



# Exploring the Perceptions and Experiences of Local Versus Non-Local Rangers: Insights From Across 11 Countries

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Multiple demographic factors can affect ranger experiences and perceptions of their work, including factors like gender, age, and income. Similarly, whether a ranger is local to their conservation area might influence their experiences and perceptions of the work. This premise, however, has received limited attention. In this study we use survey data from across 11 countries to explore how being local to a conservation area might affect ranger experiences and perceptions. We define local rangers as originally being from within 20km of their conservation area. Our findings suggest that being local corresponds to more positive relations with local communities. Our results also imply that whilst being a local ranger might not directly affect job satisfaction, local rangers may well enjoy higher job satisfaction because of how they tend to differ from non-local rangers in other characteristics (e.g., lower formal education; greater access to familial support; more amicable community relations). Moreover, our findings indicate that non-local rangers tend to experience certain symptoms associated with a challenging job (e.g., feeling worn out and emotionally exhausted) more regularly than local rangers, which might correspond to lower welfare. In all, our findings indicate that further, more in-depth research into how the perceptions and experiences of local versus non-local rangers might differ could be useful. Examining the links between being a local ranger and community relations might be especially valuable.

**Keywords:** ranger, protected area, wildlife crime, community, ranger perceptions

## INTRODUCTION

Rangers are defined as individuals who play a critical role in conservation; they are responsible for safeguarding nature, and cultural and historical heritage, and protecting the rights and well-being of present and future generations (IRF, 2021). There are wide range of titles used for rangers across the globe such as wildlife officers, forest guards, watcher, warden etc. For this research, the term ranger is used for the conservation frontline workers in the survey countries. Rangers have multifaceted

roles that centre around protecting biodiversity, and can therefore span law enforcement, research and monitoring, habitat management, environmental risk mitigation (e.g., fire prevention, human-wildlife conflict alleviation and response), awareness and education, and community and visitor engagement (Moreto and Matusiak, 2017; IRF, 2021; Singh et al., 2021).

Ranger work is typically challenging due to various occupational factors (Oliver and Meier, 2006; Moreto, 2015; Moreto et al., 2016; Spira et al., 2019). For instance, rangers are often expected to operate over large areas for long periods of time and endure uncertainty and danger (Eliason, 2006a; Moreto, 2015; Belecky et al., 2021). Training and resource provision to rangers is also often inadequate (Meduna et al., 2009; Eliason, 2011; Etemesi et al., 2018; Gao and Li, 2021) and relations between park authorities (incl., rangers) and communities can be strained (Allendorf et al., 2007; Anthony, 2007; Karanth and Nepal, 2012; Moreto, 2015; Moreto et al., 2017b). Moreover, individual characteristics of rangers (e.g., demographic traits) can affect ranger experiences and perceptions of the work. For instance, female rangers are disproportionately impacted by women-specific barriers (e.g., gender norms of appropriate behaviour for women that deter them from taking jobs seen as physically demanding; pervasive and extraordinarily high levels of violence and harassment) and generalised obstacles like low pay and poor equipment that have gender-differentiated effects (e.g., female rangers are less likely to be on permanent contracts, and purchase more of their equipment at personal expense) (Seager, 2021). Other demographic factors like age and income level can also affect ranger job satisfaction (Ogunjinmi et al., 2008; Spira et al., 2019).

Conceivably, ranger experiences and perceptions may also be affected by whether rangers are local to their conservation area. For instance, local rangers may be able to spend more time with their families, which could contribute towards mediating the stresses from ranger work and promote job satisfaction (Gao and Li, 2021). Being local might also affect ranger relations with local community members, with the familiarity of local rangers perhaps leading to more amicable relations or, if local rangers are perceived as enforcing rules that conflict with local community values, increased hostile relations. Given the importance of community engagement in ranger work (Moreto and Matusiak, 2017; IRF, 2021; Singh et al., 2021), any impacts of being a local ranger on ranger-community relations might subsequently affect job performance. Such effects of being a local ranger have similarities to the notion that, in a broad sense, women can bring valuable skills and interests to ranger work that lend themselves towards community engagement like de-escalation and negotiation skills and the ability to access different groups of people (e.g., other women). On a related but subtly different note, local and non-local rangers might differ in their experiences and perceptions for reasons beyond whether they are local. To clarify, local and non-local rangers might tend to differ in terms of certain characteristics (e.g., age, education, length of time working in a conservation area) that, in turn, affect factors like job satisfaction and community relations. However,

the various hypothetical impacts of being a local ranger have received relatively little attention.

In this paper we use data from across 11 countries to explore how being a local ranger might affect ranger perceptions and experiences. Our analysis comprises multiple stages and involves consideration of various aspects of ranger work, perceived necessity and effectiveness of the work, job satisfaction, relations with supervisors and local communities, and experiences of physical and emotional symptoms associated with the profession. First, we explore how local and non-local rangers differ in terms of various demographic and occupational factors. We then explore how an array of factors, including whether rangers are local to their conservation area, shape ranger relations with local community members and job satisfaction. We acknowledge that the broad scale of this research means that we do not comprehensively consider the context-specific nuances of constituent conservation areas, and that our analyses may have not included some important factors. Nevertheless, this paper does provide novel insights into the potential impacts of rangers being local to their conservation area – insights that could incentivise and inform future research on ranger perceptions and experiences.

