Protecting those who protect nature by supporting conservationists' mental wellbeing

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Article

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Abstract

Biodiversity conservation work can be challenging but rewarding, with potential consequences for conservationists' mental health. Yet, little is known about patterns of mental health among conservationists and its associated protective and risk factors. A better understanding can help improve working conditions, supporting conservationists' job satisfaction, productivity, and engagement, while reducing costs from staff turnover, absenteeism, and presenteeism. We surveyed 2311 conservationists across 143 countries, asking about experiences of psychological distress, personal characteristics, and workplace conditions. Moderate or severe distress was reported by 27.8%. Respondents with low dispositional and conservation-specific optimism, poor physical health, limited social support, women, and early-career professionals were most at risk. Heavy workload, job demands, and organisational instability were linked to higher distress, but job stability and satisfaction with one's contributions to conservation were associated with lower distress. We suggest ways employers and others could support conservationists' mental health and ability to tackle the global ecological crisis.

Introduction

As in other sectors, the challenges and rewards that conservationists face may be significant factors affecting their mental health[1]. Mental health has been defined as a "state of wellbeing in which the individual realises [their] own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to [their] community"[2]. Stage-based models of mental illness suggest a spectrum from low-level psychological distress to increasingly specific symptoms, finally passing diagnostic thresholds for mental illnesses[3,4]. Mental illness is a leading contributor to the global burden of disease, with over 260 million people estimated to have had depression in 2017[5]. In the UK alone, poor mental health was estimated to cost employers between £33 billion and £42 billion in 2016[6]. Most people experience variable mental health throughout their lives and can be helped to thrive even when experiencing mental illness[6].

Conservation can be a tough sector to work in. Conservationists exposed to the loss of nature but provided with inadequate support might face acute ecological grief[7]. This grief may be a natural and legitimate response to perceived societal inaction, feelings of powerlessness, and the expectation that future environmental targets will not be met[8,9]. These feelings may be exacerbated by the "gloom-and-doom" narrative prevalent in some conservation discourse[10]. The conservation sector is also underfunded. For example, conservation spending is estimated to be an order of magnitude smaller than is required to meet critical global biodiversity targets[11]. This underfunding may partly explain the prevalence of precarious, inadequately compensated, and poorly resourced conservation jobs (e.g., [12]). Furthermore, the vocational nature of conservation work can encourage exploitative practices, such as long-term unpaid or low-paid work, that affects those from disadvantaged backgrounds and junior members of the profession worst[13–15]. Moreover, many conservation roles blur the boundary of personal and professional lives. For instance, conservation scientists often work outside regular office hours, may

be based in remote locations, and spend significant time away from friends and family[16,17]. Similarly, some in the sector can have conflicting responsibilities and loyalties, which may be distressing. For instance, protected area rangers can come from or live in the communities they police, which may create tensions with friends, neighbours, and family[18]. In other cases, conservationists can face hard choices when trading-off objectives[19], which could be compounded by the challenges of interdisciplinary research and practice[20] and ideological conflicts with peers (e.g., [21]). These challenges are not equally experienced within the sector and can vary by job role, geography, race and ethnicity, sexual orientation, religion, gender, and other identities and social relations[22–24]. For example, several recent studies examine workplace stressors – such as isolation from family, poor health and safety, and inadequate compensation – experienced by conservation rangers[18,25–29].

Yet, working in conservation can also be rewarding. Many people across numerous sectors seek work that aligns with their values or contributes to societal causes[30]. Doing value-aligned work is also important for many conservationists, such as those motivated by their love of nature and its perceived intrinsic and instrumental values[31]. Engaging in value-aligned work can be a source of satisfaction and meaning in conservationists' lives[12]. Some types of conservation work also provide beneficial opportunities to spend time in nature, travel, learn and grow, and interact with colleagues and other groups[31,32].

These challenges and rewards, and the balance between them, are likely to play a role in conservationists' mental health. There are multiple reasons why the conservation sector should care about the mental health of its members. For individuals, good working conditions can enhance job satisfaction and quality of life beyond work[33]. Such conditions are often associated with better job performance and career advancement and might help those who want to remain in the sector to do so[34]. There are also pragmatic reasons why organisations should care about staff mental health. Good working conditions can increase staff engagement, creativity and productivity while reducing costs from absenteeism, presenteeism (working while being unwell), and staff turnover[6,35]. Good working conditions may also ease stress-induced workplace conflict and reduce incentives for misconduct[36,37]. In many countries, employers have a duty of care towards their staff; failure to fulfil this duty might pose liability risks. Across the sector, a more productive and innovative workforce might be better able to deliver conservation action.

Substantial evidence suggests that good working conditions can be good for mental health[33]. Efforts to support mental health at work can involve 'promoting the positive', preventing harm, and helping manage mental illness regardless of the cause[1,6]. 'Promoting the positives' involves identifying and enhancing aspects of work that support job satisfaction and wellbeing. Among conservationists, these aspects may include feeling like one is making a "meaningful contribution" or spending time in nature[12,31]. Supporting mental health also involves preventing harm from workplace stressors. These include imbalances between workplace efforts and rewards, high job demand, job insecurity, and lack of social support from colleagues (e.g., [38–40]). Finally, organisations can also provide adjustments to support those with mental illness to stay in or return to work (although these interventions are beyond the scope of this article).

