STRENGTHENING A RESILIENT PROTECTED AREA WORKFORCE TO ADVANCE THE 30X30 GOAL: THE CASE OF MADAGASCAR

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ABSTRACT

Protected areas depend on a reliable and strong workforce to achieve biodiversity conservation goals. The Kunming-Montreal Global Biodiversity Framework adopted a target to protect at least 30 per cent of the planet's land and seas by 2030, also known as '30x30'. To reach and maintain this ambitious goal, an expanded conservation workforce is indispensable. Despite this, most protected areas are currently critically understaffed. This study examines staffing in shared governance protected areas in Madagascar – a biodiversity hotspot that has significantly expanded its protected area network since 2015. We explore factors that attract and retain protected area workers in order to suggest recommendations for workforce development. We employ a qualitative approach utilising face-to-face interviews and a survey of protected area staff and local communities in Madagascar. We obtained data from 62 individuals across 10 protected areas, under IUCN management categories II, V and VI. Findings indicate that understaffing is a dynamic rather than a static phenomenon. A key motivation for working in the protected area sector is place attachment. Non-monetary work practices including place-based empowerment of community groups and gender-inclusive approaches can improve organisational culture to meet growing human resource needs in protected areas. By charting a new path for workforce development, protected areas may be able to address long-standing human resources issues and contribute to community empowerment and sustainable livelihoods.

Keywords: protected area management, biodiversity conservation, staffing

INTRODUCTION

No industry can thrive if it is unable to attract and retain workers (Eversole et al., 2012). Effective workforce development requires awareness of employee needs and an understanding of the sector's demands on human resources. Throughout the world, protected areas severely lack human resources: staffing is only about a third of what is needed for effective protected area management (Appleton et al., 2022; Waldron et al., 2020). Concerns about staffing adequacy have been raised in light of the Kunming-Montreal Global Biodiversity Framework (CBD, 2022) that aims to conserve land and seas on 30 per cent of the planet by 2030, the '30x30' goal (Appleton et al., 2022; Rakotobe & Stevens, 2023). Attracting and retaining workers will be vital to the success of the '30x30' goal. These staff capacities are essential to reduce the risk of having established yet ineffective protected areas or 'paper parks'.

Research on the issue of protected area understaffing is limited and focuses on a narrow subset of staffing aspects. From a quantitative perspective, a major global study has updated data on paid protected area staff numbers, decades after the last census was published (Appleton et al., 2022; James et al., 1999). Although significant, these studies do not capture contributions from civil society and private organisations, a significant segment of the actual and potential protected area workforce. At the site level, studies based on management effectiveness evaluations conclude that a majority of protected areas lack necessary human resources (Coad et al., 2019; Geldmann et al., 2018; Gill et al., 2017). Again, these studies capture numbers

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of formal employees within a given public, private or non-governmental organisation, but not contributors that provide labour and capacity outside the formally paid organisational structure (Parr et al., 2013; Waithaka et al., 2012). Fewer studies have attempted to calculate external workforce service contributions to protected area management (Rakotobe & Stevens, 2023; VIPP, 2021). Indeed, although formal staffing can be insufficient, the external workforce can often complement skills and tasks, closing staffing gaps and creating greater presence on the ground (Rakotobe & Stevens, 2023). In state governed and shared governance protected areas, local community members often contribute to patrolling, biodiversity monitoring, ecological restoration and other tasks as contingent workers hired on a per-project or activity basis (Lotter & Clark, 2014; Singh et al., 2021a). In Indigenous, community-led protected areas, local people self-organise and engage in management without monetary compensation, as part of a broader system of locally sustainable livelihoods (Tran et al., 2020; Worboys & Trzyna, 2015).

From a qualitative perspective, an understanding of the factors influencing the sector's long-term workforce remains fragmentary. Since most protected areas lack personnel, it is essential to know how understaffing is experienced by current workers and what attracts, motivates and retains the protected area workforce. This is critical, both for the contractual and non-contractual (external) workforce, as it determines rewards or outcomes that are valued by current and potential members of the workforce, with possible variations across sites and groups (Eversole et al., 2012). Studies on frontline rangers have revealed profound issues pertaining to their work conditions, capacities, well-being and security and have increased recognition of the critical importance of looking beyond numbers of protected area staff (Belecky et al., 2019; Singh et al., 2021a). Site-specific studies have demonstrated that factors motivating staff participation in protected area management are not necessarily linked to financial rewards, number of employees or even training and qualifications, rather, they are linked to a favourable work environment and personal attitudes (Ayivor et al., 2020; Elisée et al., 2021). Reasons that local communities engage in conservation efforts were categorised as both heteronomous motivations (engaging in a behaviour to obtain social and economic rewards) and autonomous motivations (self-endorsed behaviour from an intrinsic value such as love of nature) (Nilsson et al., 2016). During the Covid-19 pandemic, less studied qualitative aspects in the protected area workforce emerged such as increased anxiety and stress among staff and exacerbated negative effect of chronic understaffing (Powlen et al., 2023), the roles of rangers in providing health service (Singh et al., 2021b; Stolton et al., 2023) and continued maintenance of conservation activities through on-the-ground presence (Eklund et al., 2022).