## METHODS

### Data Collection

This study used data from a ranger perception survey (RPS) carried out from 2016–19 across 25 countries (Belecky et al., 2019). In the present study, all rangers in the survey were employed in the public sector, meaning that their positions were characterised by accountability and duties to a government authority. To develop the overall RPS, the research team met with subject matter experts, in-country WWF representatives, and rangers in Cambodia in 2015 for a project workshop. During the workshop, the survey was reviewed, contextualised to ranger work (e.g. defining community, basic equipment to ranger context) piloted, and finalized. The final version contained questions about numerous aspects of ranger work. The workshop also provided the research team with an opportunity to review study protocols, including informed consent procedures and proper data collection, storage and entry, which helped ensure high standards and consistency across study sites.

Prior to data collection, participant rangers were informed that their involvement was voluntary, their responses would remain anonymous, and of their right to remove themselves at any point. Given the nature of the study and potential concerns over how responses may impact their jobs, participants were told that individual responses would not be directly provided to the organisation that they worked for nor to government officials. A written informed consent document in the local language was shown to each participant, and each participant provided verbal consent to participate in the study. The overall RPS was approved by the University of Central Florida Institutional Review Board (SBE-16-12184).

Responses were gathered in the following ways: 1) Completed by ranger on paper; 2) Completed by ranger individually but in a group setting with other participants sitting far away to avoid any group biases; and 3) For illiterate rangers, a member of the survey team read the questions and documented the respondent's answers. Unless otherwise stated, responses analysed were recorded as a four-point Likert-type items from 1 to 4, denoting either 'Disagree A Lot' to 'Agree A Lot', 'Strongly Disagree' to 'Strongly Agree', or 'Very Unlikely' to 'Very Likely'. Exceptions include the responses recorded as numeric variables; as binary variables (e.g., 'Yes', 'No'); on three-point scales of 'Yes', 'No', and 'Unsure'; and on five-point scales of 'Never', 'Rarely', 'Sometimes', 'Often', and 'Always' for experiences of physical and emotional symptoms associated with a challenging occupation.

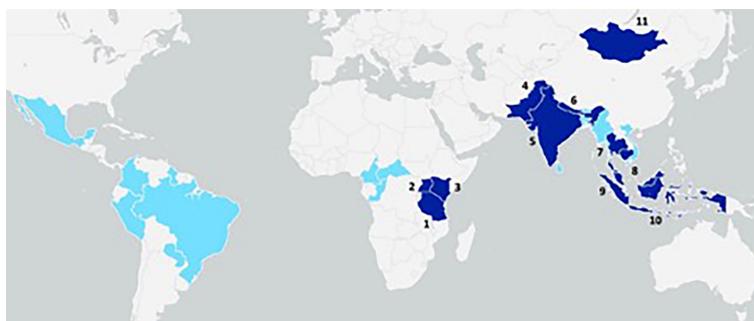
## Data Analysis

Our analysis of how being local might affect ranger perceptions and experiences used data from the 11 countries that satisfied the criterion of having at least 50 responses from local rangers and 50 from non-local rangers (**Figure 1**). Unfortunately, this resulted in the exclusion of data from all Latin American countries where responses received during the RPS were consistently low (see **Table 1**). For the purposes of this study, rangers were defined as local if they responded, 'Yes' to the question, 'Were you originally from a neighbouring community (e.g., within 20kms) near the park?'. We acknowledge that this definition comes with uncertainty. For instance, some respondents might have interpreted 'originally from a neighbouring community' to mean born and raised in a nearby community, whereas others could have interpreted the phrasing to mean simply having lived in a nearby community before working in the park. Respondents may also have differed in their threshold for amount of time spent living locally to then consider themselves as originally from a nearby community. Subtle variations between translations could also have impacted how respondents interpreted and responded to this question. The 20km threshold was selected as this distance was assumed to be a somewhat appropriate general threshold for distinguishing between communities that may well be more affected by and involved in the park.

Nevertheless, we acknowledge that the appropriateness of this threshold will vary for different contexts.

Our exploration into the perceptions and experiences of local versus non-local rangers comprised multiple stages. First, we examined how local rangers tend to differ from non-local rangers through the construction of a series of mixed effects logistic regression models, each with the dependent variable of whether a ranger was local. Each model had a single demographic or occupational factor as an independent variable that we hypothesised might relate differently to local versus non-local rangers. Country was included as a random variable in each model to control, to an extent, for inter-country variation in ranger perceptions and experiences. Further details on the variables in this series of models, and on all of the variables in the subsequent models of this study, can be found in **Table S1** (Supplementary materials). Each model was examined for linearity and collinearity between independent variables and no problematic breaches were found. The glmer function of R package "lme4" (Bates et al., 2015) was used to construct the models in R version 4.0.0 (R Core Team, 2020).

