frontiers | Frontiers in Conservation Science

TYPE Original Research
PUBLISHED 29 November 2023
DOI 10.3389/fcosc.2023.1298768



OPEN ACCESS

EDITED BY
Jean Hugé,
Open University of the Netherlands, Netherlands

REVIEWED BY
Olekae Tsompi Thakadu,
University of Botswana, Botswana
Timothy C. Haas,
University of Wisconsin–Milwaukee, United States

*CORRESPONDENCE
Capucine Pierrefeu
cpierrefeu@wwf.sg

RECEIVED 22 September 2023
ACCEPTED 14 November 2023
PUBLISHED 29 November 2023

CITATION
Phoonjampa R, Srirattanaporn S, Phumanee W, Pierrefeu C, Singh R and Ong EJ (2023) Exploring local communities' perceptions of protected area authorities: a case study from Khlong Lan National Park and Mae Wong National Park in Thailand.
*Front. Conserv. Sci.* 4:1298768.
doi: 10.3389/fcosc.2023.1298768



# Exploring local communities' perceptions of protected area authorities: a case study from Khlong Lan National Park and Mae Wong National Park in Thailand

Rungnapa Phoonjampa[1], Surasak Srirattanaporn[1], Worrapan Phumanee[1], Capucine Pierrefeu[2*], Rohit Singh[3] and Elliott James Ong[2]

[1]Department of Conservation, World Wide Fund for Nature-Thailand, Phayathai, Bangkok, Thailand, [2]Department of Conservation, World Wide Fund for Nature-Singapore, Singapore, Singapore, [3]Department of Wildlife, World Wildlife Fund, Washington, DC, United States

Rangers and local communities play a critical role in enforcing conservation in and around Protected Areas (PAs), yet, their role as planetary health workers and the their relationship dynamics has long been overlooked. This study assesses the relationship between communities and PA authorities in 39 villages adjacent to two high conservation value National Parks in Thailand. Using the responses of 200 participants gathered through a Likert-type survey questionnaire, we analyzed community perception of PA authorities using Ordinal Logistic Regression models. Results indicate good community-ranger relations in the study area. Specifically, regular communication and community involvement in decision-making significantly impact trust and respect towards PA authorities. The models further reveal that while education levels influence trust, a culture of respect for authority figures remains deeply rooted in local communities, highlighting the importance of good PA authorities' engagement with communities. The results suggest that capacity building for field staff, in particular in social skills and collaboration with local communities, has the potential to improve the relation between communities and rangers. As global efforts intensify to achieve target 3 of the Post-2020 Global Biodiversity Framework, this research offers valuable insights into fostering respectful and trusting relations between communities and PA authorities.

KEYWORDS

**rangers, protected areas, trust, community, indigenous people**

# 1 Introduction

Between 1970 and 2018, wildlife populations in the Asia Pacific declined by 55% (Almond et al., 2022). Moreover, tropical forests, long thought to be the lungs of our planet, are rapidly becoming net carbon sources, the main driver of these emissions being deforestation and the degradation of remaining standing forests (Baccini et al., 2017; Harris et al., 2021). In response to the increasing anthropogenic pressure on the environment, governments in the Asia Pacific have been expanding the number and coverage of Protected Areas (PAs) to reduce biodiversity loss and deforestation, expanding them from 2 to nearly 3 million km$^2$ between 1990 and 2014 (UNEP-WCMC, 2016).

As the proportion of protected land increases, so does the need for enforcement personnel on the ground. A study revealed that, in Southeast Asia, forest cover loss is three times higher beyond protected area boundaries than within (Graham et al., 2021). PA authorities play a fundamental role in ensuring PAs deliver on their targets (Belecky et al., 2019; Singh et al., 2021). Yet, PAs worldwide are suffering from a low workforce. Current estimates indicate that the global ranger density is one per 72 km$^2$, less than the International Union for Conservation of Nature's (IUCN) recommended one per 5 km$^2$ (IUCN, 2016; Appleton et al., 2022). The Chitwan declaration, adopted in 2019, identifies rangers as planetary custodians at the nexus of biodiversity conservation, ecosystem integrity, Indigenous Peoples and Local Communities (IPLCs), human rights, and sustainable development (IRF, 2019; Belecky et al., 2021). Without enough monitoring and personnel on the ground, PAs will not reach their fullest potential and nations will fall short of Target 3 of the post-2020 Global Biodiversity Framework (GBF) to effectively conserve and manage 30% of the planet by 2030 (Appleton et al., 2022; CBD, 2022; Stolton et al., 2023).

Many PAs were established with the aim to protect large key biodiversity areas from human pressure, except for resource management and tourism (Zube and Busch, 1990). Poor governance, poverty, and the marginalization of humans from nature, where indigenous knowledge systems and traditional land management dominate the landscape, foster tensions between local communities, rangers, and government authorities (Bragagnolo et al., 2016; Pillay et al., 2020). Although there are examples of rangers and IPLCs having trusting and respectful interactions (Stolton et al., 2022), there are many places where this is not the case (Mehta and Heinen, 2001; Wang and Yamamoto, 2009). In extreme circumstances, rangers and communities face life-threatening situations linked to conservation practice and enforcement (Woodside and Vasseleu, 2021). Yet, over 80% of rangers attribute part of their job's success to good community relations (Belecky et al., 2019; Cronin et al., 2021). Local communities' degree of involvement in PA management and governance affects their attitude toward conservation, and their support for PAs relies heavily on the perceived costs and benefits of living near such areas (Mehta and Heinen, 2001; Lee et al., 2009; Abukari and Mwalyosi, 2020). Therefore, with increases in PA coverage and rangers on the ground, it is essential to consider the resources required by both parties to collaborate and sustainably co-exist.

In this study, a PA refers to a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with its associated ecosystem services and cultural values where rangers, known as, but not limited to, wildlife wardens, forest guards, park guard, and other field staff (collectively referred to here as "Protected Area authority") are the frontline workers maintaining the law and conserving natural resources within the boundaries of PAs (IUCN, 2016).

Building on the work of Parker et al. (2022a, 2022b), this study explores local communities' relationship with PA authorities in two Thai National Parks. The PAs are located in the Dawna-Tenasserim Landscape (DTL), a 63,239 km² forested mountainous area between Thailand and Myanmar, home to diverse ethnic groups. The DTL is in the heart of the Western Forest Complex, the largest PA network in Southeast Asia (WWF, 2014). As one of the Greater Mekong areas' most unaltered landscapes, this area harbors important populations of endangered wildlife and is essential for mitigating climate change and biodiversity loss (Phumanee et al., 2021). The study aims to identify the factors that affect community-ranger relations to strengthen cooperation between communities and rangers and provide new insights to guide future interventions. This objective will be achieved by examining (1) the demographic factors influencing communities' trust and respect, (2) current PA authority practices that may be influencing trust and respect, and (3) the community empowerment strategies enabling trust and respect. Based on the existing community-ranger relations literature, trust and respect were identified as two elements of significant importance. Both represent similar values and must go hand in hand to kindle collaboration between communities and rangers leading to strengthened relationships (Belecky et al., 2019; Anagnostou et al., 2020). Therefore, this study will focus on these two to evaluate the relationship between the communities and PA authorities surveyed.