This study examines the protected area understaffing phenomenon and investigates factors that attract and retain full-time paid staff and an external non-contractual workforce. Our goal is to promote a more inclusive protected area workforce development strategy that is sensitive to the workforce population's diversity, needs and motivations.

METHODS

Study area: Madagascar

Our study employs a qualitative case-study approach to examine protected areas in Madagascar, one of the world's biodiversity hotspots with key biodiversity conservation significance (Mittermeier et al., 2011; Ralimanana et al., 2022). The country has increased its protected area coverage from 6 per cent of the nation's territory in 2003 to about 11 per cent in 2015 through the Durban Vision, an ambitious plan to extend Madagascar's system of protected areas, locally termed SAPM (Gardner et al., 2018). Such extension has required additional management efforts. The parastatal association (Madagascar National Parks, or MNP) retains management of 43 protected area sites – mostly of IUCN management category II (national parks). Management authority for the 80 new protected areas was delegated to a collection of 20 non-governmental, community-based and private organisations. Most of these were in new management categories V (protected landscape or seascape) and VI (protected area with sustainable use of natural resources) featuring socio-economic objectives and close management collaboration with local communities – attributes that had not previously characterised Madagascar's protected area system. The latter are often engaged through local groups called CLP (in French, Comité Local du Parc, or local park committee) by MNP or through VOI (in Malagasy, Vondron'Olona Ifotony, or community-based groups).

Sustainability and resilience of the extended SAPM presents significant challenges in a country characterised by 77 per cent of its population living in extreme poverty (Crespo Cuaresma et al., 2018), 28 per cent lacking access to formal education (Instat, 2021), and a road density index of 11 per cent – among the lowest globally – meaning 17 million Malagasy inhabitants (65 per cent of the total) remain isolated from primary infrastructure

A scenic view of Isalo National Park, south of Madagascar
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(World Bank, 2023). Rural areas, where protected areas are located, face more extreme challenges than do urban settings.

Overall, Madagascar's protected areas are severely understaffed, particularly the newly designated sites (Rakotobe & Stevens, 2023). A key feature of SAPM is increased collaboration with local community-based organisations for biodiversity monitoring, law enforcement and socio-economic projects. Local communities, via CLPs or VOIs, provide significant in-service hours to protected areas, either voluntarily or in exchange for minimal compensation (Rakotobe & Stevens, 2023). In this study, we document motivations among both full-time paid staff members and external workforce contributors such as CLP and VOI members that assist with tasks on an unpaid or temporary basis for protected area management.

Data collection

We conducted face-to-face semi-structured interviews with on-site protected area staff and local community participants in July 2022 and April 2023 using convenience sampling (Patton, 2002). Participants are from shared governance protected areas, which vary in size (from 4.02 km² to 3,104.1 km²) and management categories (II, V, VI) (Figure 1, Table 1). All participants were informed about the scope and goals of the research, and they granted permission to record the interviews. Each interview was conducted individually, in the local language (Malagasy), permitting effective and informative interactions with study participants. In April 2023, a protected area director who was interested in the study's outcomes made it possible for the study team to evaluate motivations of her entire staff (21) through a paper-based questionnaire (see Supplementary Online Material). That survey was anonymous, with responses collected by a staff member and passed in full to the primary investigator.

In total, we received responses from 62 people, 44 male and 18 female, representing 10 sites: 44 staff members and 18 members of CLP and VOI supporting protected area management. Interview transcripts were coded using an inductive approach and a coding process following Williams and Moser (2019) with similar responses aggregated into categories for analysis and discussion.

Research limitations

Certain study limitations restrict the generalisability of our findings. For example, we chose to focus on protected areas under the shared-governance model, with an employer-employee structure. Additional insights may be gained through deeper study of other protected area governance models. In addition, our choice of protected area sites for this study was based on accessibility, hence more remote and hard-to-access sites were not included. Rich opportunities exist to survey motivations and retention factors for staff and external workforce in remote protected areas.

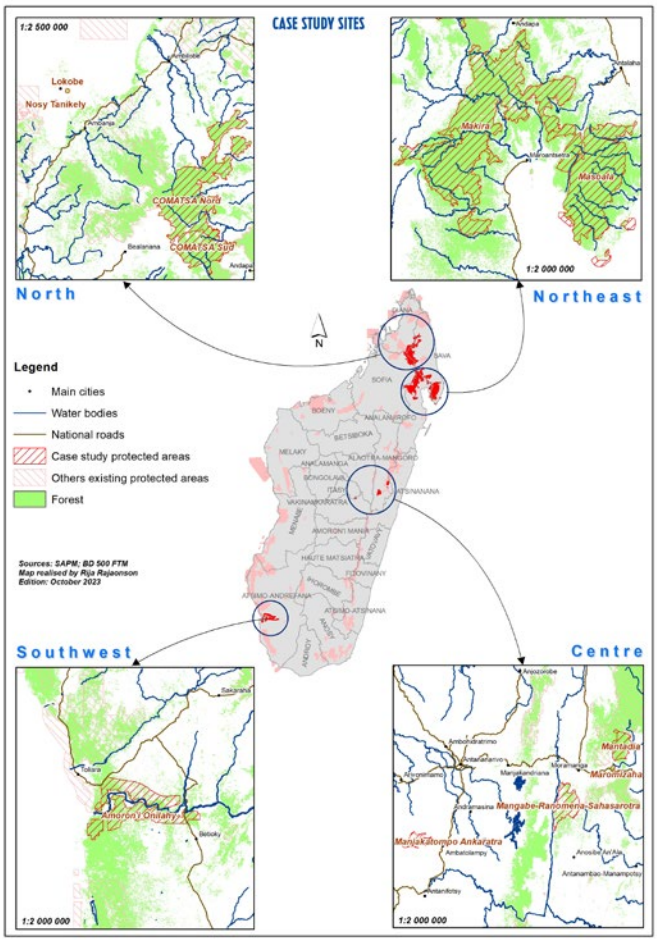

Figure 1. Map of the study area

Table 1. Site and study participants.