We then built two ordinal logistic regression mixed models to explore how various demographic and occupational factors, including whether a ranger is local, affect relationships with local communities. The respective dependent variables of these models were perceived respect from communities and perceived trust from communities. Each model initially had the independent variables of age, education, gender, time worked in the conservation area, perceived adequacy of training provision, and perceived adequacy of resource provision; all of which we hypothesised might relate strongly to the quality of ranger-community relations. Each of these ordinal logistic regression mixed models had country as a random variable. A stepwise backwards selection process was then used to select the minimal adequate model for respect from local communities and for trust from local communities. Likelihood ratio tests (analyses of variance) were performed at each variable removal step to ensure the simpler model did not lead to a statistically significant loss of fit. The clmm function in the R package "ordinal" (Christensen, 2019) in R version 4.0.0 (R Core Team, 2020) was used to fit the ordinal logistic regression mixed models. All



**FIGURE 1** | Countries in the overall ranger perception survey (light blue) and countries that were included in this study as they relate to responses from at least 50 local and 50 non-local rangers (dark blue). (1) Tanzania, (2) Uganda, (3) Kenya, (4) Pakistan, (5) India, (6) Nepal, (7) Thailand, (8) Cambodia, (9) Malaysia, (10) Indonesia, (11) Mongolia.

**TABLE 1** | Breakdown of local and non-local responses by country.

Country	Continent	Local	Non-Local	Percentage Local for Country	Included in Analysis
Pakistan	Asia	362	112	76.4	Yes
Mongolia	Asia	194	68	74	Yes
Thailand	Asia	225	184	55	Yes
Cambodia	Asia	109	91	54.5	Yes
Mexico	Africa	35	35	50	No
Republic of Congo	N. America	44	44	50	No
Nepal	Asia	96	104	48	Yes
Guyana	S. America	9	11	45	No
Colombia	S. America	38	56	40.4	No
Peru	S. America	14	22	38.9	No
Uganda	Africa	227	371	38	Yes
India	Asia	260	477	35.3	Yes
Central African Republic	Africa	13	24	35.1	No
Paraguay	S. America	11	23	32.4	No
Kenya	Africa	161	353	31.3	Yes
Malaysia	Asia	63	160	28.3	Yes
Myanmar	Asia	27	69	28.1	No
Bhutan	Asia	12	42	22.2	No
Viet Nam	Asia	31	109	22.1	No
Indonesia	Asia	136	605	18.4	Yes
Bangladesh	Asia	26	117	18.2	No
Sri Lanka	Asia	25	120	17.2	No
Brazil	S. America	5	31	13.9	No
Tanzania	Africa	81	605	11.8	Yes
Cameroon	Africa	6	103	5.5	No
		Total: 2210	Total: 3936	Mean: 35.6	Total: 11

independent variables in each of the models had acceptably low levels of heteroscedasticity and collinearity with other independent variables. We also tested the proportional odds assumption of the ordinal models graphically and statistically (Liu and Zhang, 2018) and found no problematic breaches. The appropriateness of the logit link function for each model was assessed by comparing QQ plots for models with different link function.

Finally, we examined how various factors, including whether a ranger is local, relate to ranger job satisfaction. This analysis involved building an ordinal logistic regression mixed model with the dependent variable of job satisfaction. Job satisfaction was measured as a four-point Likert-type item ranging from 'Disagree A Lot' to 'Agree A Lot' in response to the statement, 'I feel satisfied with my job'. We included various demographic and occupational factors were as independent variables, all of which we hypothesised would associate strongly with job satisfaction. Country was again included as a random variable. We also built a simpler ordinal logistic regression mixed model to specifically examine how the surveyed local and non-local rangers differ in job satisfaction. This model had job satisfaction as the dependent variable, whether a ranger was local as the independent variable, and country as the random variable. These models were duly tested, and no problematic breaches of assumptions were found.

## RESULTS

### Summary of Respondent Characteristics

The dataset for all of the 25 countries in the RPS contained responses from 6146 rangers working in or for 587 conservation

areas. The counts and proportions of local versus non-local ranger responses differed across these 25 countries, with proportions of responses from local rangers ranging from 6% in Cameroon to 76% in Pakistan (**Table 1**). Eleven countries satisfied the criterion for inclusion in our analysis of having at least 50 responses from local rangers and 50 responses from non-local rangers (**Table 1**).

The 5044 responses from the 11 countries included in the analysis of this study were dominated by male rangers (89%) in a gender balance that broadly echoes estimates for the global ranger workforce (Belecky et al., 2019; Seager, 2021). The mean age of respondents was 39 (SD: 11). The modal and median education level, on a scale of 1 (no formal education) to 11 (graduate degree), was 7 (24%). Eighty-three percent of respondents were married and 81% had children. Thirty-three percent of rangers lived with their spouse and 31% lived with their children. Mean number of hours worked per week was 69 (SD: 33) and at least 88% of respondents only worked as rangers and were not involved in any other occupation. Mean length of ranger career was 11 years (SD: 14) and 32% of respondents had roles that included supervising other employees. Thirty-eight percent (i.e., 1914) of respondents were originally from within 20km of the conservation area where they were working and thus, for the purposes of this study, were considered local.