# 2 Methods

## 2.1 Study area

The study area extends through Khlong Lan National Park, Kamphang Phet Province, and Mae Wong National Park, straddling Kamphang Phet and Nakhon Sawan Provinces, at the northern border of the DTL (Figure 1). The parks were established in 1985 and 1987 respectively to safeguard prime sites for tiger conservation in Thailand and the region. A 5 kilometers buffer zone between the parks and communities has been established in accordance with the 1964 National Forest Preservation Act to secure food and Non-Timber Forest Products (NTFPs) to local communities (UNFF, 2021). Agriculture and human settlements can be found to the east of the parks. The total population across the study area was 21,013 as of 2022 across 60 villages (Department of Health Service Support, 2022a). The main indigenous communities in the area are the Karen, the Mien/Yao, the Lisu/Lisaw, and the Lahu/Muse (Department of Health, 2022b). No communities live within the parks' boundaries.

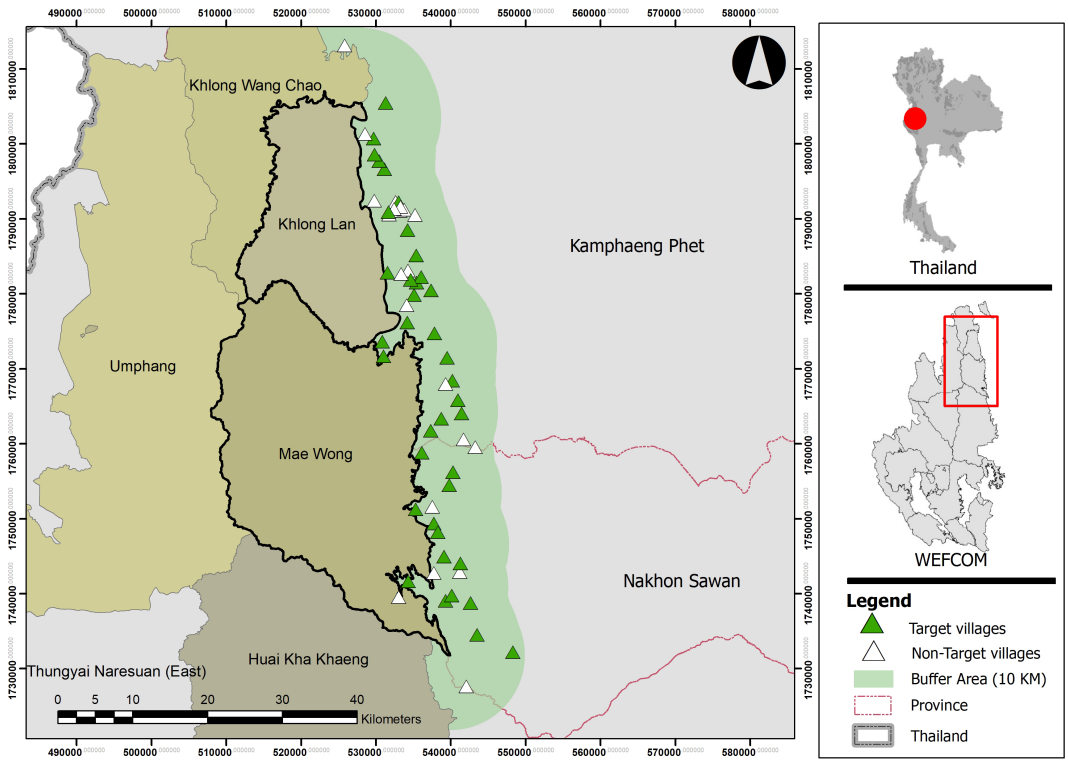


FIGURE 1
Spatial distribution of the villages targeted by the study. The areas in gray on the map represent non-protected land, and the colored ones represent IUCN-recognized Protected Areas. The two maps on the right situate the study area at the national (Thailand) and landscape scale (Western Forest Complex: WEFCOM).

The study area is home to rare and endangered wildlife and plant species of outstanding universal value. It was selected because of Mae Wong and Khlong Lan's (MWKL) wildlife value, where WWF Thailand and Thailand's Department of National Parks have been working on tiger recovery since 2013. The landscape is composed of a mix of evergreen and deciduous forests home to many flagship species such as Kitti's hog-nosed bat (*Craseonycteris thonglongyai*), Asian elephants (*Elephas maximus*), the largest breeding population of tiger (*Panthera tigris*) in the Greater Mekong region and Southeast Asia, and many more critically endangered and rare endemics like Fea's muntjac (*Muntiacus feae*) (Steinmetz et al., 2006; WWF, 2014; Duangchantrasiri et al., 2015).

In the areas surrounding MW and KL National Parks, the main conservation challenges faced by PA authorities in recent years have stemmed from a lack of wildlife awareness and support from local communities. Although some bushmeat hunting has been recorded in the parks' buffers, human-wildlife conflict and poaching are not key drivers of biodiversity and wildlife decline in this specific area (Stolton et al., 2022). At present, the patrolling effort in the two parks is at its maximum capacity with 12 teams operating for more than 15 days per month. Based on the monthly monitored activity reported by park rangers, the majority of poaching at this site targets small mammals on the park boundaries, including squirrels, porcupines, junglefowl, and reptiles, rather than ungulates and large mammals (Phumanee et al., 2020).

## 2.2 Sampling

Thirty-nine villages within the study area were identified as sampling targets. They were selected given their proximity to the study sites (<10 km distance) and their potential dependence, cultural and spiritual connection with the landscape. The villages were randomly selected within the sampling area to represent the diversity of views that may be held by communities living in close proximity to MW and KL National Parks. The goal was not to compare those views to one another. Therefore, the study participants are considered one study group, unique in the common proximity they share with the PAs. More specifically, stratified sampling was used to distribute the questionnaire among villagers to ensure that the sample sizes were as representative of gender, age, education, and occupation as possible and covered all villages uniformly. Five individuals were sampled per village, with the exception of one where 10 individuals were sampled, totaling 200 responses. This number was selected to get an equal representation of views from villages sampled as the study aimed to be equal in its representation of local perceptions of PA authorities.

Good relations between communities and rangers is critical for effective conservation action at the site level. That's why communities located the closest to the PAs were selected as our focus group. The survey was designed in consultation with experts of the landscape who work closely with rangers and communities. It was adapted from similar studies conducted in the Philippines and

Myanmar to reflect the knowledge and challenges specific to the Thai context (Belecky et al., 2019; Parker et al., 2022a).

## 2.3 Data collection

A door-knock approach was used to interview each participant. Depending on the availability of the respondents, they filled out the survey questionnaire in individual or group interviews which were commonly held in the evening, to accommodate for their workday (Davies, 2011). Interviews were conducted in Thai by a team composed of two people between May 1 and May 31, 2022. Except for the participants who could not read or write who were assisted by the interviewers, the participants wrote their own answers. Written consent was taken from all participants before initiating the survey. Village heads were contacted to inform and communicate about the study's aim and methodology. Responses were recorded anonymously and participants were free to withdraw from the survey at any point. The hard copies of the survey are kept at the WWF Thailand office.

Each survey contained a total of 123 questions arranged into two sections (a copy of the questionnaire is available in the Supplementary Material): 16 questions relating to the demographics of the respondent (Section 1) and 107 questions consisting of a mix of yes/no questions, direct written responses, and Likert-type scale questions (Section 2) where respondents had to select their level of agreement with various statements (Likert, 1932). Response data were expressed on a 4-point Likert-type scale ranging from 'Strongly disagree' (1) to 'Strongly agree' (4). The survey covered topics ranging from access to natural, cultural, and religious resources in the PA and satisfaction in park management to trust and respect for rangers and compensation received for loss and damage caused by wildlife.