Zone	Protected areas and management categories	Surface (km²)	Managing institutions
Centre	1. Manjakatompo Ankaratra (VI)	81.3	Tafo Mihaavo
	2. Maromizaha (VI)	15.8	GERP
	3. Analamazaotra-Mantadia (II)	163.27	MNP
	4. Ranomena-Mangabe-Sahasarotra (VI)	271.34	MV
North	5. Corridor Marojejy- Anjanaharibe Sud-Tsaratanana COMATSA (V and VI)	3104.1	WWF
	6. Lokobe (II)	15.1	MNP
	7. Nosy Tanihely (II)	4.02	MNP
Northeast	8. Makira (II)	7224.9	WCS
	9. Masoala (II)	3100.95	MNP
Southwest	10. Amoron'Onilahy (VI)	1020.71	WWF
National			MNP, Tafo Mihaavo

GERP: Groupe d'Etude et de Recherche sur les Primates | MNP: Madagascar National Parks | MV: Madagasikara Voakajy | WWF: World Wildlife Fund | WCS: Wildlife Conservation Society

RESULTS

We organised our results into four themes based on the empirical data: 1) how understaffing is experienced and its consequences, 2) sense of place as a major motivation, 3) importance of equity and respect, and 4) local community members' work expectations relating to protected areas.

Understaffing and its consequences

Interviews with staff offer nuanced insights into protected area understaffing. A key finding of this study is that understaffing is a dynamic rather than a static phenomenon. Staffing is adequate in some settings (e.g. in offices but not in field locations, in some departments but not others). Understaffing often reflects specific skills gaps rather than an insufficiency in overall personnel numbers. In some cases, teams based in the organisation's headquarters may complement competency gaps for activities such as communication or capacity building. Staffing shortages also vary over time. When field agents are sick or on leave, and during times with high influx of visitors, severe temporary understaffing is experienced. Also, the number of rangers, locally termed 'field agents', may become insufficient with workload changes over time, or as seasoned field staff develop physical limitations (e.g. with age) and become unable to keep pace with previous expectations. Availability of staff can also change with new projects. On the positive side, an influx of project funds may alleviate staffing shortages by temporarily enabling the hiring of new staff. Conversely, new projects can also become burdensome when the budget covers project activities only with no resources to support additional staff.

A staff member handling an injured lemur brought to the Ivoloina park © Domoina Rakotobe

One main consequence of staffing insufficiency is a delay in reporting illegal activities. When field agents are readily available, they can immediately contact their supervisor as soon as serious offences are observed, and immediate measures can be taken. Failure to respond

Community rangers patrolling in Itremo protected area, center of Madagascar © Rhayo | Forum Lafa WCS Madagascar

quickly can severely impact biodiversity (e.g. the spread of fire or deforestation). Insufficient numbers of field agents can also result in complete lack of enforcement in areas that are difficult to monitor. Offenders know that rangers often cannot reach remote areas, making them prime targets for illegal activities. Lack of field enforcement results in persistent destruction, and unaddressed illegal activities create a negative image of park staff. Understaffing frequently requires performing tasks outside the job description on a daily basis, diminishing the ability to achieve desired results. Chronic understaffing creates an unsustainably heavy workload for existing employees. From our staff survey, those who reported negative impacts on their family life were all women, as longer work hours reduced their time to fulfil family roles such as tutoring their children.

Major motivation: A sense of place

Responses varied as to why staff and local communities choose to work in protected areas. A love of the beauty of nature and the desire to preserve natural spaces are vividly expressed by local community members and also by staff members in two popular protected areas that are highly frequented by tourists. Our interviewees from local communities cited love of nature and desire to protect the environment as top motivations for engaging with protected areas. Some reported that they enjoy exploring the forest, seeing wildlife, and getting fresh air. Community members reported that they enjoy higher air quality in and around the protected area, compared to other places like nearby small cities.

But love of place is not just about the beauty of the landscape or its ecological attributes (fresh air, presence of charismatic species, etc.). It was also at times more personal. Protected area staff reported that they engage in this work in their region of origin, filling them with pride, a sense of belonging and contribution to a greater purpose. Even office-based employees, such as one young female staff member, the mother of a toddler, felt fortunate to work near where her family lives. A park director shared that he accepted transfer to a more challenging park setting because of its location within his native region, where his elderly parents still reside.