The employment conditions of rangers, were recorded on four-point scales of either 'Disagree A Lot' to 'Agree A Lot', 'Strongly Disagree' to 'Strongly Agree', or 'Very Unlikely' to 'Very Likely'. **Table 2** elaborates some of the key employment conditions across 11 countries that reflects the challenges rangers face in delivering their duties. On the value of the role of rangers, majority of rangers considered rangers to be necessary for preventing crime (agreed: 53%; strongly agreed: 43%) as well

**TABLE 2** | Perception of Rangers regarding their employment conditions.

Country	Strongly Agreed or Agreed
Satisfied with their job	53%
Being Ranger is a dangerous Job	83%
Rewarded satisfactorily for their work	63%
Initial training was adequate	69%
Provision to adequate number of uniforms and boots	53%
Provision to adequate basic equipment (e.g. GPS, binoculars etc)	59%
Access to clean drinking water and toilet facilities	53%
Provision to adequate shelter	47%
Subject to hostile behaviours by colleagues in the preceding 12 months	26%

as effective at preventing illegal activities in their conservation area (agreed: 52%; strongly agreed: 43%). Strengthening Ranger-community relations are key aspect of ranger work and the research looks into some of these aspects. The survey reveals that 67% agreed and 21% strongly agreed that local communities respected them, and 61% agreed and 20% strongly agreed that local communities trusted them; however, 41% had been subject to hostile behaviours by members of a local community in the preceding 12 months.

## How do Local Rangers Tend to Differ From Non-Local Rangers?

Local and non-local rangers tend to differ in several ways (Table 3). For instance, older rangers are more likely to be

local, rangers with higher levels of formal education are less likely to be local, and rangers that are male are more likely to be local. Local rangers are more likely to be married and live with their spouse, as well as more likely to have children and live with them. Notably, for the 11 countries considered, local rangers had higher average national percentages for being married (91% vs 84%), living with their spouse (45% vs 26%), having children (89% vs 80%), and living with their children (43% vs 24%). Focussing on job-related factors, rangers who have spent more time working in their respective conservation area are more likely to be local. In addition, one of the models suggests that rangers who are more satisfied in their work are more likely to be local, which aligns with the fact that the average national percentage of rangers that were very satisfied with their job was higher for local than non-local rangers (40% vs 33%). There is also some evidence that rangers who are more satisfied with the rewards that they receive for their work are more likely to be local. Further, rangers who perceive training provision and resource provision as being more adequate are more likely to be local. Rangers with better relations with local communities are also more likely to be local. Rangers who experience certain emotional and physical symptoms more often, namely symptoms usually associated with a demanding job, are less likely to be local.

## Community Relations, Job Satisfaction, and Being a Local Ranger

Several demographic and occupational factors appear to relate strongly to aspects of ranger-community relations (Table 4; Table 5). The trait of being a local ranger in and of itself might relate positively with relations with local communities

**TABLE 3** | Coefficients, standard errors (SE) and p-values for each model in our series of mixed effects logistic regression models.

Single Independent Variable	Coefficient	SE	P-Value	Significance Level
Age	0.03	0.00	0.00	***
Gender (Female, Baseline: Male)	-0.43	0.15	0.00	**
Education	-1.25	0.19	0.00	***
Marital Status (Married, Baseline: Unmarried)	0.89	0.14	0.00	***
Live with Spouse (Yes, Baseline: No)	0.96	0.09	0.00	***
Children (Yes, Baseline: No)	0.83	0.12	0.00	***
Live with Children (Yes, Baseline: No)	0.90	0.09	0.00	***
Necessity of Ranger Work	-0.08	0.15	0.57	
Effectiveness of Ranger Work	0.00	0.16	0.99	
Danger of Ranger Work	-0.04	0.06	0.46	
Time Worked in Conservation Area	0.03	0.00	0.00	***
Hours Worked per Week	0.00	0.00	0.11	
Job Satisfaction	0.49	0.13	0.00	***
Satisfaction in Rewards for Ranger Work	0.33	0.12	0.01	**
Training Provision	0.35	0.06	0.00	***
Resource Provision	0.31	0.06	0.00	***
Relations with Colleagues	0.14	0.16	0.38	
Experience of Hostility from Colleagues	-0.05	0.09	0.57	
Relations with Communities	0.40	0.11	0.00	***
Experience of Hostility from Community Members	-0.15	0.08	0.07	.
Experience of Emotional and Physical Symptoms	-0.16	0.06	0.00	**

Each model had whether a ranger was local to the conservation area as the dependent variable, a single demographic or occupational factor as the independent variable, and country as the random variable. Significance levels denoted by '.' for very low (0.1), '\*\*' for low level (0.05), '\*\*\*' for intermediate level (0.01), and '\*\*\*\*' for high level (0.001).

**TABLE 4** | Coefficients, standard errors (SE) and p-values for the final ordinal model with the dependent variable of perceived respect from local communities.

Variable	Coefficient	SE	P-Value	Significance Level
Local (Yes; Baseline: No)	0.15	0.08	0.07	.
Age	0.01	0	0.06	.
Education	0.63	0.18	0	***
Training Provision	0.7	0.06	0	***
Resource Provision	0.14	0.06	0.02	*

Significance levels denoted by '.' for very low (0.1), '\*' for low level (0.05), '\*\*' for intermediate level (0.01), and '\*\*\*' for high level (0.001).

due to better understanding of the cultural and historical context of the areas. The models also suggest that perceived adequacy of training and perceived adequacy of resource provision both have strong, positive relationships with perceived respect and trust from local communities, as does level of formal education.