Healthcare, education, emergency services, and other sectors have a history of investigating and acting to support worker mental health. For example, we found multiple meta-analyses exploring risk factors for mental illness among healthcare workers and interventions to support them[41,42]. In contrast, we found only a few studies exploring mental health among conservationists (see Belhekar, et al. [28] and Gao and Li [26], who examine psychological wellbeing and stress among rangers in India and China, respectively). As such, the conservation sector as a whole appears to have lagged behind other sectors. Nevertheless, there is growing recognition of the need to better support those in conservation, given the diverse challenges many in the sector face. For example, the *International Ranger Federation* aims to professionalise ranger roles and plans to develop minimum standards around working conditions and welfare[43]. Equally, the *Lonely Conservationists* website shares conservationists' experiences and resources to support mental health (www.lonelyconservationists.com). Therefore, while the lessons learned in other sectors are likely to be informative, these should be evaluated and tailored to the unique challenges and rewards experienced by conservationists.

This study aims to increase understanding of the patterns and risk factors of psychological distress – a state of emotional disturbance that impairs social functioning and daily activities[44] – within conservation. In doing so, we hope to catalyse efforts to support those in the sector better. We convenience-sampled conservationists through an internet survey (https://livedataoxford.shinyapps.io/lifeinconservation/), available in six languages, from July 2019 to August 2020. We investigated two research questions. First, how prevalent is psychological distress within a sample of the conservation community? Second, what personal characteristics and workplace factors are associated with psychological distress? Psychological distress was measured using the Kessler Psychological Distress Scale (Kessler-10)[45]. Two structural equation models were fitted, exploring hypothesised associations between personal characteristics, workplace conditions, and latent psychological distress (Table 1, see Supplementary Information (SI) 1 for details). One set of variables in the analysis related to the extent to which workplace rewards offset efforts, measured using a modified version of the effort-reward imbalance (ERI) instrument[46]. The first model ('ERI-score model') included the total ERI score for each respondent but excluded individual instrument items. Conversely, the second model ('ERI-item model') included each item of the ERI instrument but excluded total imbalance scores.

Table 1

Personal characteristics and occupational risk factors that were expected to be associated with psychological distress in two models (see SI 1 for details). The 'ERI-score model' includes the effort-reward imbalance score but excludes each item of the effort-reward imbalance instrument. The 'ERI-item model' includes each item of the instrument but excludes the effort-reward imbalance score. * Variables moderately correlated with other explanatory variables (*rho* > 0.6) were removed from the statistical analysis post-hoc. †Ordinal exogenous variables were treated as numeric. ‡Conservation-specific items added to the original effort-reward imbalance instrument. Key: RL = reference level; + = expected positive association; - = expected negative association; and ? = ambiguous or unclear expected association.

Association	Name	Model	Description or statement
-	Dispositional optimism	Both	A latent variable derived from the Life Orientation Test – Revised[47]. Dispositional optimism is the general expectation of good outcomes in life[48].
-	Situational optimism	Both	A latent variable describing situational optimism about conservation outcomes over the next decade[49]. Situational optimism is the expectation of positive outcomes within a specific context[50]. A correlation between situational and dispositional optimism was included in the analysis.
-	Gender	Both	Female or male (RL = female).
?	Age*	Both	Age in years.
?	Years in conservation	Both	Years working in conservation.
?	National / non-national	Both	Working in one's country of nationality or not (RL = national).
?	Education	Both	University or non-university education (RL = non-University).
-	Physical health†	Both	"How is your physical health in general?"
-	Personal relationships†	Both	Satisfied with "your personal relationships?"
-	Friends and family support†	Both	Satisfied with "the support you get from your friends and family?"
-	Friends and family time†	Both	Satisfied with "the amount of time you are able to spend with friends and family"†
+	Effort-reward score	ERI-score model	The adapted effort-reward imbalance score[46].

Association	Name	Model	Description or statement
+	Heavy workload†	ERI-item model	“I have constant time pressure due to a heavy work load”.
+	Many disturbances*,†	ERI-item model	“I have many interruptions and disturbances while performing my job”.
+	Increasingly demanding job†	ERI-item model	“Over the past few years, my job has become more and more demanding”.
+	Not enough resources†,‡	ERI-item model	“I do not have the resources I need to achieve my work goals”.
+	Not enough funding*,†,‡	ERI-item model	“The organisation I work for does not have enough funding to achieve its main aims”.
+	Organisational instability†,‡	ERI-item model	“The organisation I work for may not exist in five years’ time”.
-	Respect I deserve*,†	ERI-item model	“I receive the respect I deserve from my boss and work colleagues”.
-	Job advancement prospects*,†	ERI-item model	“My job promotion or advancement prospects are poor (reverse coding)”.
-	Do not expect undesirable job change†	ERI-item model	“I have experienced or I expect to experience an undesirable change in my work situation (reverse coding)”.
-	Good job security†	ERI-item model	“My job security is poor (reverse coding)”.
-	Respect and prestige†	ERI-item model	“Considering all my efforts and achievements, I receive the respect and prestige I deserve at work”.
-	Job advancement†	ERI-item model	“Considering all my efforts and achievements, my job promotion or advancement prospects are adequate”.
-	Income is alright†	ERI-item model	“Considering all my efforts and achievements, my salary or income is alright”.
-	Contribution to conservation†,‡	ERI-item model	“I am satisfied with the contribution I make to conservation”.