Equity and respect in the workplace

Protected area staff mentioned a number of effective, motivating, on-the-job practices. With specific considerations for women, they included more flexible hours and improved field work conditions. In particular, early career professionals aspire to have opportunities for training and capacity growth. Recommendations by protected area staff and external workforce from local communities are summarised in Table 2, detailing employer–employee and peer-to-peer relationships and collaborations. A park director with 20 years of experience noted that "*Building team spirit is exceedingly important for site-based employees, because they are far from their own family and our stressful work requires strong bonds among staff.*" Many protected area staff cite small practices that make a difference in creating long-term positive working environments for the external workforce (Table 2).

Local community members expressed similar feelings. Members stressed the importance of work organisation being sufficiently flexible in response to an individual's needs, as VOI members are not a uniform group that will follow strict rules of participation as would formal employees. Indeed, some members may be disproportionally impacted by required workloads, on a seasonal or regular basis. For example, those without family members find it hard to share subsistence farming tasks. One woman explains that she is unmarried with children and works as a day labourer in other people's fields, hence it is harder for her to perform VOI duties than for members with additional caregivers/ farm workers. In addition, authoritarian attitudes and harsh language can easily demotivate local community members from joining a VOI, performing activities and complying with rules.

VOI leaders explain that the best way to improve relationships among protected area managers and VOIs is to strengthen local agency and ownership of protected area sites. This approach is important long-term, establishing the local community as first line decision-makers and conflict resolution experts in their territory. Individual VOI organisations also appreciate praise and recognition for achieving positive results, in a way that highlights individuality. Long-term protection depends on VOIs taking ownership of decision-making mechanisms related to their lands. One leader from the national platform of VOIs indicated that having an outside institution paying VOI members to patrol undermines local ownership of a given protected area and reinforces donor dependency, all unsustainable in the long-term. In fairness, people must receive compensation for time spent on habitat monitoring, but he suggests developing a stable locally organised income-generating activity, such as a cooperative that would pay for surveillance and patrols. A protected area chief, drawn from the local communities, supports the notion of self-funding VOIs. He would like to establish a potato farming cooperative, leveraging the region's flagship product to pay salaries for park management and community rangers. Another respondent shared that a similar approach is already in place in the Corridor Marojejy- Anjanaharibe Sud-Tsaratanana (COMATSA) protected area, featuring well-run and profitable vanilla cooperatives that have afforded local communities greater financial autonomy.

Local community members' expectations

Many VOI and CLP members considered that having an additional income apart from their traditional farming activities was a tangible benefit of working for a protected area. Generally, each VOI or CLP member patrols for an average of one day per week or four days per month, conducting biodiversity monitoring and recording evidence of any illegal activities. Payment systems vary across sites, with two common payment types. One is by direct payment to the community member for each day of patrolling at a rate of 5,000 Ariary (1.16 USD), equivalent to a workday in the fields. Alternatively, a community organisation may receive a monthly lump sum payment for all protected area activities undertaken. The amount varies among protected area managing institutions, ranging between 120,000 Ariary (27.30 USD) and 250,000 Ariary (57.80 USD). Some community organisations elect to keep one-fifth for management fees, distributing four-fifths to the participants in that month's activities. Others retain the entire amount for community activities (e.g. supporting local schools or organising member trainings). In one protected area, the withdrawal of the official managing institution led to the cessation of payments to VOIs. This change generated complaints among the former beneficiaries and the new management institution struggled to sustain a financial mechanism for VOIs. Even minimal supplemental income is meaningful to families in impoverished rural areas.

Most community rangers suggest that higher payments would increase practical motivation. A former CLP member explained that he stopped being a CLP member because reduced workdays made payments less attractive. Indeed, with additional members and no increase in total workdays, MNP redistributed the workload among CLP members, resulting in fewer working days per person. Similarly, VOI members from central Madagascar expect a revision of the current payment scheme, generally insufficient to allow the VOI to undertake major community projects. Particularly for one site, support mechanisms do not result in an increase in the number of participants simply because all funds are split among active members. Consequently, when more people participate in the activities, each receives a lower share.

Many others expect that continuing to work for protected areas will bring eventual socio-economic rewards. Some said they would continue to do the work with the hope that some protected area partners will provide service projects to local communities, such as building schools or

Table 2. Recommendations from protected area staff and local communities on non-monetary practices to motivate and retain protected area workforce.

For staff and full-time employees		For external workforce from local communities (CLPs and VOIs)
Increase visibility and understanding of protected area mission: communicate, train staff, and repeat mission frequently		Avoid top-down interactions (from protected area team to community members)
Delegate full authority to local staff on matters concerning the site, not being overshadowed by HQ in Antananarivo		Trust communities to be responsible decision-makers and to resolve conflicts in and about their territory
Create adequate balance between field and desk activities	Common	Grant autonomy for participants to manage their own tasks
Develop clear work instructions	Create opportunities for all to increase capacity/responsibility	Create social engagement with protected area team
Create opportunities for inter-generational learning: early-career professionals to learn from longer term staff	Allow possibility to exchange ideas and discuss tasks	
Engage/train director with strong positive communication skills, equity and leadership	Treat everyone equally and implement non-discrimination policies	Ensure equitable share of tasks among community members
Reinforce communication among staff	Offer opportunities for exchanges of ideas and discussions	
Identify and alleviate stress and pressure	Use encouraging and respectful (not offensive) language	Praise and recognise individual VOI organisations (VOIs are not all the same)
Hire locally whenever possible	Avoid authoritarian attitudes and harsh language	
Create flexibility for remote work, Adapt adequate logistical conditions in field settings, Consider and develop resources for family support		Permit flexibility in response to each individual's needs to promote diversity and inclusion

providing trainings for farmers. One member indicated that he would continue to be a VOI member because he expects some future returns, or '*valim-babena*[1]', either for himself or his children. Another one hopes to become a permanent park agent one day because she has been a CLP for six years and, apart from the park, work opportunities in the area are very rare.