## 2.4 Data analysis

We constructed 4 Ordinal Logistic Regression models, with respect and trust as the dependent variables. Logistic regression models have been widely used in social sciences as they are particularly useful for categorical response data (Agresti, 2002). Respect data was extracted from question 16 (i) "The community respects park rangers" (A copy of the full questionnaire is available in the supplementary materials). Trust data was extracted from question 16 (j) "The community trusts park rangers". The two questions were used as proxies to assess and measure the more abstract concepts they represent. The independent variables included demographic information in the first model and community experience of PA management in the second model.

Statistical tests were run on RStudio [R version 4.2.2 (2022-10-31)] using the polr function (Venables and Ripley, 2002; MASS package version 7.3.58.1) and corrected using the vif (Variance Inflation Factors) function (Fox and Weisberg, 2019; CAR package version 3.1.1) to avoid multi-collinearity issues and remove variables with a value of more than 3 (James et al., 2013). Graphs were created using the Likert function (Bryer and Speerschneider, 2016; Likert package version 1.3.5).

# 3 Results

## 3.1 Demographics of respondents

A total of 200 respondents from 39 villages make up the survey (42% near Khlong Lan National Park and 58% near Mae Wong National Park). The gender breakdown is 106 men (53%), 91 women (45.5%), and 3 (1.5%) not reported. Forty-eight percent of the respondents are middle-aged (31 to 50 years old), 42.5% classify as old (50 years old and above), and 9.5% as young (30 or younger). Sixty-three percent of respondents are married, and 16.5% have children. Only 4% of the respondents have previously been employed as a ranger, and 28.5% have friends or family members employed as rangers. The dominant occupation is agriculture (55%), and the most common highest level of education is state level (grades 6 and 9, 55%). The mean gross annual income of the population surveyed is 148,455 THB (approximately 4,403 USD; population SD=142,469 THB, ~4,225 USD; N=22), and the median annual income is 100,000 THB (~2,864 USD).

## 3.2 What demographic factor(s) influence local communities' trust and respect for PA authorities?

Out of the six demographic factors tested for an association with respect and trust in rangers, only education has a statistically significant association with trust. Respondents with a maximum education level of grade 6 have the strongest association with trust for rangers (p=0.050, N=200; Table 1.1), followed by grade 9 (p=0.114). Subsequently, the higher the education received, the lower the trust in PA authorities. There is no association between education and respect. Unemployed respondents demonstrate the strongest association with respect for PA authorities (p=0.089; Table 1.2), however, it is not statistically significant. There is no association between occupation and trust.

## 3.3 PA authorities' practices

The communities report that park management treats people fairly (96.5%), with respect (97%), and are predominantly honest (91.5%). Seventy percent agree that park management gives equal services to the wealthy and the poor, and 94% to people of all ethnicities. They make decisions based on facts and law, not personal opinions (96%), explain their decisions to the people (95.5%) and take time to listen to the community (97.5%). The communities trust rangers to do what is good for the community (93.5%). Interestingly, 27% report that park management frequently exhibits rude or discourteous behavior.

Out of 200 respondents, 39% indicated having had an interaction with a park ranger. Based on their interaction(s), communities found PA authorities to be knowledgeable (85.9%) and helpful (93.6%). They treated communities with respect (96.2%), listened to their needs and concerns (93.6%), and created a space where people were able to speak their opinion (88.5%).

TABLE 1.1 Ordinal logistic regression model results: relationship between demographic factors and community trust in PA authorities.

| Variable (D) | Value | SE | P-value | Significance level |
|---|---|---|---|---|
| Sex (Male, baseline: female) | 0.125 | 0.376 | 0.740 | |
| Age (31-50 years old, baseline: below 30 years) | -0.407 | 0.674 | 0.546 | |
| Age (Above 50 years old) | -0.915 | 0.731 | 0.211 | |
| Married (Yes, baseline: no) | 0.341 | 0.454 | 0.453 | |
| Children (Yes, baseline: no) | -0.256 | 0.565 | 0.650 | |
| Education (Grade 6, baseline: university[1]) | -1.483 | 0.755 | 0.050 | * |
| Education (Grade 9) | -1.086 | 0.687 | 0.114 | |
| Education (Grade 12) | -0.569 | 0.665 | 0.392 | |
| Occupation (Agriculture, baseline: employee) | 0.275 | 0.478 | 0.564 | |
| Occupation (Business) | 0.683 | 0.666 | 0.305 | |
| Occupation (Work for government) | -0.422 | 1.126 | 0.708 | |
| Occupation (Unemployed) | 0.946 | 0.733 | 0.197 | |

[1] University: bachelor, master or higher.
P-values less than 0.1 significance level are flagged with one dot (.), one star (*) for p ≤ 0.05, 2 stars (**) for p ≤ 0.01, and three stars (***) for p ≤ 0.001.

TABLE 1.2 Ordinal logistic regression model results: relationship between demographic factors and community respect in PA authorities.

| Variable (D) | Value | SE | P-value | Significance level |
|---|---|---|---|---|
| Sex (Male, baseline: female) | 0.091 | 0.367 | 0.804 | |
| Age (31-50 years old, baseline: below 30 years) | -0.698 | 0.670 | 0.298 | |
| Age (Above 50 years old) | -1.056 | 0.712 | 0.138 | |
| Married (Yes, baseline: no) | 0.053 | 0.438 | 0.904 | |
| Children (Yes, baseline: no) | 0.407 | 0.583 | 0.485 | |
| Education (Grade 6, baseline: university[1]) | -0.721 | 0.731 | 0.324 | |
| Education (Grade 9) | -0.671 | 0.686 | 0.328 | |
| Education (Grade 12) | -0.115 | 0.665 | 0.863 | |
| Occupation (Agriculture, baseline: employee) | 0.399 | 0.475 | 0.401 | |
| Occupation (Business) | 1.051 | 0.661 | 0.112 | |
| Occupation (Work for government) | 1.059 | 1.044 | 0.311 | |
| Occupation (Unemployed) | 1.208 | 0.711 | 0.089 | . |

[1] University: bachelor, master or higher.
P-values less than 0.1 significance level are flagged with one dot (.), one star (*) for p ≤ 0.05, 2 stars (**) for p ≤ 0.01, and three stars (***) for p ≤ 0.001.

## 3.4 What practices employed by PA authorities affect trust and respect the most?

Out of the 18 behavioral statements presented to the community, two indicate a statistically significant interaction with trust and respect. The first is the frequency at which park management communicates information about the parks to the communities, and it has the strongest association with trust and respect for rangers (p=0.000, N=200; Table 2.1 & Table 2.2) and second is communities' ability to provide input for conservation decision-making (p=0.045, Table 2.2). Park management frequently exhibiting rude or discourteous behavior has the second strongest negative association with trust (p=0.076, Table 2.2) but is not statistically significant.

Community members having worked as rangers or having friends or family employed as rangers in PAs does not yield any association to respect and trust for PA authorities (trust: p=0.261 and p=0.548; N=200; respect: p=0.270 and p=0.987; N=200; respectively). Similarly, respondents' encounters with PA authorities does not affect trust or respect in PA authorities (p=0.452, p=0.694; N=200). Attending meetings hosted by the PA authorities does not show an association with trust. However, it may influence the level of respect they receive from local communities, although the association is not statistically significant (p=0.073).

