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CONTRIBUTED PAPERS

Supporting conservationists' mental health through better working conditions

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Article impact statement: Conservationists' workplaces are associated with their risk of psychological distress; better supporting them may help protect nature.

Abstract

Biodiversity conservation work can be challenging but rewarding, and both aspects have potential consequences for conservationists' mental health. Yet, little is known about patterns of mental health among conservationists and its associated workplace protective and risk factors. A better understanding might help improve working conditions, supporting conservationists' job satisfaction, productivity, and engagement, while reducing costs from staff turnover, absenteeism, and presenteeism. We surveyed 2311 conservation professionals working in 122 countries through an internet survey shared via mailing lists, social media, and other channels. We asked them about experiences of psychological distress, working conditions, and personal characteristics. Over half were from and worked in Europe and North America, and most had a university-level education, were in desk-based academic and practitioner roles, and responded in English. Heavy workload, job demands, and organizational instability were linked to higher distress, but job stability and satisfaction with one's contributions to conservation were associated with lower distress. Respondents with low dispositional and conservation-specific optimism, poor physical health, and limited social support, women, and early-career professionals were most at risk of distress in our sample. Our results flag important risk factors that employers could consider, although further research is needed among groups underrepresented in our sample. Drawing on evidence-based occupational health interventions, we suggest measures that could promote better working conditions and thus may improve conservationists' mental health and abilities to protect nature.

KEYWORDS
conservation psychology, conservationists, environmentalists, mental health, occupational health, positive psychology, psychological distress, workplace well-being

Mejores condiciones de trabajo para apoyar la salud mental de los conservacionistas

Resumen: La conservación de la biodiversidad puede ser difícil pero gratificante y ambos aspectos pueden tener consecuencias en la salud mental de los conservacionistas. Sin embargo, sabemos poco sobre la salud mental de los conservacionistas, sus patrones y los factores de protección y riesgo asociados al lugar de trabajo. Un mayor conocimiento ayudaría a mejorar las condiciones de trabajo, pues impulsaría la satisfacción laboral, la productividad y el compromiso de los conservacionistas, mientras se reducen los costos

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derivados de la rotación de personal, el ausentismo y el presentismo. Encuestamos a 2,311 profesionales de la conservación de 122 países con una encuesta virtual compartida por listas de correo, redes sociales y otros medios. Les preguntamos a los profesionales sobre sus experiencias de estrés psicológico, condiciones de trabajo y características personales. Más de la mitad trabajaban y procedían de Europa y Norteamérica; la mayoría respondió en inglés, contaba con estudios universitarios y actualmente desempeña funciones académicas y profesionales. La carga de trabajo excesiva, las exigencias laborales y la inestabilidad organizacional se relacionaron con un mayor estrés, mientras la estabilidad laboral y la satisfacción con la contribución propia a la conservación se asociaron con un menor estrés. En nuestra muestra, los encuestados con baja disposición y un optimismo específico hacia la conservación, mala salud física, apoyo social limitado, las mujeres y los profesionales que inician su carrera son los que corren un mayor riesgo de sufrir estrés. Nuestros resultados señalan importantes factores de riesgo que los empresarios podrían considerar, aunque es necesario seguir investigando entre los grupos menos representados en nuestra muestra. Con base en las intervenciones de salud laboral respaldadas con pruebas, sugerimos medidas que podrían promover mejores condiciones de trabajo y, así mejorar la salud mental de los conservacionistas y su capacidad para proteger la naturaleza.

PALABRAS CLAVE
ambientalistas, bienestar laboral, conservacionistas, estrés psicológico, psicología de la conservación, psicología positiva, salud laboral, salud mental