Association	Name	Model	Description or statement
-	Social pride[†,‡]	ERI-item model	“My friends and family are proud that I work in conservation”.
?	Position	Both	Academia and research or practice and policy (RL = academia and research).
+	Dangerous at night[*,†]	Both	“It is dangerous to go outside at night alone”.
+	Dangerous situations[†]	Both	“My work puts me in dangerous situations”.
+	Not feeling safe[†]	Both	“I do not feel safe, even where I live”.
+	Working hours	Both	Work hours per week.

Results

Prevalence of psychological distress among respondents

Our survey was completed by 2311 respondents who said they were familiar with conservation across 143 countries (Table 2). Of these, 2213 were completed in English, 55 in French, 24 in Portuguese, 17 in Spanish, 2 in Kiswahili, and none in Khmer. Respondents had a mean Kessler-10 score of 20.9 (standard deviation (SD) = 7.0) and median score of 20.0 (inter-quartile range = 9.0). Among the respondents, 14.8% had scores suggesting moderate distress (25-29), and a further 13.0% had scores indicating severe distress (> 30).

Table 2
Respondent characteristics by gender. Continuous variables are described with means (and standard deviations), and categorical variables are described with counts (and percentages). Key: LOTR = Life Orientation Test – Revised; ERI (original) = scores from the original effort-reward imbalance instrument; ERI (new) = scores from a modified effort-reward imbalance instrument that includes five new items specific to conservation.

Characteristic	**Overall** **N = 2311**	**Women** **N = 1208**	**Men** **N = 969**	**Non-binary** **N = 5**	**Unspecified** **N = 129**
Kessler-10 score	20.9 (7.0)	21.7 (7.3)	19.8 (6.5)	30.8 (7.2)	21.9 (6.7)
LOTR score	15.0 (3.9)	15.1 (3.9)	15.1 (3.8)	9.0 (5.8)	14.2 (3.5)
Age	37.0 (11.2)	35.1 (9.5)	39.2 (12.7)	29.6 (2.9)	37.8 (10.7)
Years in conservation	12.2 (10.5)	10.2 (8.2)	14.3 (12.1)	7.8 (3.1)	26.6 (17.1)
National / non-national					
National	1704 (77%)	920 (76%)	755 (78%)	5 (100%)	24 (75%)
Non-national	509 (23%)	287 (24%)	214 (22%)	0 (0%)	8 (25%)
Unknown	98	1	0	0	97
Education					
Non-university	141 (6.1%)	50 (4.1%)	78 (8.0%)	0 (0%)	13 (10%)
University	2069 (90%)	1158 (96%)	888 (92%)	5 (100%)	18 (14%)
Unknown	101 (4.4%)	0 (0%)	3 (0.3%)	0 (0%)	98 (76%)
Position					
Academic	1094 (47%)	584 (48%)	491 (51%)	3 (60%)	16 (12%)
Practice	729 (32%)	393 (33%)	323 (33%)	2 (40%)	11 (8.5%)
Unknown	488 (21%)	231 (19%)	155 (16%)	0 (0%)	102 (79%)
Working hours	43.5 (13.2)	43.2 (12.9)	44.0 (13.6)	49.0 (10.8)	43.2 (10.1)
Nationality (region)					
Central & Southern Asia	249 (11%)	117 (9.7%)	129 (13%)	0 (0%)	3 (9.4%)
Eastern & South-Eastern Asia	116 (5.2%)	79 (6.5%)	37 (3.8%)	0 (0%)	0 (0%)

Characteristic	Overall N = 2311	Women N = 1208	Men N = 969	Non-binary N = 5	Unspecified N = 129
Europe & Northern America	1308 (59%)	752 (62%)	526 (54%)	5 (100%)	25 (78%)
Latin America & the Caribbean	157 (7.1%)	80 (6.6%)	76 (7.8%)	0 (0%)	1 (3.1%)
Northern Africa & Western Asia	32 (1.4%)	11 (0.9%)	21 (2.2%)	0 (0%)	0 (0%)
Oceania	131 (5.9%)	72 (6.0%)	57 (5.9%)	0 (0%)	2 (6.2%)
Sub-Saharan Africa	220 (9.9%)	96 (8.0%)	123 (13%)	0 (0%)	1 (3.1%)
Unknown	98	1	0	0	97
ERI (original)	1.2 (0.5)	1.3 (0.5)	1.2 (0.4)	1.4 (0.6)	1.3 (0.5)
ERI (new)	1.1 (0.4)	1.1 (0.4)	1.1 (0.3)	1.2 (0.4)	1.1 (0.4)