10.3389/fcosc.2023.1298768

TABLE 2.1 Ordinal logistic regression model results: relationship between ranger behavior and community trust in PA authorities.

| Variable (D) | Value | SE | P-value | Significance level |
|---|---|---|---|---|
| Has been employed as a ranger (Yes, baseline: no) | -2.154 | 1.916 | 0.261 | |
| Has friends or family employed as ranger (Yes, baseline: no) | -0.267 | 0.444 | 0.548 | |
| 11 b. Park management treats people fairly. | 2.819 | 2.672 | 0.291 | |
| 11 c. Park management takes the time to listen to people. | 2.015 | 2.487 | 0.418 | |
| 11 d. Park management makes decisions based on facts and law, not on their personal opinions. | 2.055 | 1.362 | 0.132 | |
| 11 e. Park management explains their decisions to people. | -0.806 | 1.189 | 0.498 | |
| 11 f. Park management does a good job of keeping the community safe from wildlife. | 0.143 | 1.228 | 0.907 | |
| 11 g. Park management are often rude or discourteous. | 0.756 | 0.427 | 0.076 | . |
| 11 i. Park management gives equal services to both the wealthy and the poor. | -0.314 | 0.419 | 0.453 | |
| 11 m. Park rangers are generally honest. | 0.674 | 1.020 | 0.509 | |
| 11 o. Park rangers provide equal services to people of all ethnicities. | 0.550 | 1.367 | 0.688 | |
| 11 r. Communities are able to provide input to conservation decision-making. | 3.680 | 2.371 | 0.121 | |
| 11 s. The local community benefits from local conservation efforts. | 3.396 | 2.354 | 0.149 | |
| 11 u. Park laws and rules are clearly articulated to the community by park management. | 3.637 | 2.543 | 0.153 | |
| 15 d. Park management regularly communicates information about the park(s) to the communities. | 7.515 | 1.634 | 0.000 | *** |
| 16 f. Park management listens to the needs and concerns of the community. | -4.326 | 3.062 | 0.158 | |
| 21. Has attended a meeting hosted by the park authorities (Yes, baseline: no) | -0.579 | 0.408 | 0.156 | |
| 22. Has had an encounter with a park ranger (Yes, baseline: no) | 0.319 | 0.424 | 0.452 | |

P-values less than 0.1 significance level are flagged with one dot (.), one star (*) for $p \leq 0.05$, 2 stars (**) for $p \leq 0.01$, and three stars (***) for $p \leq 0.001$.

TABLE 2.2 Ordinal logistic regression model results: relationship between ranger behavior and community respect in PA authorities.

| Variable (D) | Value | SE | P-value | Significance level |
|---|---|---|---|---|
| Has been employed as a ranger (Yes, baseline: no) | -1.383 | 1.253 | 0.270 | |
| Has friends or family employed as ranger (Yes, baseline: no) | 0.007 | 0.413 | 0.987 | |
| 11 b. Park management treats people fairly. | 2.353 | 1.884 | 0.212 | |
| 11 c. Park management takes the time to listen to people. | 0.756 | 1.791 | 0.673 | |
| 11 d. Park management makes decisions based on facts and law, not on their personal opinions. | 0.787 | 1.376 | 0.567 | |
| 11 e. Park management explains their decisions to people. | -0.913 | 1.068 | 0.393 | |
| 11 f. Park management does a good job of keeping the community safe from wildlife. | 0.033 | 1.137 | 0.977 | |
| 11 g. Park management are often rude or discourteous. | 0.612 | 0.424 | 0.149 | |
| 11 i. Park management gives equal services to both the wealthy and the poor. | -0.435 | 0.409 | 0.288 | |
| 11 m. Park rangers are generally honest. | 0.251 | 0.851 | 0.768 | |
| 11 o. Park rangers provide equal services to people of all ethnicities. | -0.441 | 1.157 | 0.703 | |
| 11 r. Communities are able to provide input to conservation decision-making. | 3.537 | 1.762 | 0.045 | * |
| 11 s. The local community benefits from local conservation efforts. | 0.094 | 1.225 | 0.939 | |
| 11 u. Park laws and rules are clearly articulated to the community by park management. | 2.878 | 1.781 | 0.106 | |
| 15 d. Park management regularly communicates information about the park(s) to the communities. | 5.234 | 1.121 | 0.000 | *** |
| 16 f. Park management listens to the needs and concerns of the community. | -2.723 | 2.201 | 0.216 | |

*(Continued)*

TABLE 2.2 Continued

| Variable (D) | Value | SE | P-value | Significance level |
|---|---|---|---|---|
| 21. Has attended a meeting hosted by the park authorities (Yes, baseline: no) | -0.730 | 0.407 | 0.073 | . |
| 22. Has had an encounter with a park ranger (Yes, baseline: no) | 0.165 | 0.420 | 0.694 | |

P-values less than 0.1 significance level are flagged with one dot (.), one star (*) for p ≤ 0.05, 2 stars (**) for p ≤ 0.01, and three stars (***) for p ≤ 0.001.

## 3.5 Community-ranger collaboration

Communities believe they should be directly involved in decision-making about conservation efforts (99.5%) or at least provide input for decision-making (94.5%), and that conservation efforts will only be effective if the community is involved (91.5%). Overwhelming number of communities (98.5%) believe that park management needs to be supported by the local community in order to be effective. Communities strongly believe mutual trust (98%) and respect (98.5%) is needed between the community and the park rangers in order for conservation efforts to succeed, and they expressed that the community currently respects (95%) and trusts (96%) park rangers. Similarly, respondents believe park management trusts (97.5%) and respects (98.5%) the community.

However, a large 95% of respondents claimed communities are fearful of the park rangers because of the authority they represent. This value provides insight as to why 73% claimed it would be hard to justify disobeying a park ranger and believe they should accept park rangers' decisions even if they think they are wrong. Despite that, community members generally have a largely positive perception of PA authorities (Table 3). Similarly, 58.5% said that they should follow a park manager's order even if you disagree. Additionally, respondents would report a community problem to park managers (95.5%) and or to rangers (69.5%), such as wildlife entering the community. If the problem were of a more serious nature, such as a wildlife crime or knowledge about a suspected offender, a smaller 54% declared being likely to report said offense to park managers.

TABLE 3 Community's perception of communication with park authorities.

| Questions | Strongly agree/agree |
|---|---|
| Park management can be effective without the help of the community. | 61.5% |
| Local community members should work alongside park rangers to reduce poaching. | 97.5% |
| The community and the park rangers generally have the same sense of right and wrong. | 98.5% |
| Most community members know how to contact park management should they need assistance. | 95% |
| Communities are comfortable with contacting park authorities for assistance. | 96.5% |
| Park rangers can be trusted to do what's good for my community. | 93.5% |
| Park management listens to the needs and concerns of the community. | 99% |
| Would call park authorities if I saw a person entering the conservation area illegally. | 89% |
| Communities trust that if a ranger did something wrong park management would address the problem. | 96.5% |

## 3.6 Community empowerment

The local communities' express high levels of satisfaction with authority institutions including the local police agency (97%), the local government (99.5%), and park management (99.5%). Ninety-eight percent see that the local communities benefit from local conservation efforts, and are satisfied with the monetary benefits derived from them (94.5%), the services provided by park management to the local community (90.5%), and the infrastructure to support local conservation efforts (99.5%). A majority of respondents feel a sense of ownership for the park(s) (90.5%), are satisfied with their involvement in park management (98.5%), and declare that they can provide input to conservation decision-making (98%).

Respondents affirm that communities are aware of the benefits of the PAs (97%) and consider conservation important (99%). Ninety-seven percent are willing to attend a community meeting hosted by the PA authorities to learn about conservation, and 48% reported having already attended one. Of those, 97% claimed that the meeting provided useful information regarding the benefits of the conservation area and the work performed by rangers and park management, and 99% thought it provided useful information regarding local conservation efforts and wildlife laws, rules, and regulations.