We find evidence for suggested links between numerous demographic and occupational variables and ranger job satisfaction (**Table 6**). There appears to be a positive association between level of education and job satisfaction, while married rangers tend to have higher job satisfaction. Rangers who see greater need in ranger work (and that consider ranger work to be more effective in their conservation area) enjoy higher job satisfaction. Working more hours per week corresponds to lower job satisfaction, whereas greater satisfaction in rewards received for work relates strongly and positively to job satisfaction. Greater perceived adequacy of training also appears to relate to higher job satisfaction. Relationships appear to be important, as evidenced by positive relationships between rangers who like their colleagues more and job satisfaction, and between rangers who perceive themselves to have more positive relations with local communities and job satisfaction. Somewhat counterintuitively, the model suggests a positive relationship between having experience of hostility from community members in the preceding 12 months and job satisfaction. The subject needs further in-depth research to understand the nuances of the complex relationship which will vary from site to site. In addition, experiencing certain physical and emotional symptoms that are usually associated with a demanding job more frequently has a strong and negative relationship with job satisfaction.

## DISCUSSION

By exploring ranger perspectives and experiences from the angle of local versus non-local rangers, this study has yielded

various novel insights that contribute towards a more detailed understanding of the lived experiences of the people working on the frontlines of conservation. First, our study highlights that local and non-local rangers may tend to differ with regards to an array of demographic and occupational factors (**Table 3**). Most notably, our findings indicate that local rangers tend to have more amicable relationships with local communities and enjoy higher job satisfaction. Yet, closer examination of the factors that relate strongly to metrics of ranger-community relations (**Table 4**; **Table 5**) and job satisfaction (**Table 6**) suggests a more complex picture. As discussed in more detail in the following paragraphs, our findings indicate that being local might, in and of itself, affect ranger-community relations, but not job satisfaction. Instead, the greater job satisfaction of local rangers may well be down to how local and non-local rangers tend to differ with regards to particular demographic and occupational factors. However, these results are solely based on the perceptions of rangers. Future research should also look into community perceptions as well to understand their perspective.

Regarding ranger-community relations, our findings indicate that being local might, in and of itself, contribute towards better relations with local communities, specifically with regards to perceived trust from local community members (**Table 5**). However, this needs further research as being local may also mean social pressure, selective enforcement etc. Our findings also provide strong evidence that perceived adequacy of training and resource provision relate strongly (and positively) to the quality of ranger-community relations, perhaps because having more adequate training and resources enables rangers to be more able to cultivate positive relationships with local communities (**Tables 4, 5**). Community engagement is a core aspect of ranger work (Moreto et al., 2017a; Woodside et al., 2021) and amicable ranger-community relations can be associated with various benefits, like greater inclination amongst community members to adhere to conservation area rules and regulations and to report offenders, as well as improved ranger and community member

**TABLE 5** | Coefficients, standard errors (SE) and p-values for the final ordinal model with the dependent variable of perceived trust from local communities.

Variable	Coefficient	SE	P-Value	Significance Level
Local (Yes; Baseline: No)	0.17	0.08	0.05	*
Education	0.55	0.17	0	**
Training Provision	0.71	0.06	0	***
Resource Provision	0.14	0.06	0.02	*
Resource Provision	0.14	0.06	0.02	*

Significance levels denoted by '.' for very low (0.1), '\*' for low level (0.05), '\*\*' for intermediate level (0.01), and '\*\*\*' for high level (0.001).

**TABLE 6 |** Coefficients, standard errors (SE) and p-values for the final ordinal model with job satisfaction as the dependent variable and various demographic and occupational factors as the independent variables.

Variable	Coefficient	SE	P-Value	Significance Level
Local (Yes; Baseline: No)	0.12	0.08	0.15	
Gender (Female; Baseline: Male)	0.22	0.14	0.1	
Education	-0.59	0.18	0	**
Marital Status (Married; Baseline: Unmarried)	0.28	0.13	0.02	*
Necessity of Ranger Work	1.18	0.15	0	***
Effectiveness of Ranger Work	0.7	0.17	0	***
Time Worked in Conservation Area	0	0	0.14	
Hours Worked per Week	0	0	0.01	*
Satisfaction in Rewards for Ranger Work	0.9	0.12	0	***
Training Provision	0.54	0.06	0	***
Relations with Colleagues	1.75	0.17	0	***
Relations with Communities	0.71	0.11	0	***
Experience of Hostility from Community Members	0.22	0.08	0	**
Experience of Emotional and Physical Symptoms	-0.28	0.05	0	***

Significance levels are denoted by '.' for very low (0.1), '\*' for low level (0.05), '\*\*' for intermediate level (0.01), and '\*\*\*' for high level (0.001).

well-being (Lee et al., 2009; Moreto et al., 2017a; WWF, 2019; Jacobsen, 2020; Zhang et al., 2020; Anagnostou et al., 2020; Mbanze et al., 2021; Woodside et al., 2021). However, relations between rangers and local communities are not always positive and are influenced by historical, cultural, political and governance factors (Dutta, 2020; Woodside et al., 2021), and as a result, improving these relationships remains a common goal in conservation (Moreto, et. al., 2017, Chitwan Declaration; Singh et al., 2021; URSA, 2021, Rizzolo, et. al., 2021). Our findings contribute to this aim by indicating that whether rangers are local to their conservation area and adequacy of training and resource provision may well affect ranger-community relations. However, our findings are merely based on correlations, meaning future research that explores the roles of these factors in more rigorous detail could be useful.