Personal characteristics and workplace conditions associated with psychological distress

Two structural equation models were implemented with 2306 observations (five respondents with non-binary gender identities were excluded from the sample for reasons described in the methods). Both models fitted the data well (see SI 2). Dispositional optimism was negatively associated with distress in both models (Figure 1.a.). For instance, those with one SD higher dispositional optimism reported 0.29 SD lower distress than those at the mean (in the 'ERI-score model'). Situational optimism about conservation outcomes was slightly negatively associated with psychological distress; those with one SD greater situational optimism than the mean reporting 0.05 SD lower distress ('ERI-score model'). Men reported lower distress than women. For instance, men reported 0.21 SD lower psychological distress than women ('ERI-score model'). Years of experience in conservation was negatively associated with distress in both models. For instance, those in conservation for five years reported 0.19 SD higher distress than those in conservation for 15 years ('ERI-score model'). The results also suggested co-morbidity between physical health and psychological distress in both models; those who said their physical health was bad reported 0.18 SD higher distress than those who said their health was fair ('ERI-score model'). All three social support measures were negatively associated with psychological distress in both models. For example, those satisfied with the support received from their friends and family reported 0.25 SD lower distress than those who said they were dissatisfied ('ERI-score model').

Likewise, workplace characteristics were associated with psychological distress in both models (Figure 1.b.). For instance, those reporting one SD higher ERI scores had 0.27 SD higher psychological distress than those at the mean ('ERI-score model'). Moreover, many of the individual effort-reward instrument items were also associated with psychological distress. Notably, those who agreed with the statement "I

am satisfied with the contribution I make to conservation" reported 0.24 SD lower psychological distress than those who disagreed ('ERI-item model'). This effect represented the second largest negative association with psychological distress, following dispositional optimism. As another example, those who agreed with the statement "I have constant time pressure due to a heavy work load" reported 0.11 SD higher psychological distress than those who disagreed ('ERI-item model'). Equally, those who agreed with the statement "Considering all my efforts and achievements, I receive the respect and prestige I deserve at work" reported 0.07 SD lower distress than those who disagreed with the statement ('ERI-score model'). Furthermore, personal insecurity was positively associated with distress in both models. For example, those who agreed that they did not feel safe, even where they lived, reported 0.23 SD higher distress than those who disagreed ('ERI-item model'). Supplementary analysis removing dispositional optimism (SI 3), replacing situational optimism with a measure of collective conservation goals progress (SI 4), exploring the role of age (SI 5), and disaggregating the analysis by gender (SI 6) were used to explore the sensitivity of our results.

Discussion

Psychological distress was prevalent within our sample of 2311 conservationists; more than one in four had scores suggesting moderate or severe distress. Both personal characteristics and workplace conditions were associated with this distress. Individuals with low dispositional and situational optimism, poor health, limited social support, women, and at early career stages were most at risk. Workplace efforts (like high job demand and organisational insecurity) and rewards (like feeling as if one is contributing to conservation), and imbalances between them, were also associated with distress risk.

Care should be taken when directly comparing Kessler-10 scores between studies in different sectors, as they may vary because of demographic and other characteristics rather than workplace differences. However, respondents' distress scores tended to be higher than some general population samples. For instance, the 8841 Australian adults sampled in a nationally representative 2007 study had a mean Kessler-10 score of 14.5[51]. A 2017 study among 2425 rural Bangladeshis reported average Kessler-10 scores of 16.7 (SD = 11.3)[52]. However, whether conservationists are more or less distressed than other groups is perhaps less important than identifying risk factors that can be managed to reduce distress, regardless of its absolute levels.

Study considerations

The conservation sector is large and diverse, and there is no widely agreed-upon definition of a conservationist. Our sampling approach meant most respondents were university-level educated, spoke English, and were from Europe or Northern America. The sample included only 164 individuals who identified as rangers or fieldworkers. Consequently, our results do not reflect the experiences of those in frontline roles, who may face unique and substantial challenges and risks[18,25–29]. Improving working conditions in offices and headquarters, but overlooking those in frontline roles, may create or worsen

health inequalities within the conservation sector. As a result, the suggestions below should be considered hand-in-hand with measures specific to frontline roles.

Although our survey asked about age and gender, we did not explore how other identities and social relations – such as race, sexual orientation, disability, and their intersections – affect workplace wellbeing[22,23]. Similarly, resident communities and Indigenous groups play crucial roles in conserving nature, but our study does not explicitly explore their experiences. Future research could explore these dimensions, potentially using in-depth qualitative methods to provide nuanced insights (e.g., [24]).

Our study was a cross-sectional observational study, and so does not allow for causal inference. While some of our observations are supported by prior research (such as the impacts of ERI[53]) others were exploratory (like the role of situational optimism). As a result, these exploratory findings should be treated cautiously.