Under poor governance, Protected Areas' laws and their enforcement can be significant inhibitors of community empowerment. Respondents agree that the punishments for violating park laws and regulations are clearly articulated by park management (96.5%) and that most community members are familiar with them (92.5%). Figure 2 summarizes the communities' perception of park laws.

## 3.7 PA authorities' corruption and crime

Twenty-two percent of the community respondents believe park rangers participate in corruption because of poor working conditions (e.g., lack of equipment and/or training, inadequate subsistence support), 21% because they have family or friends living in nearby communities, 18% because they believe they will not be caught, 15% because other park rangers and government officials participate in such behavior, and 11% because of low salary or greed. Considering these reasons, only 4.5% of the community

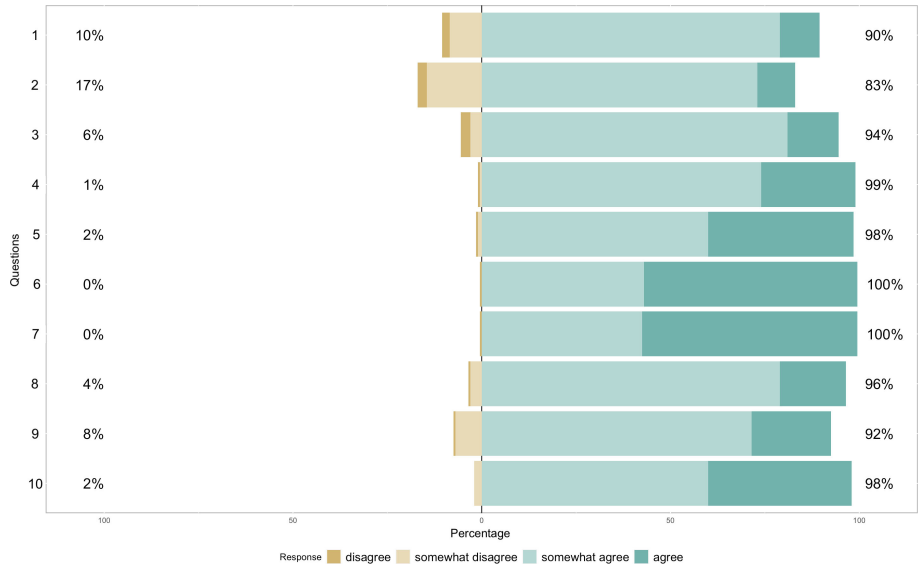


FIGURE 2
Stacked bar graph of the responses about the community's perception of park laws. Questions: (1) Current laws unfairly restrict access to resources important for cultural practices, (2) Current laws unfairly restrict access to important medicinal resources, (3) Current laws unfairly restrict access to important resources (e.g., firewood), (4) Wildlife laws reflect local community values, (5) Wildlife laws were developed to help local communities, (6) Wildlife laws are an important tool to protect endangered wildlife, (7) Endangered wildlife should be protected, (8) Punishments for violating park laws and regulations are clearly articulated by park management, (9) Most community members are familiar with the punishments associated with violating park laws and regulations, and (10) Park laws and rules are clearly articulated to the community by park management.

members reported having heard or witnessed park rangers engaging in misbehavior or misconduct, such as poaching (with or without evidence). Only 2% heard or witnessed park rangers engaging in corruption, such as taking bribes (with or without evidence).

## 4 Discussion

The analysis indicates that out of the 6 demographics factors tested for an association, only education appears to significantly affect trust in PA authorities; none affect respect. This observation may indicate that respect is more culturally embedded in the communities as an intrinsic human value (Dalton and Ong, 2005), whereas trust is more elusive and shaped by experiences (Wilkins, 2018). The association between trust and education indicates that respondents whose maximum attained education is lower (grade 6 equivalent) are more likely to trust PA authorities. Conversely, respondents whose maximum attained education is higher (bachelor's or master's degree equivalent) are less likely to trust PA authorities. This observation echoes Ugur-Cinar et al. (2020) finding that, as the level of education increases, the effect of education on political trust becomes more pronounced. While the results from our analysis indicate differences between each educational level, in reality the gap between people with a maximum education of grade 6 and grade 9, or grade 9 and 12 is not equal. It is important to note at this point that education in Thailand is mandatory for all until grade 9 (Fry, 2018). Most villagers who have completed Grades 6 and 9 will remain in their home communities to work in agriculture. It familiarizes them with the place and people, particularly the government sector or employees, including rangers, which is a direct result of respect for government officials. This correlates to our findings indicating that 55% of the respondents have a maximum education of grade 9 and 55% work in agriculture (although the two are independent of each other). Therefore, other factors might compound to affect trust. In fact, research suggests factors such as meritocracy and corruption are more likely to influence university graduates' trust levels (Ugur-Cinar et al., 2020).

From the 18 behavioral and contextual elements tested for an association with trust and respect, both models identified communication as the factor with the strongest association with trust and respect in PA authorities. The second most influential factor for respect is communities' ability to provide input to conservation decision-making, and the second most influential factor for trust is disrespectful behavior from PA authorities. These findings inform us of the level of involvement communities expect in PA activities. Granting them the level of implication they require therefore appears to be a decisive factor in fostering trust and respect between communities and PA authorities. Additionally, treating local communities as equals and with respect in this process could lead to better conservation outcomes.

While the results show that trust is most affected by frequent communication, local sources argue that Thai people will respect and trust any individual representing authority, regardless of their behavior. That is a significant element of Thai culture that is not represented in the questionnaire and that got lost in our models. It can be seen with the questions: it would be hard to justify disobeying a park ranger; "I" should accept park rangers' decisions even if I think they are wrong; and "I" should follow a park manager's order even if I disagree. PA authorities, including

rangers and their managers, are individuals of power. In many ways, they fulfill a similar role to police or military officers in Thailand; both maintain the law, protect people and their property, and play an essential role in crime control and prevention by creating a safe environment (Sahapattana and Cobkit, 2016; Stolton et al., 2022). Part of the trust and respect can be attributed to local communities' fear of repercussions for disobeying. This fear is not specifically directed towards rangers but mostly towards the legal actions that could result from breaking the law. Maintaining good relationships with the communities in which they operate is essential to enhance the success of their duties.

Rangers express that a major challenge to their job is that they must often be far from their family and are unable to contact them by lack of communication means (Belecky et al., 2019). With this occupational obstacle in mind (Anagnostou et al., 2022), we expected to see a relationship between community members having worked as rangers, or having friends or family employed as rangers in PAs and levels of respect. The analysis did not confirm that hypothesis for either scenario. For the former, the sample size was too small to show significant interaction (N=8). However, for the latter the sample size was larger but the analysis model found no association (N=57). Overall, the study indicates that the communities of MW and KL National Parks have a predominantly positive relationship with local PA authorities. Most importantly, the results are uniform throughout the 39 villages suggesting that the communities experience PA management uniformly.

Additionally, the absence of major poaching threats in the study area could play an important role in explaining the positive relationship between local communities and PA authorities. Poaching was not included in the present analysis due to the lack of occurrence reported by respondents. Although a correlation might be present between the two factors, we cannot draw a definite conclusion about the role poaching would play in shaping community-ranger relations in this landscape. However, in areas where local communities rely more heavily on the PAs resources but where no traditional livelihood accommodations are in place, more individuals may be driven to break park laws and face penalties imposed by PA authorities.