Regarding job satisfaction, our findings provide evidence that a number of demographic (e.g., education, marital status) and occupational factors (e.g., hours worked, rewards received for work, relations with colleagues and communities) associate strongly with ranger job satisfaction. Previous studies have identified many of these factors as important in shaping ranger job satisfaction (Eliason, 2006b; Ogunjinmi et al., 2008; Moreto et al., 2016; Spira et al., 2019; Gao and Li, 2021), meaning that whilst our findings are merely correlative, some of them may well reflect causative relationships. For instance, more adequate training and resource provision would conceivably make ranger work easier and more enjoyable, thereby improving job satisfaction. For the purposes of our study on local versus non-local rangers, it is notable that the trait of whether a ranger is local does not appear to relate strongly to job satisfaction. Yet, many of the variables that associate strongly with ranger job satisfaction also differ between local and non-local rangers, like level of education, marital status, and community relations. This might indicate that local rangers, as a group, tend to enjoy higher satisfaction with their job than non-local rangers due to how they differ in certain characteristics. For example, local rangers tend to have lower levels of formal education than non-local rangers, which, according to our overarching job satisfaction model,

relates to lower job satisfaction. This interpretation aligns with insights in the wider literature which explains how, in some professions, higher levels of formal education can lower job satisfaction by elevating job expectations (e.g., better pay and resource provision) to levels that are unmet (Vollmer and Kinney, 1955, Klien and Maher, 1966, Metle, 2001). This paradigm could occur in ranger work, which is often associated with low pay and the inadequate provision of resources (Meduna et al., 2009; Moreto, 2015; Digun-Aweto et al., 2019). On a related note, local rangers may have, or perceive themselves to have, fewer and less well-paid job options than more educated non-local rangers, a discrepancy which could translate to local rangers being more grateful for and satisfied with their job. We suggest that future research should also focus on how being local helps rangers in improving their effectiveness in addition to job satisfaction.

Local rangers could also tend towards higher job satisfaction because of how they generally differ in terms of relations with communities and access to familial support. Notably, local rangers, in general, appear to have better relationships with communities and more amicable community relations relate strongly and positively to job satisfaction. Together, these findings indicate that the generally better ranger-community relations enjoyed by local rangers might contribute towards their generally higher levels of job satisfaction.

Our findings also indicate that access to familial support might also contribute to the higher job satisfaction of local rangers, as being married associated strongly to the likelihood of being a local ranger and to having higher job satisfaction. Indeed, Gao and Li (2021) emphasise the benefits to rangers of access to familial support, and the wider literature stresses that familial support can be valuable for buffering the impacts of workplace stressors (Kwok et al., 2015; Zhang et al., 2018). Access to familial support might be especially beneficial for rangers given the demanding nature of their work.

Finally, our findings indicate that local rangers experience certain emotional and physical symptoms that are typically associated with a demanding job less frequently than non-local

rangers (e.g., feeling worn out, emotionally exhausted, physically exhausted). Whilst it is beyond the scope of this study to determine how and why local and non-local rangers appear to differ in their experiences of symptoms, this finding implies that further, more in-depth research into the perceptions and experiences of local versus non-local rangers may well yield insights that are valuable for developing strategies for improving ranger wellbeing.

In all, we trust that that our findings on the potential impacts of being a local ranger incentivise and inform future work on this topic; however, we acknowledge that this study has a number of limitations that related future work might seek to address more effectively. For instance, the definition and nature of being local may vary from site to site depending on factors such as the historical context, socio structure of the community, duration of stay within the community, ethnicity, social status and many others. Also, the study involved the broad analysis of survey data from across numerous, diverse study sites with different political, social, cultural and governance factors that may have influenced the responses of rangers. Evaluating whether our findings are relevant for a particular site should be based on a comprehensive and nuanced understanding of the situation (e.g., the various social, cultural, historical, and ecological factors). Individual survey responses may also have been unduly influenced by factors such as translation or the manner in which these were collected; for example, survey responses completed in a group setting may lead to some respondents not answering truthfully due to concerns about how responses may be fed back to others. Moreover, our study considered several relatively complex concepts, like trust and respect, in a somewhat cursory manner. Further, more in-depth research, again based on more comprehensive understandings of local contexts, that explores such concepts in greater detail would be useful. Finally, no indigenous and community conserved areas (ICCAs) were included in this study. As ranger characteristics, perceptions, and experiences will likely differ in ICCAs, it would be useful for related future research to encompass a broader and more diverse, suite of PCAs.

In addition to contributing to the existing academic literature, the present study also highlights important information that will prove useful for conservation agencies, organisations, and managers tasked with conservation area management and monitoring. Recognising the unique experiences and attitudes of frontline personnel, and how their pre-existing and current relationship with nearby locales and communities impacts their workplace environment and behaviours may help inform recruitment and retention initiatives. This points to increased need to better understand organisational factors that may bolster or hinder benefits associated with local rangers as suggested by the present study. Moreover, organisational decision-making and operational deployment of staff may also impact how local and non- local rangers are utilised for community engagement and community-centred events (e.g., meetings), research, tourism, and law enforcement activities, which in turn may impact overall job satisfaction.