Finally, the Kessler-10 is a brief screening instrument that indicates the scale of psychological distress but cannot be used to diagnose specific conditions. So, while our research indicates the prevalence and risk factors for distress among conservationists, further research is needed to understand how these translate into patterns of mental illness.

Workplace wellbeing in conservation

Swaisgood and Sheppard [10] suggest there may be a culture of “learned helplessness” within the conservation sector[49], potentially leading to demotivation and distress. Our results suggest that those with lower situational optimism about conservation tend to report higher levels of distress, but this effect size was relatively small when controlling for dispositional optimism. In contrast, respondents’ satisfaction with their individual contributions to conservation was one of the largest predictors of distress. This contrast suggests that respondents may be less distressed by the “bigger picture” of ongoing nature loss, but more concerned about their individual contributions. This corroborates other research suggesting that ecological grief emerges partly from feelings of individual and collective powerlessness to prevent environmental degradation[8]. Qualitative results from a companion study of the same sample of respondents found that many focus on their contributions to stay motivated in the face of ongoing nature loss[12]. Further research is needed to understand the causal relationships between individuals’ satisfaction with their contributions to conservation and their experiences of distress. However, nature would be worse-off in the absence of conservationists[54,55]. Optimism movements, like *Conservation Optimism*, *Earth Optimism*, and *Ocean Optimism*, that share examples of positive conservation outcomes may help illustrate this fact[49]. Some individuals struggling with the “bigger picture” may find it helpful to engage with these movements and concentrate on their positive roles within collective conservation efforts. Additionally, those with low dispositional optimism appeared to be at greater risk of psychological distress. Dispositional optimism is generally stable over an individual’s life course[48]. Therefore, individuals struggling with low dispositional optimism might benefit most from support when working in challenging roles or avoid such positions altogether, where feasible[49].

In general, women tend to report higher rates of psychological distress than men for multiple and complex reasons, regardless of profession[44]. Within conservation, women can face unequal compensation, exclusion, harassment and institutional injustice, assumptions of inadequacy, and other forms of discrimination[24,56]. Efforts to address these issues could include offering women mentoring and career development opportunities, improving organisational justice and transparency, and addressing salary inequalities[24]. These efforts could also include fostering supportive work relationships, such as encouraging leaders to demonstrate confidence in women employees, provide constructive guidance, and introduce them to their networks[24].

Those involved in conservation for longer were expected to be more established in their careers, with more secure and better compensated roles, than early-career conservationists[12]. Moreover, people tend to become less distressed with age, which was strongly associated with experience in our study[44]. Consequently, our results indicate the need for targeted support for early-career conservationists. Moreover, lack of experience can be a barrier to entry for those wanting to enter the conservation sector, particularly for those from disadvantaged backgrounds[12,13,15]. While unpaid volunteer positions can help some individuals gain experience, employers should ask if their use of unpaid labour propagates inequalities and undermines meritocracy in the sector. Moreover, they might examine their hiring practices and adopt competency rather than experience-based recruitment approaches[12], especially for junior positions.

Work and non-work factors can also interact to affect psychological distress. Our results corroborate other research illustrating how poor general health, inadequate social support, and feeling in danger can be linked to worse mental health[57–59]. Employers can support employees' work-life balance by, for instance, adopting sustainable career management approaches, such as allowing career breaks, part-time or flexible working patterns, and investing in employees' development[60]. They can also reduce incentives to overwork, such as setting realistic deadlines, valuing quality over quantity, and increasing employees control of their day-to-day activities.

Workplace challenges and rewards found in other sectors – like heavy job load or the expectation of an undesirable job change[38–40] – appeared to be important determinants of distress in our study. This result has several implications. First, improved worker wellbeing may not be conditional on addressing the global biodiversity crisis or associated feelings of ecological grief. In other words, conservationists can be supported to thrive at work, even when environmental trends look dire. Second, it implies that many challenges faced by our respondents are not unique to the sector. Consequently, conservation organisations can probably learn much from how other sectors, such as healthcare, education, emergency services, have identified and managed these issues (e.g., [41,42]). Many generic guidelines exist across the world to help organisations manage staff mental health and wellbeing. Among these, the UK Government's *Thriving at Work* mental health core standards provide up-to-date and accessible advice applicable across organisational sizes and contexts[6]. The authors of these standards suggest users

tailor them to specific sectors, which we have done (Table 3, see SI 7 for further details and limitations around each option).

Table 3

Suggestions for employers for supporting staff mental health and wellbeing demonstrated through hypothetical but illustrative vignettes. See SI 7 for details, limitations and risks, links to resources, and a description of our approach to tailoring the *Thriving at Work* mental health core standards to the conservation sector[6].