Other motivations derive from the joy of the work itself. The president of the local guides' association estimates that he will continue to work if researchers need him because he retains unique local ecological knowledge of the area. A local guide has been proud to contribute to research on birds for 15 years. One woman, who had never attended high school, enjoys doing research with students because she is learning too.

DISCUSSION

Our results indicate that the local communities surveyed appear to exhibit a strong desire to work in protected areas, offering the System of Protected Areas of Madagascar (SAPM) a vast potential pool of collaborators and/or workers. Local stakeholders may be motivated by place-based connections and appreciation for nature, wanting to benefit their surroundings. Scarcity of other employment opportunities in rural areas, together with key opportunities for people lacking formal education, make engagement with protected areas a comparatively attractive sector. Our work relates to discussions on heteronomous and autonomous motivations for local communities involved in nature protection (Lliso et al., 2022; Nilsson et al., 2016). Although some studies have documented that direct payment can generate positive outcomes (Jones et al., 2018), others point out a reversal of behaviour should payment be inconsistent or discontinued, with particularly detrimental effects on intrinsic motivation

(Rode et al., 2015). It is still unclear whether salary-based participation by local community members would decrease or eliminate intrinsic motivation. As autonomous motivations create sustainable pro-conservation behaviour, shifting focus from predominantly heteronomous motivation to an approach with additional non-financial incentives to motivate community participation such as conservation stewardship, easements, and performance-based payments for communities may help to mitigate staffing shortages and benefit conservation in the long term (Nilsson et al., 2016). However, ethical implications for low-or-no pay work in areas experiencing food insecurity and lower access to resources are of paramount concern. Local CLP and VOIs remain sensitive to non-monetary rewards based on healthy work relationships, attachment to place, celebration of achievements, citizen science and capacity development. With similar aspirations to formal paid employees, the local external workforce appears to be motivated and perseverant, offering strong potential for retention and long-term stability in protected area staffing.

The work environment itself is another key motivation for staff. In contrast with Elisée (2021), our study found that not only senior-level protected area managers, but importantly, local community members aspire to stronger professional relationships and advancement. On the one hand, insufficient work opportunities – apart from farming – in remote rural areas explain why local workers seek permanent careers in the protected area sector. On the other hand, protected areas would benefit from greater sensitivity to human resource management, not simply in terms of recruitment, but also for retention and growth. Our findings align with best practice suggestions for working with local communities outlined by the Universal Ranger Support Alliance (Stolton et al., 2022), which include for example that they should feel valued and offered life opportunities. Loffeld et al. (2022) also found that positive psychological states associated with fairness and recognition of achievement for work are determinant factors for perseverance among conservation professionals. Taken together, these data raise the call for conservation organisations to address motivation and empowerment for long-term community protected area management.

Notably, some female participants in this study expressed gender-specific workplace considerations as either a motivator/deterrent to participation in the protected area sector, namely the importance of proximity to family network, scheduling flexibility for childcare, and logistical conditions during fieldwork. These findings suggest that, as in many other professions, actions to ensure gender equity in the conservation workplace are needed to advance more diverse, inclusive, empowering and appealing employment opportunities to enable long-term protected area staffing success (Jones & Solomon, 2019; Woodhouse et al., 2022).

CONCLUSION

Long-standing issues in protected area management can be addressed by community empowerment and espousing a renewed collaborative philosophy. Such a place-based strategy will help attract and retain a local workforce. In-office staff, field-based employees and members of the external workforce all report a desire for a more inclusive and equitable workplace. Key issues include family considerations, pride of place and recognition of individuality and strengths for local groups (e.g. women as knowledge holders). New pandemic induced work relationships, the Kunming-Montreal Global Biodiversity Framework and lessons learned from the 'Durban vision' provide opportunities for governmental (such as SAPM) and non-governmental organisations to promote critical discussions around human resource issues.

This study lifts the veil on sensitive questions, including: What systemic changes are needed to empower local communities to engage in management of existing protected areas? What changes in work practices are needed among current protected area managing organisations? How can the protected area sector become more inclusive by taking into consideration the needs of women and especially single mothers in the workforce? How can we address the needs of distance-separated families, and young professionals? What financial mechanisms can reduce donor-dependency and sustain community workers? Does success depend on changing the mandates and roles of protected area managing institutions (both governmental and non-governmental)? How can donors, international aid agencies and other protected area stakeholders (universities, tourism actors, etc.) shift to a more inclusive, equitable, mature, internal and external workforce management practice?