## 5 Limitations

Opinion surveys using ordinal ranking systems such as the Likert scale are widely used in the social sciences to statistically analyze otherwise abstract concepts (Likert, 1932; Jamieson, 2004; Parker et al., 2022a; Parker et al., 2022b). Yet, using a rank-based questionnaire subjects the data to three forms of bias: (1) the central tendency bias, in which respondents avoid extremes; (2) the acquiescence bias, where respondents will avoid disagreeing with the statement; and (3) the social desirability bias, where they will respond to portray themselves or the institution, they represent in the best way possible (Westland, 2022).

The long ordinal questionnaire format also poses its own set of limitations. In an attempt to include as many of the topics relevant to the study, the survey becomes long. A longer survey exposes respondents to survey fatigue, causing the study population to rush the survey to end it faster, compromising the honesty of responses, or to make mistakes as they tire (Jeong et al., 2022). The qualitative nature of data in an ordinal questionnaire also comes with its own set of limitations (Anderson, 2010). A lot of information about the dynamics between PA authorities and local communities cannot be adequately depicted through questionnaires and is subject to individual interpretation. In the case of our study, another layer for this limit is that meaning for concepts or questions can get lost in translation.

Upon considering the multiple factors that directly and indirectly influence community-ranger relations, we realize that the data gap present in this landscape. There is a need for more in depth studies to be carried out in specific villages to further understand the resource usage among the villages, ethnicities or other demographic groups not included in this study. Such research would inform us of population-groups' specific practices with regard to resource and land usage in PAs buffer areas and lead to more inclusive PA management practices.

## 6 Conclusion and recommendations

As demonstrated by the successful example of MW and KL National Parks, building capacity for PA authorities is required to foster healthy relationships with IPLCs. Specifically, training should emphasize on social skills needed to interact with local communities. Stress and trauma may accumulate during patrols, where PA authorities paradoxically feel "cut off from the outside world" (Belecky et al., 2019; Duffy et al., 2019). This lack of human proximity can subsequently impact the quality of their interactions and harm relations with local communities (Guthrie-Gower and Wilson-Menzfeld, 2022). Wilson et al. (2018) explored this phenomenon with veterans. Their systematic literature review found that multiple factors are associated with experiences of loneliness and social isolation of military veterans such as struggling to relate to civilians, and physical or mental health issues. In the case of this study, these factors may be responsible for the 27% of respondents reporting that park management frequently exhibits rude or discourteous behavior.

Results from the survey and subsequent analyses suggest that local management context and PA authority behavior will affect community-ranger relationships most, regardless of population demographics. While communication strategies, and community involvement and benefit programs lead to PA management effectiveness and positive outcomes, in many places these factors are generally inadequate (Leverington et al., 2010). Hence, improving the involvement of local communities in PA activities and maintaining frequent communication with them on topics related to PA conservation is essential to create and maintain good relations between the local communities and PA authorities. An area where such communication could be beneficial is related to NTFPs which respondents suggested be discussed during meetings with PA authorities. NTFPs such as bamboo shoots, sweet vegetables and mushrooms are generally collected once a year and are used by villagers as a substitute income source and can play an important role for their culture and livelihood. It is therefore

essential for policies to reflect communities' needs and include the beneficiaries from healthy forests in the management of PA (Ormbsby et al., 2021).

Many communities adjacent to PAs in Thailand lack knowledge about the local wildlife (Jenks et al., 2013). Therefore, increasing the opportunity rangers have to interact with local populations through educational activities could lead to an increase in residents' awareness about the importance of biodiversity and take action to protect it. Initiatives like the Big Cat Band and The Tiger Learning Centre (Stolton et al., 2022) are vectors for residents to become familiar with local PA authorities and gain environmental awareness. The Big Cat Band is a music group composed of ten MW and KL rangers, and was formed with the support of WWF Thailand. Together with the Tiger Learning Centre, "Sor Seua Witthaya" (meaning "tiger knowledge"), opened in 2020, they seek to engage people through musical performances, exhibits and conservation-based curricula, emphasizing the importance of conservation and encouraging children to develop a sense of empathy and compassion toward wildlife. These initiatives have led local communities to develop friendships with the rangers demonstrating that capacity-building must go hand in hand with community awareness programs to be the most effective. Empowering the local communities with knowledge about nature could accommodate the personnel shortfall while improving the relationship between rangers and local communities.

In light of the post-2020 GBF, states will be working towards the ambitious target of 30x30 by increasing Protected and Conserved Areas (PCAs) coverage (CBD, 2022). The recommendations mentioned in this paper aim to ensure that IPLCs feel a sense of ownership of the parks and highlight the necessity of increasing local communities' participation in PA management, both of which are key factors for achieving respect in PA authorities and improving attitudes towards conservation and PA policies as highlighted from the present study and similar research (Jenks et al., 2013). IPLCs can not only be part of the local ranger workforce, but also take decisions that would be beneficial for the enhancement of ranger-community relations and enhance conservation results (Agarwal et al., 2022; Appleton et al., 2022). The example of Kuiburi National park in Thailand demonstrates the benefits of their collaboration. The involvement of rangers and local communities in drafting park management plans has had positive impacts on trust between local communities and park officials, decreasing conflict, rise in corruption reporting and better awareness of human-wildlife conflict in the park's vicinity (Parr et al., 2008). Maintaining high levels of trust can empower local communities to take responsibility for crime control and act for the common good (Anagnostou et al., 2020). Therefore, creating the conditions necessary for IPLCs to participate in PA management is critical for protecting and conserving natural resources, forests, and wildlife. Simultaneously, it is essential to ensure that PA authorities frequently and uniformly have access to capacity building training, especially with regard to communication and public interaction.

Supporting the existing literature, this exploratory study shows that communities value regular communication with PA authorities. Community composition does not significantly affect the perception communities have of PA authorities. However, the interaction they have with PA authorities and the conditions in which these interactions happen will affect the level of trust and respect the most. Conservation is an important issue to them as they are keenly aware of the benefits provided by PAs. Hence, their inclusion in conservation decision-making is essential for them to respect PA authorities. This may be training residents for patrolling and management duties, educating the youth about their surrounding environment to empower them to care for local species, and hosting more frequent meetings between PA authorities and residents. By increasing the opportunity for communities to bring up concerns and address issues, PA authorities would improve their service, reduce conflict, and encourage trust and collaboration between local communities and rangers to benefit nature and people. Additionally, training rangers to have better communication and interactions with the local communities will enhance their relationship. The results are visibly homogeneous across the 39 villages surveyed. However, the results are unique to MWKL National Parks and cannot be generalized to Thailand's entire PA network. While we acknowledge that PAs globally experience site-specific challenges and receive different management styles, the results can help us make universal recommendations as community-ranger relations have historically followed the same top-down management style.

## Data availability statement

The datasets presented in this article are not readily available because requests must be processed through national authorities. Requests to access the datasets should be directed to cpierrefeu@wwf.sg.

## Ethics statement

The studies involving humans were approved by University of Central Florida Ethical Board. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

## Author contributions

RP: Conceptualization, Data curation, Funding acquisition, Investigation, Writing – review & editing. SS: Conceptualization, Data curation, Funding acquisition, Investigation, Writing – review & editing. WP: Conceptualization, Data curation, Funding acquisition, Investigation, Writing – review & editing. CP: Formal Analysis, Investigation, Methodology, Visualization, Writing – original draft, Writing – review & editing. RS: Conceptualization, Funding acquisition, Investigation, Supervision, Writing – review & editing. EO: Writing – review & editing.

## Funding

The author(s) declare financial support was received for the research, authorship, and/or publication of this article. Funding for this study was provided through the WWF network.