Suggestions	Hypothetical vignettes
Understand experiences, attitudes, and knowledge among staff.	*Asili na Watu* is a Tanzanian organisation with 20 employees. They asked their staff to complete a short anonymous survey, describing the things they found most challenging and rewarding in their jobs. They used these results to guide the development of their wellbeing at work plan.
Produce, implement, and update a wellbeing at work plan.	*Bugs Benevolence Society* is a medium-sized non-governmental organisation with mostly office-based staff. They found high rates of sickness absence due to staff burnout. So, they formed a committee, led by the human resource manager, to look into this issue. The committee found that these issues stemmed from poor work planning and a culture that rewarded overwork. So, they designed a six-month plan with senior management for how they would address these issues. This plan included specific, measurable, achievable, relevant, and time-bound (SMART) goals to implement the other suggestions presented in this table.
Develop awareness of mental health and resources among all staff.	The *National Nature Agency* is a governmental organisation with over 1000 staff. They have resources on mental health, and the support available to staff, on their intranet. However, these resources are rarely used. In response, senior leadership asked their human resource teams to tailor the resources for each office. They also launched an awareness-raising campaign at their all-staff meeting, which included anonymous stories and clear guidance on available support.
Encourage open conversations about wellbeing and mental health and the support available.	As part of their awareness-raising campaign, the *National Nature Agency* also encouraged office managers to set aside informal spaces where staff could socialise within each office. In parallel, they suggested that team leaders set an example by being open about their struggles and the resources and support that helped them cope.
Provide good working conditions – 'promoting the positives'.	Many of *Asili na Watu's* staff started working in conservation because of their love of natural history and spending time in nature. However, many of the office-based staff do not have opportunities to spend time in nature. So, the executive director organised bird watching and hiking activities on the last Friday of every month, open to all staff members. They also produce an annual internal report that shares achievements while recognising and reflecting on problems and issues. This report emphasises the positive contributions of individuals and teams, ensuring that the contributions of all staff are recognised.

Suggestions	Hypothetical vignettes
Provide good working conditions – removing the risks.	*Bugs Benevolence Society* identified a set of actions for addressing burnout and overwork within their mental health at work plan. This included implementing policies around flexible working, not working beyond a maximum number of hours, and opportunities to take career breaks. They also evaluated whether they met statutory requirements around work hours, minimum wages, holiday, sick, and maternity pay, and workplace discrimination. Moreover, they also recognised that organisational instability was a source of distress in their organisation. So, the leadership team commissioned a working group to evaluate the organisations' resilience and long-term sustainability. One of the working groups conclusions was the need to grow their 'rainy day fund', amassed from 2.5% of every grant application.
Promote effective team leadership.	*Bugs Benevolence Society* recognised that issues of overwork stemmed from the organisation's culture and management approaches. In response, they organised training for team leaders in strategic planning, time management, and effective leadership. They also altered employee performance evaluations to focus on impacts (like achieving on-the-ground project goals) rather than inputs (like the amount of time spent at work) and outputs (like the number of reports produced).
Routinely monitor employee mental health and wellbeing.	The *National Nature Agency* subscribed to a mood tracker app, which employees can voluntarily choose to use. The app allows staff to indicate how they are feeling and provide anonymous feedback. These anonymised and aggregated data are used by human resource personnel to track staff morale. Furthermore, struggling employees can use the app to ask the human resource team for help.

The suggestions presented above focus on employer-employee relations. However, being unable to secure work in the conservation sector can also be distressing[12]. Recognising this, initiatives including *Conservation Careers* (https://www.conservation-careers.com/) and *Young Ecologists Talk & Interact* (YETI, https://www.meetyeti.net/) consolidate and advertise opportunities for those seeking work.

More broadly, other actors may also play a role in supporting conservationists. For example, professional associations (like the *Society for Conservation Biology*) could help develop and promote best practice workplace guidelines. A good example comes from the *Universal Ranger Support Alliance*, which developed an action plan to professionalise ranger roles[43]. Other support could include developing tools and resources to help organisations evaluate and strengthen their resilience and long-term sustainability, such as those offered by *Capacity for Conservation* (https://capacityforconservation.org/). Moreover, funders may evaluate how and where they direct their resources, including making good workplace practices and policies a condition of receiving grants and providing capacity-building funds. Funders might also consider providing funding over longer times, with a greater share of budgets used for staff overheads, and helping organisations build 'rainy day funds' to enhance institutional and employment stability.

Conclusion

Most people spend a significant amount of their waking lives at work, and workplace conditions can strongly influence mental health[1]. Furthermore, supporting workers' mental health and wellbeing can

contribute to their quality of life, increase productivity and engagement, and reduce organisational costs[6,35,36]. Yet, while some conservation organisations proactively support staff mental health, there is limited empirical evidence to guide and expand on these efforts (but see Belhekar, et al. [28] and Gao and Li [26]).