Embracing these questions is a turning point for the SAPM. It is a pivotal opportunity to help restore agency to communities and avoid the mistakes made in the past by depriving local and Indigenous peoples of decision-making about their lands and seas. Avoiding change runs the risk of merely generating paper parks, and threatens to perpetuate top-down and neo-colonial systems of power. Now is the time for an honest paradigm shift restoring human rights and recognising protected area human resources as an important dimension of human capital in the global conservation effort.

"Polisin'ala" members of local communities in charge of surveillance and patrolling of Maromizaha protected area, Madagascar
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ENDNOTE

[1] Valim-babena: an expression used to say that the duty of grown children is to help their parents in the future in recognition of what they have done.

SUPPLEMENTAREY ONLINE MATERIAL

Questionnaire used in study

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REFERENCES

Appleton, M. R., Courtiol, A., Emerton, L., Slade, J. L., Tilker, A., Warr, L. C., Malvido, M. Á., Barborak, J. R., de Bruin, L., Chapple, R., … Long, B. (2022). Protected area personnel and ranger numbers are insufficient to deliver global expectations. *Nature Sustainability*, 5, 1–11. https://doi.org/10.1038/s41893-022-00970-0

Ayivor, J. S., Nyametso, J. K. & Ayivor, S. (2020). Protected area governance and its influence on local perceptions, attitudes and collaboration. *Land*, 9(9), 310. https://doi.org/10.3390/land9090310

Belecky, M., Singh, R. & Moreto, W. D. (2019). *Life on the Frontline 2019: A Global Survey of the Working Conditions of Rangers*. WWF. https://files.worldwildlife.org/wwfcmsprod/files/Publication/file/k36blpy2c_wwf_rangers_survey_report_2019.pdf?_ga=2.87152152.1051238264.1626724937-466079191.1626724937

CBD. (2022). *Kunming-Montreal Global Biodiversity Framework* (p. 14). https://www.cbd.int/doc/decisions/cop-15/cop-15-dec-04-en.pdf

Coad, L., Watson, J. E., Geldmann, J., Burgess, N. D., Leverington, F., Hockings, M., Knights, K. & Marco, M. D. (2019). Widespread shortfalls in protected area resourcing undermine efforts to conserve biodiversity. *Frontiers in Ecology and the Environment*, 17(5), 259–264. https://doi.org/10.1002/fee.2042

Crespo Cuaresma, J., Fengler, W., Kharas, H., Bekhtiar, K., Brottrager, M., & Hofer, M. (2018). Will the Sustainable Development Goals be fulfilled? Assessing present and future global poverty. *Palgrave Communications*, 4(1), Article 1. https://doi.org/10.1057/s41599-018-0083-y

Eklund, J., Jones, J. P. G., Räsänen, M., Geldmann, J., Jokinen, A.-P., Pellegrini, A., Rakotobe, D., Rakotonarivo, O. S., Toivonen, T. & Balmford, A. (2022). Elevated fires during COVID-19 lockdown and the vulnerability of protected areas. *Nature Sustainability 5*, 603–609. https://doi.org/10.1038/s41893-022-00884-x

Elisée, Y. N., Alexis, K. Y., Mohamed, T. D. & Dramane, O. K. (2021). Conservation Durable des Aires Protégées et Motivation des Ressources Humaines: Cas du Projet Autonome Pour la Conservation du Parc National de Taï (PACPNT), en Côte d'Ivoire. *European Journal of Scientific Research*, 153(3), 16.

Eversole, B. A. W., Venneberg, D. L. & Crowder, C. L. (2012). Creating a flexible organizational culture to attract and retain talented workers across generations. *Advances in Developing Human Resources*, 14(4), 607–625. https://doi.org/10.1177/1523422312455612

Gardner, C. J., Nicoll, M. E., Birkinshaw, C., Harris, A., Lewis, R. E., Rakotomalala, D. & Ratsifandrihamanana, A. N. (2018). The rapid expansion of Madagascar's protected area system. *Biological Conservation*, 220, 29–36. https://doi.org/10.1016/j.biocon.2018.02.011

Geldmann, J., Coad, L., Barnes, M. D., Craigie, I. D., Woodley, S., Balmford, A., Brooks, T. M., Hockings, M., Knights, K., Mascia, M. B., … Burgess, N. D. (2018). A global analysis of management capacity and ecological outcomes in terrestrial protected areas. *Conservation Letters,* 11(3), e12434. https://doi.org/10.1111/conl.12434

Gill, D. A., Mascia, M. B., Ahmadia, G. N., Glew, L., Lester, S. E., Barnes, M., Craigie, I., Darling, E. S., Free, C. M., Geldmann, J., … Fox, H. E. (2017). Capacity shortfalls hinder the performance of marine protected areas globally. *Nature, 543*(7647),. https://doi.org/10.1038/nature21708

Instat. (2021). *Troisième Recensement Général de la Population et de l'Habitation (RGPH-3) thème 01: Etat et structure de la population* (p. 192). Instat. https://instat.mg/autres/rgph-3

James, A. N., Green, M. J. B. & Paine, J. R. (1999). *The global review of protected area budgets and staff.* World Conservation Press.