## Acknowledgments

We thank all the community members who participated in the survey, the research team, including Sanikan Raksasittichai and Rattapeet Chupaew for helping with data collection, everyone involved in the development of the survey instruments and protocols, and the reviewers for improving this research paper. In particular, we are grateful to WWF Germany, WWF Singapore, WWF Sweden, and WWF Thailand for the financial support for this work.

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

## Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fcosc.2023.1298768/full#supplementary-material

## References

Abukari, H., and Mwalyosi, R. B. (2020). Local communities' perceptions about the impact of protected areas on livelihoods and community development. *Global Ecol. Conserv.* 22, e00909. doi: 10.1016/j.gecco.2020.e00909

Agarwal, S., Sairorkham, B., Sakitram, P., and Lambin, E. F. (2022). Effectiveness of community forests for forest conservation in Nan province, Thailand. *J. Land. Use Sci.* 17 (1), 307–323. doi: 10.1080/1747423X.2022.2078438

Agresti, A. (2002). *Categorical Data. 2nd Edn* (New York: John Wiley & Sons). 320–332.

R. E. A. Almond, M. Grooten, D. Juffe Bignoli and T. Petersen (Eds.) (2022). *Living Planet Report 2022 – Building a nature-positive society* (Gland, Switzerland: WWF).

Anagnostou, M., Gunn, V., Nibbs, O., Muntaner, C., and Doberstein, B. (2022). An international scoping review of rangers' precarious employment conditions. *Environ. Syst. Decisions.* 42 (4), 479–503. doi: 10.1007/s10669-022-09845-3

Anagnostou, M., Mwedde, G., Roe, D., Smith, R. J., Travers, H., and Baker, J. (2020). Ranger perceptions of the role of local communities in providing actionable information on wildlife crime. *Conserv. Sci. Pract.* 2 (6), e202. doi: 10.1111/csp2.202

Anderson, C. (2010). Presenting and evaluating qualitative research. *Am. J. Pharm. Educ.* 74 (8), 141. doi: 10.5688/aj7408141

Appleton, M. R., Courtiol, A., Emerton, L., Slade, J. L., Tilker, A., Warr, L. C., et al. (2022). Protected area personnel and ranger numbers are insufficient to deliver global expectations. *Nat. Sustainabil.* 5 (12), 1100–1110. doi: 10.1038/s41893-022-00970-0

Baccini, A., Walker, W., Carvalho, L., Farina, M., Sulla-Menashe, D., and Houghton, R. A. (2017). Tropical forests are a net carbon source based on aboveground measurements of gain and loss. *Science* 358 (6360), 230–234. doi: 10.1126/science.aam5962

Belecky, M., Parry Jones, R., and Singh, R. (2021). Employment conditions of public sector rangers: A major under addressed problem. *Parks. Stewardship. Forum* 37 (1), 185–195. doi: 10.5070/p537151749

Belecky, M., Singh, R., and Moreto, W. (2019) *Life on the Frontline 2019: A Global Survey of the Working Conditions of Rangers*. Available at: https://files.worldwildlife.org/wwfcmsprod/files/Publication/file/k36blpy2c_wwf_rangers_survey_report_2019.pdf.

Bragagnolo, C., Malhado, A. C. M., Jepson, P., and Ladle, R. J. (2016). Modelling Local attitudes to protected areas in developing countries. *Conserv. Soc.* 14 (3), 163–182. doi: 10.4103/0972-4923.191161

Bryer, J., and Speerschneider, K. (2016). "Likert: Analysis and Visualization Likert Items," in *R package version 1.3.5*. Available at: https://CRAN.R-project.org/package=likert.

CBD (2022) *'Post-2020 Global Biodiversity Framework: Recommendation WG2020-5/2', UN Biodiversity Conference (COP15). Montreal, 3-5 December* (CBD). Available at: https://www.cbd.int/doc/c/409e/19ae/369752b245f05e88f760aeb3/wg2020-05-l-02-en.pdf (Accessed 28 Feb 2023).

Cronin, D. T., Benbow, S., Bergl, R. A., Bourgault, L., Caro, L., Dancer, A., et al. (2021). "Empowering rangers through technology and innovation," in *Parks Stewardship Forum*, (University of California) vol. 37. . doi: 10.5070/p537151750

Dalton, R. J., and Ong, N.-N. T. (2005). Authority orientations and Democratic attitudes: A test of the "Asian Values" hypothesis. *Japanese. J. Political. Sci.* 6 (2), 211–231. doi: 10.1017/S1468109905001842

Davies, K. (2011). Knocking on doors: Recruitment and enrichment in a qualitative interview-based study. *Int. J. Soc. Res. Method.* 14 (4), 289–300. doi: 10.1080/13645579.2010.516645

Department of Health (2022b) *HHDC Dashboard, Ethnic population data in 20 provinces*. Available at: https://hhdclampang.anamai.moph.go.th:8080/hhdcdashboard/frontend/web/ethnics/default/index (Accessed 20 June 2022).

Department of Health Service Support (2022a) *Population Data Report of Kamphaeng Phet and Nakhonsawan Provinces*. Available at: https://3doctor.hss.moph.go.th/main/ (Accessed 20 June 2022).

Duangchantrasiri, S., Umponjan, M., Simcharoen, S., and Pattanavibool, A. (2015). Dynamic of a low-density tiger population in southeast Asia in the context of improved law enforcement. *Conserv. Biol.* 30 (3), 639–648. doi: 10.1111/cobi.12655

Duffy, R., Massé, F., Smidt, E., Marijnen, E., Büscher, B., Verweijen, J., et al. (2019). Why we must question the militarisation of conservation. *Biol. Conserv.* 232, 66–73. doi: 10.1016/j.biocon.2019.01.013

Fox, J., and Weisberg, S. (2019). *An {R} Companion to Applied Regression. 3rd Edn* (Thousand Oaks, California: Sage). Available at: https://socialsciences.mcmaster.ca/jfox/Books/Companion/.

G. W. Fry (Ed.) (2018). *Education in Thailand: An Old Elephant in Search of a New Mahout* Vol. 42 (Singapore: Springer). doi: 10.1007/978-981-10-7857-6

Graham, V., Geldmann, J., Adams, V. M., Negret, P. J., Sinovas, P., and Chang, H. C. (2021). Southeast Asian protected areas are effective in conserving forest cover and forest carbon stocks compared to unprotected areas. *Sci. Rep.* 11 (1). doi: 10.1038/s41598-021-03188-w

Guthrie-Gower, S., and Wilson-Menzfeld, G. (2022). Ex-military personnel's experiences of loneliness and social isolation from discharge, through transition, to the present day. *PloS One* 17 (6), e0269678. doi: 10.1371/journal.pone.0269678

Harris, N. L., Gibbs, D. A., Baccini, A., Birdsey, R. A., de Bruin, S., Farina, M., et al. (2021). Global maps of twenty-first century forest carbon fluxes. *Nat. Climate Change* 11 (3), 234–240. doi: 10.1038/s41558-020-00976-6

IRF (2019)Chitwan declaration (IRF). Available at: https://www.internationalrangers.org/wp-content/uploads/Chitwan-Declaration_2019_EN.pdf (Accessed 06 Mar 2023).

IUCN (2016)Establishment, recognition and regulation of the career of park ranger (IUCN). Available at: https://portals.iucn.org/library/node/46520 (Accessed 28 Feb 2023).

James, G., Witten, D., Hastie, T., and Tibshirani, R. (2013). *An Introduction to Statistical Learning: With Applications in R*, (New York: Springer Science & Business Media) Vol. Vol. 103.