We provide the first large study examining mental health and its predictors in a broad international sample of conservationists. Psychological distress appeared common among our respondents. Some social groups are at particular risk, particularly women, early-career professionals, or those with low dispositional and situational optimism. Individuals, employers, funders, professional societies and others can play a role in addressing the root causes of this distress, such as by tackling workplace discrimination or avoiding practices that may propagate social inequalities. Moreover, our results illustrate how workplace factors can contribute towards or alleviate distress among conservationists. Employers, funders, and professional societies should seek to reduce these workplace risks, like overwork and job instability. Simultaneously, they may promote the positives, such as celebrating individual and collective contributions to conservation efforts – especially from those whose efforts are under-recognised. In general, while some aspects of conservation work reflected in our sample are unique, much can be learned from the steps taken in other sectors. Identifying cost-effective workplace mental health interventions that ultimately improve outcomes for people and nature would help justify using scarce resources to support conservationists.

We encourage the conservation community as a whole to think about better ways to support those who support nature. We suggest ways this could be done, drawing on best practice guidelines. These efforts are likely to take time, resources, and commitment. Nevertheless, supporting conservationists will be increasingly critical going forward, given their essential roles in addressing the global biodiversity and climate crises.

Methods

An *Ethical Review Board* at the *University of Oxford* approval the study protocol (R62487/RE002, SI 8). The target population included those who self-identified as conservationists (see SI 9). These were convenience sampled through internet surveys available in Spanish, English, French, Kiswahili, Portuguese, and Khmer. This internet survey was shared through conservation in person at an international conference, by directly contacting organisations, through listservs and newsletters, and social media networks.

Variable description

Participants completed the Kessler-10, which has consistent psychometric properties across demographic groups and countries (e.g., [45,61,62]). This instrument consists of ten Likert-scaled items asking how frequently symptoms are experienced, each with five response levels from “None of the time”

(scored 1) to “All of the time” (scored 5). Scores across each item are added to provide a total score, ranging from 10 (indicating no distress) to 50 (indicating severe distress). Those scoring 25-29 are likely to be moderately distressed, and those scoring 30 or above are likely to be severely distressed[63]. Rather than using these raw scores, we used the scale to estimate latent psychological distress.

Latent dispositional optimism was estimated using the Life Orientation Test-Revised, using the factor structure described in other literature (see SI 10)[47,49,64]. Latent situational optimism was estimated using a ten-item instrument developed in a companion study[49]. In summary, this instrument included pairs of statements corresponding to the five Strategic Goals of the C*onvention on Biological Diversity’s* Aichi Biodiversity Targets[65]. Respondents were asked about the likelihood that each statement would be achieved in the next decade. This latent variable was estimated using the factor structure described in Pienkowski, et al. [49] (see SI 11).

According to the effort-reward imbalance model, people work on the expectation that their efforts will be compensated with rewards; an imbalance occurs when efforts exceed rewards[66]. The original ERI instrument includes three Likert-scaled items describing ‘efforts’ and seven describing ‘rewards’[46]. We adapted this instrument by adding three new effort items and two reward items relevant to the conservation sector (see SI 12). Effort-reward imbalance scores are calculated following Equation 1.

$$ERI_i = \frac{e_i}{r_i c_i}$$

Equation 1.

In this equation, *i* is the individual, *e* is the sum score of effort items, *r* is the sum score of reward items, and *c* is the difference in the number of items in the numerator and denominator. This score was used in the ‘ERI-score model’. We were also interested in the association between each item of the effort-reward imbalance instrument and psychological distress; these items were included (and the imbalance score was excluded) in the ‘ERI-item model’.

Statistical analysis

All analysis was performed using the ‘R’ statistics software (version 4.0.2)[67]. After coding missing categorical data as ‘unknown’, 1.3% of values in the survey data were missing, mostly where individuals did not complete the survey or chose not to disclose their age or years in conservation (see SI 13). Missing values were replaced with synthetic ones following multivariate imputation by chained equations; ten imputed datasets were created using the ‘mice’ package (version 3.9.0, SI 14)[68]. Five

observations from those reporting non-binary gender identities were removed from the statistical analysis, as their inclusion introduced statistical separation.

The ‘ERI-score model’ and ‘ERI-item model’ were estimated for each of the ten imputed datasets, using the robust weighted least squares estimator and polychoric correlation. For each model, estimates and variances were pooled using Rubin’s Rules, and coefficient estimates were presented in standardised units[69].

Declarations

Data and code availability

Study data is available at doi: 10.6084/m9.figshare.17089037 and code at https://github.com/Pienkowski/LiC-conservation_distress.

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Author contributions

TP: Conceptualization; Methodology; Software; Formal analysis; Investigation; Resources; Data Curation; Writing - Original Draft; Writing - Review & Editing; Visualization; Project administration; Funding acquisition. **AK**: Conceptualization; Methodology; Formal analysis; Investigation; Writing - Original Draft; Writing - Review & Editing; Visualization; Supervision. **SCT**: Conceptualization; Methodology; Investigation; Writing - Original Draft; Writing - Review & Editing; Visualization. **EDL**: Conceptualization; Methodology; Investigation; Writing - Original Draft; Writing - Review & Editing; Visualization. **MH**: Conceptualization; Methodology; Investigation; Writing - Original Draft; Writing - Review & Editing; Visualization. **MK**: Conceptualization; Methodology; Investigation; Writing - Original Draft; Writing - Review & Editing; Visualization. **WNSA**: Conceptualization; Methodology; Investigation; Writing - Review & Editing. **GB**: Conceptualization; Methodology; Investigation; Writing - Review & Editing. **SB**: Conceptualization; Methodology; Investigation; Writing - Review & Editing. **VM**: Writing - Review & Editing. **SP**: Conceptualization; Methodology; Investigation; Writing - Review & Editing. **RR**: Conceptualization; Methodology; Investigation; Writing - Review & Editing. **IZ**: Investigation; Writing - Review & Editing. **EJMG**: Conceptualization; Methodology; Investigation; Resources; Writing - Original Draft; Writing - Review & Editing; Visualization; Supervision; Funding acquisition.