## CONCLUSION

Rangers are often central to the effective implementation of conservation efforts; however, the operating conditions of rangers are usually challenging. Quantitative research like this study can support rangers on the ground by examining the factors that appear to affect ranger experiences and perceptions.

To this end, our study explores ranger perceptions and experiences from a perspective that has previously received relatively little attention: whether a ranger is local to their respective conservation area. We find the trait of being local may, in and of itself, incline rangers towards more positive relationships with local communities. As community engagement is a central component of ranger work, more positive relations with community members could have pertinent and pervasive effects on the abilities of rangers to carry out their duties. Our findings also suggest that training and resource provision, as well as level of formal education, associate positively with ranger-community relations. Whilst job satisfaction did not seem to be directly influenced by whether a ranger was local to their conservation area, our findings suggest that local rangers tended towards higher job satisfaction than their non-local counterparts. Joint consideration of the factors that relate strongly to job satisfaction and those that differ between local and non-local rangers suggests various possible reasons; for instance, our findings indicate that local rangers generally had less formal education, more access to familial support, and better community relations. Each of these differences could contribute to the higher job satisfaction of local rangers in our study. Additionally, local rangers tended to experience certain symptoms associated with a demanding job less often than the non- local rangers. In all, our findings imply that further, more in-depth research into how and why the perceptions and experiences of local and non-local rangers differ could be useful. Studies into the links between being a local ranger and community relations might be especially valuable.

## DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because requests have to be processed through national authorities. Requests to access the datasets should be directed to the corresponding author: rsingh@wwf.sg.

## ETHICS STATEMENT

The studies involving human participants were reviewed and approved by University of Central Florida Ethical Board. The patients/participants provided their written informed consent to participate in this study.

## AUTHOR CONTRIBUTIONS

RS, MB, WM, DM, FS, OG lead the survey design, implementation, data collection and initial analysis. MH, BP

supported the conceptualisation of this particular analysis and review of the results. All authors contributed to the article and approved the submitted version.