Jamieson, S. (2004). Likert scales: How to (ab)use them. *Med. Educ.* 38 (12), 1217–1218. doi: 10.1111/j.1365-2929.2004.02012.x

Jenks, K. E., Nucharin Songsasen, N., Kanchanasaka, B., Bhumpakphan, N., Wanghongsa, S., and Leimgruber, P. (2013). Community attitudes toward protected areas in Thailand. *Natural History. Bull. Siam. Soc.* 59 (2), 65–76.

Jeong, D., Aggarwal, S., Robinson, J., Kumar, N., Spearot, A., and Park, D. (2022). Exhaustive or exhausting? evidence on respondent fatigue in long surveys. *J. Dev. Economics*. 161. doi: 10.3386/w30439

Lee, T. M., Sodhi, N. S., and Prawiradilaga, D. M. (2009). Determinants of local people's attitude toward conservation and the consequential effects on illegal resource harvesting in the protected areas of Sulawesi (Indonesia). *Environ. Conserv.* 36 (2), 157–170. doi: 10.1017/s0376892909990178

Leverington, F., Costa, K. L., Pavese, H., Lisle, A., and Hockings, M. (2010). A global analysis of protected area management effectiveness. *Environ. Manage.* 46 (5), 685–698. doi: 10.1007/s00267-010-9564-5

Likert, R. (1932). A technique for the measurement of attitudes. *Arch. Psychol.* 22 (140), 55.

Mehta, J. N., and Heinen, J. T. (2001). Does community-based conservation shape favorable attitudes among locals? An empirical study from Nepal. *Environ. Manage.* 28 (2), 165–177. doi: 10.1007/s002670010215

Ormbsby, A. A., Felardo, J., and Musci, R. (2021). Multiple values from the forest: contribution of non-timber forest products to livelihoods of local communities in Northeastern Thailand. *Environment. Dev. Sustainabil.* 23 (8), 11636–11645. doi: 10.1007/s10668-020-01131-z

Parker, B., Singh, R., Hoffmann, M., Avino, F. S., Gajardo, O. B., Moreto, W., et al. (2022b). Exploring the perceptions and experiences of local versus non-local rangers: insights from across 11 countries. *Front. Conserv. Sci.* 3. doi: 10.3389/fcosc.2022.851704

Parker, B., Soe, P., Myint, M. N. N., Shwe, N. M., Singh, R., Wyatt, A., et al. (2022a). Exploring community satisfaction in park management: Insights from protected areas in Myanmar. *PARKS* 28 (2), 55–64. doi: 10.2305/iucn.ch.2022.parks-28-2bp.en

Parr, J. W., Jitvijak, S., Saranet, S., and Buathong, S. (2008). Exploratory co-management interventions in Kuiburi National Park, Central Thailand, including human-elephant conflict mitigation. *Int. J. Environ. Sustain. Dev.* 7 (3), 293. doi: 10.1504/ijesd.2008.021901

Phumanee, W., Steinmetz, R., Phoonjampa, R., Bejraburnin, T., Grainger, M., and Savini, T. (2020). Occupancy-based monitoring of ungulate prey species in Thailand indicates population stability, but limited recovery. *Ecosphere* 11 (9), 1–16. doi: 10.1002/ecs2.3208

Phumanee, W., Steinmetz, R., Phoonjampa, R., Weingdow, S., Phokamanee, S., Bhumpakphan, N., et al. (2021). Tiger density, movements, and immigration outside of a tiger source site in Thailand. *Conserv. Sci. Pract.* 3 (12), e560. doi: 10.1111/csp2.560

Pillay, N., Knox, J., and MacKinnon, K. (2020) *Embedding human rights in nature conservation: from intent to action*. Available at: https://wwfint.awsassets.panda.org/downloads/independent_review:_independent_panel_of_experts:final_report_24_nov_2020.pdf.

Sahapattana, P., and Cobkit, S. (2016). The relationships between police performance and public confidence: a case study of Thailand. *Police. Pract. Res.* 17 (2), 171–182. doi: 10.1080/15614263.2015.1124766

Singh, R., Galliers, C., Appleton, M., Hoffmann, M., Long, B., Cary-Elwes, J., et al. (2021). The vital role of rangers in conservation. *Parks. Stewardship. Forum* 37 (1), 128–136. doi: 10.5070/p537151745

Steinmetz, R., Chutipong, W., and Seuaturien, N. (2006). Collaborating to conserve large mammals in southeast asia. *Conserv. Biol.* 20 (5), 1391–1401. doi: 10.1111/j.1523-1739.2006.00505.x

Stolton, S., Timmins, H. L., and Dudley, N. (2022) *Building Trust with Rangers and Communities: A scoping report for URSA, Volume 2: Case Studies*. Available at: https://www.ursa4rangers.org/wp-content/uploads/2022/06/BUILDING-TRUST-VOL2-case-studies-final.pdf.

Stolton, S., Timmins, H. L., Dudley, N., Biegus, O., Galliers, C., Jackson, W., et al. (2023). Essential planetary health workers: Positioning rangers within global policy. *Conserv. Lett.* 00, e12955. doi: 10.1111/conl.12955

Ugur-Cinar, M., Cinar, K., and Kose, T. (2020). How does education affect political trust?: an analysis of moderating factors. *Soc. Indic. Res.* 152 (2), 779–808. doi: 10.1007/s11205-020-02463-z

UNEP-WCMC (2016). *The State of Biodiversity in Asia and the Pacific: A mid-term review of progress towards the Aichi Biodiversity Targets* (Cambridge, UK: UNEP-WCMC). Available at: https://www.cbd.int/gbo/gbo4/outlook-asiapacific-en.pdf.

UNFF (2021) *The Global Forest Goals Report 2021* (New York, USA: United Nations Department of Economic and Social Affairs). Available at: https://www.un.org/esa/forests/wp-content/uploads/2021/08/Global-Forest-Goals-Report-2021.pdf (Accessed 30 August 2023).

Venables, W. N., and Ripley, B. D. (2002). *Modern Applied Statistics with S. 4th edn* (New York, New York: Springer). doi: 10.1007/978-0-387-21706-2

Wang, Q., and Yamamoto, H. (2009). Local Residents' Perception, attitude and participation regarding nature reserves of China: case study of beijing area. *J. For. Plann.* 14 (2), 67–77. doi: 10.20659/jfp.14.2_67

Westland, J. C. (2022). 'Information loss and bias in likert survey responses'. *PloS One* 17 (7), e0271949. doi: 10.1371/journal.pone.0271949

Wilkins, C. H. (2018). 'Effective engagement requires trust and being trustworthy'. *Med. Care* 56 (10), S6–S8. doi: 10.1097/MLR.0000000000000953

Wilson, G., Hill, M., and Kiernan, M. D. (2018). Loneliness and social isolation of military veterans: systematic narrative review. *Occup. Med.* 68 (9), 600–609. doi: 10.1093/occmed/kqy160

Woodside, D. P., and Vasseleu, J. (2021). Shaping a global strategy for building capacity and performance of rangers in and around protected areas. *Parks. Stewardship. Forum* 37 (1), 137–152. doi: 10.5070/p537151746

WWF (2014) *Dawna Tenasserim Landscape project leaflet*. Available at: https://wwf.panda.org/wwf_news/?216318/Dawna-Tenasserim-Landscape-project-leaflet.

Zube, E. H., and Busch, M. L. (1990). Park-people relationships: an international review. *Landscape Urban. Plann.* 19 (2), 117–131. doi: 10.1016/0169-2046(90)90030-6