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Figures

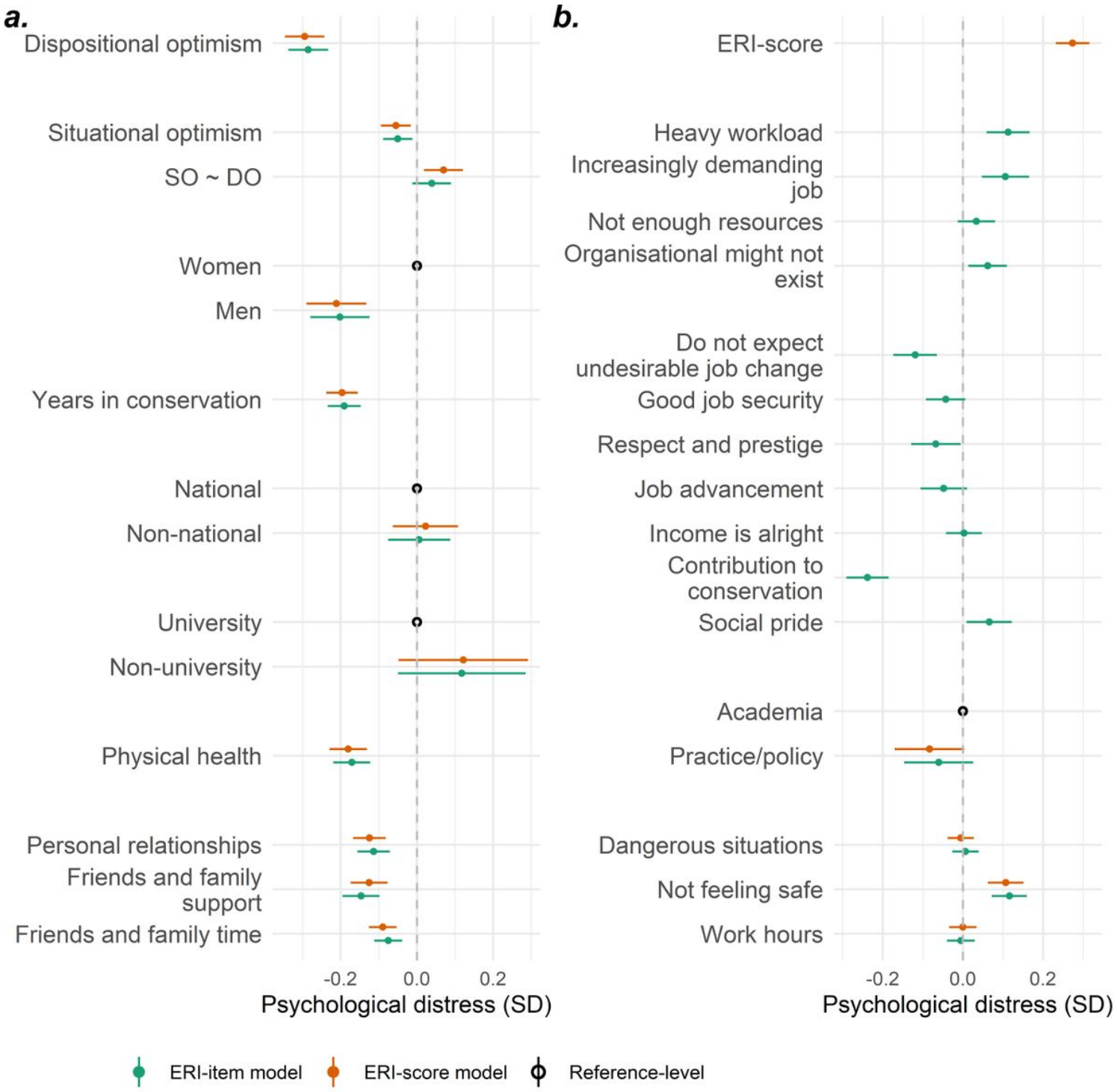

Figure 1

The estimated association in standard deviations (SD) between latent psychological distress and personal characteristics and occupational risk factors among 2306 respondents. The 'ERI-score model' included the effort-reward imbalance score but excluded the individual instrument items, while the 'ERI-item model' included these items but excluded the score. 'SO ~ DO' indicates the correlation between situational and dispositional optimism. Continuous variables were scaled and centred. 'Unknown' response levels are not shown.

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