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## REFERENCES

- Allendorf, T. D., Smith, T. L. D., and Anderson, D. H. (2007). Residents' Perceptions of Royal Bardia National Park, Nepal. *Landscape Urban Plann.* 82, 33–40.
- 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), 202.
- Anthony, B. (2007). The Dual Nature of Parks: Attitudes of Neighbouring Communities Towards Kruger National Park, South Africa. *Environ. Conserv.* 34, 236–245.
- Bates, D., Mächler, M., Bolker, B., and Walker, S. (2015). Fitting Linear Mixed-Effects Models Using Lme4. *J. Stat. Software* 67, 1–48.
- Belecky, M., Jones, P., and Singh, R. (2021). Employment Conditions of Public Sector Rangers: A Major Underaddressed Problem. *Parks Stewardship Forum* 37, 185–195.
- Belecky, M., Singh, R., and Moreto, W. (2019). *Life on the Frontline 2019: A Global Survey of the Working Conditions of Rangers* (Gland, Switzerland:WWF).
- Christensen, R. H. B. (2019). "Ordinal - Regression Models for Ordinal Data," in *R Package Version 2019*.
- Digun-Aweto, O., Fawole, O. P., and Saayman, M. (2019). Constraints to Conservation at Okomu National Park: A Ranger's Perspective. *Int. J. Comp. Appl. Criminal Justice* 43, 173–187.
- Dutta, A. (2020). *The Conservation-Corruption Conundrum: Understanding Everyday Relationships Between Rangers and Communities*. Bergen:U4 Anti-Corruption Resource Centre Chr. Michelsen Institute. 15, 1–10
- Eliason, S. L. (2006a). A Dangerous Job? An Examination of Violence Against Conservation Officers. *Police Journal: Theory Pract. Principles.* 79(4), 359–370
- Eliason, S. L. (2006b). Factors Influencing Job Satisfaction Among State Conservation Officers. *Policing: Int. J.* 29(1), 6–18.
- Eliason, S. L. (2011). Policing Natural Resources: Issues in a Conservation Law Enforcement Agency. *Prof. Issues Criminal Justice* 6(3), 43–58.
- Etemesi, N. I., Sirmah, P. K., and Chepkwony, J. (2018). Work Environment and the Performance of Forest Rangers in South West Mau Forest, Kenya. *Asian J. Forestry* 2, 46–53
- Gao, Y., and Li, B. V. (2021). Evaluation of the Status, Job Satisfaction and Occupational Stress of Chinese Nature Reserve Staff. *Global Ecol. Conserv.* 29, e01731.
- IRF (2021). *Ranger Code of Conduct Ver 1.0* (Victoria, Australia: International Ranger Federation).
- Jacobsen, K. S. (2020). *Human Dimensions of Coexistence With Lions: Attitudes, Wellbeing and Economic Valuation* (United Kingdom:Doctor of Philosophy University of Oxford).
- Karant, K. K., and Nepal, S. K. (2012). Local Residents Perception of Benefits and Losses From Protected Areas in India and Nepal. *Environ. Manage.* 49, 372–386.
- Klien, S. M., and Maher, J. R. (1966). Educational Level and Satisfaction With Pay. *Personnel Psychol.* 19, 195–208.
- Kwok, S. Y. C. L., Cheng, L., and Wong, D. F. K. (2015). Family Emotional Support, Positive Psychological Capital and Job Satisfaction Among Chinese White-Collar Workers. *J. Happiness Stud.* 16, 561–582.
- 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, 157–170
- Liu, D., and Zhang, H. (2018). Residuals and Diagnostics for Ordinal Regression Models: Asurrogate Approach. *J. Am. Stat. Assoc.* 113, 845–854.
- Mbanze, A. A., Da Silva, C. V., Ribeiro, N. S., and Santos, J. L. (2021). Participation in Illegalharvesting of Natural Resources and the Perceived Costs and Benefits of Living Within a Protected Area. *Ecol. Economics* 179, 106825.
- Meduna, A. J., Ogunjinmi, A. A., and Onadoko, S. A. (2009). Biodiversity Conservation Problems and Their Implications on Ecotourism in Kainji Lake National Park, Nigeria. *J. Sustain. Dev. Afr.* 10, 59–73.
- Metle, M. K. (2001). Education, Job Satisfaction and Gender in Kuwait. *Int. J. Hum. Resource Manage* 12(2), 311–332.
- Moreto, W. D. (2015). Occupational Stress Among Law Enforcement Rangers: Insights From Uganda. *Oryx* 50(4), 646–654.
- Moreto, W. D., Brunson, R. K., and Braga, A. A. (2017a). 'Anything We do, We Have Toinclude the Communities': Law Enforcement Rangers' Attitudes Towards and Experiences of Community-Ranger Relations in Wildlife Protected Areas in Uganda. *Br. J. Criminology* 57, 924–944.
- Moreto, W. D., Brunson, R. K., and Braga, A. A. (2017b). 'Anything We Do, We Have to Include the Communities': Law Enforcement Rangers' Attitudes Towards and Experiences of Community-Ranger Relations in Wildlife Protected Areas in Uganda. *Br. J. Criminology* 57, 924–944
- Moreto, W. D., Lemieux, A. M., and Nobles, M. R. (2016). 'It's in My Blood Now': The Satisfaction of Rangers Working in Queen Elizabeth National Park, Uganda. *Oryx* 50, 655–663.
- Moreto, W. D., and Matusiak, M. C. (2017). "We Fight Against Wrong Doers": Law Enforcement Rangers' Roles, Responsibilities, and Patrol Operations in Uganda. *Deviant Behav.* 38(4), 426–447.
- Ogunjinmi, A. A., Umunna, M. O., and Ogunjinmi, K. O. (2008). Factors Affecting Job Satisfaction Of Rangers In Yankari Game Reserve, Bauchi,Nigeria. *J. Agric. Soc. Res.* 8(2).
- Oliver, W. M., and Meier, C. (2006). "Duck Cops", "Game Wardens", and "Wildlife Enforcement"Stress Among Conservation Officers. *Appl. Psychol. Criminal Justice* 2, 1–25.
- R CORE TEAM (2020). *R: A Language and Environment for Statistical Computing. R Version4.0.0* (Vienna, Austria: R Foundation for Statistical Computing).
- Rizzolo, J. B., Gore, M. L., Long, B., Trung, C. T., Kempinski, J., Rawson, B., et al. (2021). Protected Area Rangers as Cultural Brokers? Implications for Wildlife CrimePrevention in Viet Nam. *Front. Conserv. Sci.* 2. doi: 10.3389/fcosc.2021.698731
- Seager, J. (2021). Towards Gender Equality In The Ranger Workforce: Opportunities &Challenges. *Universal Ranger Support Alliance* 1, 1–91.
- 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.
- Spira, C., Kirkby, A. E., and Plumpre, A. J. (2019). Understanding Ranger Motivation and Job Satisfaction to Improve Wildlife Protection in Kahuzi-Biega National Park, Eastern Democratic Republic of the Congo. *Oryx* 53(3), 460–468.
- URSA (2021). Action Plan for Supporting Implementation of the International Ranger Federation's Chitwan Declaration and Furthering the Professionalisation of Ranger (2021-2015) Universal Ranger Support Alliance, 1–36
- Vollmer, J. J., and Kinney, J. A. (1955). Age Education, and Job Satisfaction. *Acad. Manage. J.* 21, 265–274.
- Woodside, D. P., Vasseleu, J., Pyke, T. W., Wilson-holt, O., and Roe, D. (2021). Buildinghealthy Relationships Between Rangers and Communities in and Around Protected Areas. *Parks Stewardship Forum* 37(1), 153–173.

## SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fcosc.2022.851704/full#supplementary-material>

- WWF (2019). *Life on the Frontline: A Global Survey of the Working Conditions of Rangers* WWF, Gland:Switzerland, 1–128
- Zhang, M., Foley, S., Li, H., and Zhu, J. (2018). Social Support, Work-Family Balance and Satisfaction Among Chinese Middle- and Upper-Level Managers: Testing Cross-Domain and Within-Domain Effects. *Int. J. Hum. Resource Manage* 31(21), 2714–2736.
- Zhang, J., Yin, N., Li, Y., Yu, J., Zhao, W., Liu, Y., et al. (2020). Socioeconomic Impacts of a Protected Area in China: An Assessment From Rural Communities of Qianjiangyuan National Park Pilot. *Land Use Policy* 99, 104849 1–128.

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