Jones, K. W., Muñoz Brenes, C. L., Shinbrot, X. A., López-Báez, W., & Rivera-Castañeda, A. (2018). The influence of cash and technical assistance on household-level outcomes in payments for hydrological services programs in Chiapas, Mexico. *Ecosystem Services*, 31, 208–218. https://doi.org/10.1016/j.ecoser.2018.04.008

Jones, M. S. & Solomon, J. (2019). Challenges and supports for women conservation leaders. *Conservation Science and Practice,* 1(6), e36. https://doi.org/10.1111/csp2.36

Lliso, B., Arias?Arévalo, P., Maca?Millán, S., Engel, S. & Pascual, U. (2022). Motivational crowding effects in payments for ecosystem services: Exploring the role of instrumental and relational values. *People and Nature*, 4(2), 312–329. https://doi.org/10.1002/pan3.10280

Loffeld, T. A. C., Black, S. A., Carter, M., Sterling, E. & Humle, T. (2022). What makes conservationists persevere? Resilience strategies at work. *Oryx, 56*(5), 681–690. https://doi.org/10.1017/S0030605322000680

Lotter, W. & Clark, K. (2014). Community involvement and joint operations aid effective anti-poaching in Tanzania. *PARKS, 20*(1), 19–27. https://doi.org/10.2305/IUCN.CH.2014.PARKS-20-1.WL.en

Mittermeier, R. A., Turner, W. R., Larsen, F. W., Brooks, T. M. & Gascon, C. (2011). Global biodiversity conservation: The critical role of hotspots. In F. E. Zachos & J. C. Habel (Eds.), *Biodiversity Hotspots: Distribution and Protection of Conservation Priority Areas* (pp. 3–22). Springer. https://doi.org/10.1007/978-3-642-20992-5_1

Nilsson, D., Gramotnev, G., Baxter, G., Butler, J. R. A., Wich, S. A. & McAlpine, C. A. (2016). Community motivations to engage in conservation behavior to conserve the Sumatran orangutan: Motivations of conservation behavior. *Conservation Biology,* 30(4), 816–826. https://doi.org/10.1111/cobi.12650

Parr, J. W. K., Insua-Cao, P., Van Lam, H., Van Tue, H., Bich Ha, N., Van Lam, N., Ngoc Quang, N., The Cuong, N. & Crudge, B. (2013). Multi-level co-management in government-designated protected areas – opportunities to learn from models in mainland Southeast Asia. *PARKS, 19*(2), 59–74. https://doi.org/10.2305/IUCN.CH.2013.PARKS-19-2.JWKP.en

Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). Sage Publications.

Powlen, K. A., Jones, K. W., Moreno, E. I. B., Cordero, M. A. O., Solomon, J. N. & Gavin, M. C. (2023). Perceived impacts of the Covid-19 pandemic on protected area management and conservation outcomes in Mexico. *Oryx*, 1–11. https://doi.org/10.1017/S0030605322001478

Rakotobe, D. J. & Stevens, N. J. (2023). External Workforce Contributes to Staffing of Protected Areas in Madagascar: Reaching the 30 by 30 goal by closing staffing gaps and sustainably leveraging the external workforce in the protected areas of Madagascar. *International Journal of Primatology,* IPS XXIX, Kuching, Malaysia.

Ralimanana, H., Perrigo, A. L., Smith, R. J., Borrell, J. S., Faurby, S., Rajaonah, M. T., Randriamboavonjy, T., Vorontsova, M. S., Cooke, R. S. C., Phelps, L. N., … Antonelli, A. (2022). Madagascar's extraordinary biodiversity: Threats and opportunities. *Science*, 378(6623), eadf1466. https://doi.org/10.1126/science.adf1466

Rode, J., Gómez-Baggethun, E. & Krause, T. (2015). Motivation crowding by economic incentives in conservation policy: A review of the empirical evidence. *Ecological Economics, 117*, 270–282. https://doi.org/10.1016/j.ecolecon.2014.11.019

Singh, R., Galliers, C., Appleton, M., Hoffmann, M., Long, B., Cary-Elwes, J., Fritze, C., McCallum, J. & Jones, R. (2021a). The vital role of rangers in conservation. *Parks Stewardship Forum, 37.* https://doi.org/10.5070/P537151745

Singh, R., Galliers, C., Moreto, W., Slade, J., Long, B., Aisha, H., Wright, A., Cartwright, F., Deokar, A., Wyatt, A., … Gosh, S. (2021b). Impact of the COVID-19 pandemic on rangers and the role of rangers as a planetary health service. *PARKS, 27*, 119–134. https://doi.org/10.2305/IUCN.CH.2021.PARKS-27-SIRS.en

Stolton, S., Timmins, H. L. & Dudley, N. (2022). *Building trust with rangers and communities: A scoping report for URSA. Volume 1: Scoping Report and Initial Findings*,. Universal Ranger Support Alliance (URSA).

