it is essential to think about observer bias in monitoring (Kuiper et al., 2020).

Our work has demonstrated how cultural brokerage can be used to understand how information flows to and from rangers, and how issues of cohesion and bias can be incorporated into ranger-generated data. For example, community informants might provide rangers with incomplete or false information if they feel more solidarity with the poacher than with the authorities. The lens of cultural brokerage is important because it helps map how information and resources are impacted by the social relationships between stakeholders. When rangers provide data that is used to inform natural resource management and wildlife crime prevention, it is essential to understand how that data has been brokered. Who has provided it, and why? Has bias impacted the information?

This paper has discussed how the model of cultural brokerage can be applied to the front-line experiences of protected area rangers in Viet Nam. However, there are several limitations to our methods and data that could be expanded upon in future work. As mentioned, due to the cultural context, the interviews were not recorded or transcribed. While this does not invalidate the data (Halcomb and Davidson, 2006), it could be useful to triangulate our results with either recorded interviews or quantitative data. For example, ranger-generated data could be integrated with scientific models to evaluate wildlife crime (Kuiper et al., 2020). Further, mentorship and supervision have been identified as key variables related to rangers' self-legitimacy and interpersonal relations (Moreto et al., 2021a,b). Therefore, another avenue for future research would be to examine how forms of brokerage differ (or remain the same) among various ranks or positions within the patrol community. While this did not emerge as a significant source of variability between our respondents, this could be due to our small sample size. It would be interesting to see how cultural brokerage is modeled for junior rangers and if supervisors tend to emphasize certain forms of brokerage over others. Since we used a grounded theory approach, cultural brokerage emerged as a theoretical framework after data was collected. Our results can be viewed as a preliminary typology of cultural brokerage among rangers. Future studies could be designed at the onset to examine cultural brokerage, and interview questions could be arranged from this perspective. This could help elaborate upon and refine our initial results.

Subsequent scholarship could also expand on how and why shifts in brokerage occur, such as what precipitates shifts in social roles, and how interventions can be tailored to different forms of brokerage. Further, theoretical work on strengthening and stabilizing brokers' social position (e.g., Stovel et al., 2011) could be mined for applications to rangers. Since brokers bridge multiple groups, their social position is often "unstable," meaning that one or more groups may see them as "not one of us" and may have difficulty trusting the broker to act in the best interest of all parties (Stovel and Shaw, 2012). However, economic and sociological scholarship has developed numerous mechanisms for addressing this issue that could be modified to the conservation context. For example, organizational grafting is a method for broker stabilization in which the brokerage relationship is attached

to a pre-existing organization, such as a non-governmental organization (Stovel et al., 2011). Finally, while this paper has focused on rangers and other formal guardians as cultural brokers, informal guardians also play a pivotal role in wildlife crime prevention (Viollaz et al., 2021, in preparation). Future work could examine if and how informal guardians such as community members function as cultural brokers in order to better delineate the relationships between formal and informal guardians.

CONCLUSION

Although cultural brokerage has been applied to various development and governance contexts (Koster and van Leynseele, 2018), our work is the first to apply cultural brokerage to protected area rangers. Our key findings are that (a) rangers do function as cultural brokers within the wildlife crime prevention context and (b) rangers shift between all five forms of cultural brokerage: coordinator, representative, gatekeeper, liaison, and itinerant broker. While recent work has focused on the human dimensions of ranger efficiency and rangers' interpersonal relations (Kuiper et al., 2021; Moreto et al., 2021a; Woodside and Vasseleu, 2021), the ranger literature remains primarily focused on the content of ranger-generated patrol data and ranger efficiency. Our paper has illustrated the importance of expanding upon the information provided by rangers to inquire as to how and why information has been gathered. Cultural brokerage provides a mechanism for understanding (a) how information is embedded in social systems and (b) how issues of cohesion and bias affect the flow and content of information and the use of this information for wildlife crime prevention. This information is diverse and includes data on wildlife crime prevention and obstacles to conservation initiatives that could be addressed to improve their effectiveness and sustainability. Further, although rangers are sometimes referred to as coordinators, liaisons, or gatekeepers in the conservation literature [Mutanga et al., 2017; World Wildlife Fund (WWF), 2019], these descriptions have not been organized into a comprehensive, theoretically informed typology. The aim of our paper has been to provide such a typology and to use the example of protected area rangers in Viet Nam to demonstrate how cultural brokerage provides a systematic lens through which to understand the social context of ranger-provided data. This knowledge can help increase the comprehensiveness and accuracy of data used in wildlife crime prevention.

Rangers face numerous obstacles in their work, all of which can affect their motivation, retention, and effectiveness. Addressing these obstacles often involves the brokerage of information, relationships, or resources. We have presented a typology of the various forms of brokerage that rangers use, either intentionally or not, in their wildlife crime prevention work. Application of the cultural brokerage model to rangers' work has the potential to both improve community-ranger interactions and increase the efficiency of wildlife crime prevention.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

This research was reviewed and approved as exempt by The Human Subjects Protection Program at Michigan State University's Institutional Review Board under 45 CFR 46.101 (b)2 (Study ID STUDY00000372).

AUTHOR CONTRIBUTIONS

JR analyzed the data and wrote the manuscript. JV designed the original research, collected the data, and edited and provided feedback on the manuscript. MG participated in the design of the original research and edited and provided feedback on the manuscript. HH collected the data. BL, CT, JK, and BR provided situational awareness and assisted with data collection and analysis. All authors contributed to the article and approved the submitted version.

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