Stolton, S., Timmins, H. L., Dudley, N., Biegus, O., Galliers, C., Jackson, W., Kettunen, M., Long, B., Rao, M., Rodriguez, C. M., … Sykes, M. (2023). Essential planetary health workers: Positioning rangers within global policy. *Conservation Letters*, 16(4), e12955. https://doi.org/10.1111/conl.12955

Tran, T. C., Ban, N. C. & Bhattacharyya, J. (2020). A review of successes, challenges, and lessons from Indigenous protected and conserved areas. *Biological Conservation, 241,* 108271. https://doi.org/10.1016/j.biocon.2019.108271

VIPP. (2021). *Volunteers in Parks Program 2019 Annual Report.*

Waithaka, J., Wong, M., Ranger, J. & Halpenny, E. A. (2012). Conserving biodiversity through Parks Canada's volunteer programme. *PARKS, 18*(2), 65–78. https://doi.org/10.2305/IUCN.CH.2012.PARKS-18-2.JW.en

Waldron, A., Adams, V., Allan, J., Arnell, A., Asner, G., Atkinson, S., Baccini, A., Baillie, E., Balmford, A., Beau, J. A., … Zhang, Y. (2020). *Protecting 30% of the planet for nature: Costs, benefits and economic implications*. 58.

Williams, M. & Moser, T. (2019). The Art of coding and thematic exploration in qualitative research. *International Management Review, 15*(1), 45–55.

Woodhouse, E., Moreau, M., Booker, F., Anthem, H., Coulthard, S., Eghenter, C. & Goldman, M. (2022). *Why gender matters for biodiversity conservation*. IIED. https://www.iied.org/21266iied

Worboys, G. L. & Trzyna, T. (2015). Managing protected areas. In G. L. Worboys, M. Lockwood, A. Kothari, S. Feary & I. Pulsford (Eds.), *Protected Area Governance and Management* (pp. 207–250). ANU Press. http://www.jstor.org/stable/j.ctt1657v5d.15

World Bank. (2023). *Rural Access Index (RAI)* [dataset]. World Bank Data Catalog. https://datacatalog.worldbank.org/search/dataset/0038250

RESUMEN

Las áreas protegidas dependen de una mano de obra fiable y sólida para alcanzar los objetivos de conservación de la biodiversidad. El Marco Mundial para la Biodiversidad de Kunming-Montreal adoptó el objetivo de proteger al menos el 30% de las tierras y mares del planeta para 2030, también conocido como "30x30". Para alcanzar y mantener este ambicioso objetivo, es indispensable ampliar la mano de obra dedicada a la conservación. A pesar de ello, la mayoría de las áreas protegidas carecen actualmente de personal suficiente. Este estudio examina la dotación de personal en las áreas protegidas de gobernanza compartida en Madagascar, un punto caliente de biodiversidad que ha ampliado significativamente su red de áreas protegidas desde 2015. Exploramos los factores que atraen y retienen a los trabajadores de las áreas protegidas con el fin de sugerir recomendaciones para el desarrollo de la fuerza laboral. Empleamos un enfoque cualitativo mediante entrevistas personales y una encuesta al personal de las áreas protegidas y las comunidades locales de Madagascar. Obtuvimos datos de 62 personas de 10 áreas protegidas de las categorías de gestión II, V y VI de la UICN. Los resultados indican que la escasez de personal es un fenómeno dinámico y no estático. Una motivación clave para trabajar en el sector de las áreas protegidas es el apego al lugar. Las prácticas laborales no monetarias, como el empoderamiento de los grupos comunitarios basado en el lugar y los enfoques inclusivos de género, pueden mejorar la cultura organizativa para satisfacer las crecientes necesidades de recursos humanos en las áreas protegidas. Al trazar un nuevo camino para el desarrollo de la mano de obra, las áreas protegidas pueden ser capaces de abordar problemas de recursos humanos de larga data y contribuir al empoderamiento de la comunidad y a medios de vida sostenibles.

RÉSUMÉ

Les aires protégées dépendent d'une main-d'œuvre fiable et solide pour atteindre les objectifs de conservation de la biodiversité. Le cadre mondial pour la biodiversité de Kunming-Montréal a adopté un objectif de protection d'au moins 30 % des terres et des mers de la planète d'ici 2030, également connu sous le nom de "30x30". Pour atteindre et maintenir cet objectif ambitieux, il est indispensable de disposer d'une main-d'œuvre plus nombreuse dans le domaine de la conservation. Malgré cela, la plupart des aires protégées manquent cruellement de personnel. Cette étude examine la dotation en personnel dans les aires protégées à gouvernance partagée à Madagascar - un hotspot de biodiversité qui a considérablement étendu son réseau d'aires protégées depuis 2015. Nous explorons les facteurs qui attirent et retiennent les travailleurs des aires protégées afin de suggérer des recommandations pour le développement de la main-d'œuvre. Nous employons une approche qualitative en utilisant des entretiens en face à face et une enquête auprès du personnel des aires protégées et des communautés locales à Madagascar. Nous avons obtenu des données de 62 personnes dans 10 aires protégées, dans les catégories de gestion II, V et VI de l'UICN. Les résultats indiquent que le manque de personnel est un phénomène dynamique plutôt que statique. L'une des principales motivations pour travailler dans le secteur des aires protégées est l'attachement au lieu. Les pratiques de travail non monétaires, y compris l'autonomisation des groupes communautaires basée sur le lieu et les approches intégrant le genre, peuvent améliorer la culture organisationnelle afin de répondre aux besoins croissants en ressources humaines dans les aires protégées. En traçant une nouvelle voie pour le développement de la main-d'œuvre, les aires protégées peuvent être en mesure de résoudre des problèmes de longue date en matière de ressources humaines et de contribuer à l'autonomisation des communautés et aux moyens de subsistance durables.