【摘要】
生物多样性保护工作困难重重但也使人获益, 这两方面都可能潜在影响保护工作者的心理健康。然而, 人们对保护工作者的心理健康情况及其工作场所的保障和风险因素知之甚少。更好地理解这些问题可能有助于改善工作条件, 提高保护工作者的工作满意度、生产力和参与度, 同时减少人员流失、旷工和故意加班带来的成本。我们通过邮件列表、社交媒体和其他渠道的在线调查, 访问了在 122 个国家工作的 2311 名保护工作者, 并询问了他们的心理压力经历、工作条件和个人特征。超过一半的人来自欧洲和北美并在这些地区工作, 大多数人都受过大学教育, 从事案头调研和实践工作, 并且使用英语回答问卷问题。我们发现, 高压力水平主要来自繁重的工作量、工作要求和组织不稳定性, 而低压力水平则与工作的稳定性和对自己保护贡献的满意度有关。在我们的样本中, 自身性格和对保护的态度不乐观、身体健康状况不佳、社会支持有限、早期职业者和女性受访者最容易陷入困境。尽管仍需对在我们的样本中代表不足的群体进行进一步研究, 但我们的结果已经强调了雇主可以考虑的重要风险因素。通过借鉴基于证据的职场健康干预措施, 我们还提出了一些措施来改善工作条件, 以改善保护工作者的心理健康并提高其自然保护的能力。**【翻译: 胡怡思; 审校: 聂永刚】**

关键词: 保护心理学, 保护工作者, 环保工作者, 心理健康, 职业健康, 心理压力, 积极心理学, 职场健康

INTRODUCTION

Conservation professionals are at the forefront of efforts to reverse biodiversity loss, but they can face challenging working conditions that may threaten their mental health and capacity to protect nature (Boon, 2022). Good mental health is a state of well-being in which individuals realize their abilities, can cope with normal life stresses, can work productively, and are able to contribute to their communities (WHO, 2004). In contrast, poor mental health can cause substantial suffering and disrupt social relationships and daily activities (Patel et al., 2018). Recognizing this, the World Health Organization has called on all sectors of society to create conditions that promote good mental health (WHO, 2022b), including at work (WHO, 2022a). We aimed to increase understanding of the workplace factors associated with psychological distress (a state of emotional disturbance that impairs social functioning and daily activities [Drapeau et al., 2012]) among conservation professionals.

Psychological distress indicates poor mental health, but it is not a mental illness. We considered conservation professionals an occupational group that intends to establish, improve, or maintain good relations with nature (Mieg, 2009; Sandbrook, 2015) (Appendix S1). We focused on working conditions as an area in which employers, funders, and others might effectively support conservationists' mental health. We sought to encourage and inform these efforts, while recognizing the need for

other forms of support for those dealing with the emotional impacts of loss of biodiversity.

Environmental change can be a source of anxiety and grief among the general public (e.g., Hickman et al., 2021), partly arising from the current and anticipated loss of valued places, things, knowledge, and relationships (Cianconi et al., 2020; Clayton, 2020). Conservation professionals who are deeply aware of this loss and tasked with preventing it and who have strong emotional connections to nature might face acute feelings of grief, anxiety, or solastalgia (Boon, 2022; Clayton, 2018; Gordon et al., 2019). (Solastalgia is the "distress that is produced by environmental change [felt by] people while they are directly connected to their home environment" [Albrecht et al., 2007].) These feelings might be a natural and legitimate response to perceived societal inaction, public and political denialism, feelings of powerlessness, and the expectation that future environmental targets will not be met (Cunsolo et al., 2020; Hickman, 2020). For some, these feelings may be exacerbated by the gloom-and-doom narrative of hopelessness that Swaisgood and Sheppard (2010) claim is prevalent in some conservation discourse. The causes of this emotion are complex and multifaceted but stem partly from concerns about future outcomes for nature (Boon, 2022; Clayton, 2018; Pienkowski, Keane, et al., 2022). Optimism movements (e.g., Conservation Optimism) have emerged in part to help alleviate the emotional toll of environmental work (de Lange et al., 2022). In general, situational optimism is the expectation of positive outcomes within a specific context (Tusaie & Patterson, 2006). Pienkowski, Keane, et al. (2022) examined patterns of situational optimism about conservation in a companion study. Here, while controlling for dispositional optimism (the general expectation of good outcomes in life [Carver & Scheier, 2014; Conversano et al., 2010]), we extended this analysis to examine whether conservation optimism is negatively associated with psychological distress.

Beyond an emotional toll, conservationists can also face challenging workplace conditions, our primary focus. For example, conservation spending is estimated to be an order of magnitude smaller than is required to meet critical global biodiversity targets (Barbier et al., 2018). This underfunding may partly explain the apparent prevalence of precarious, inadequately compensated, and poorly resourced conservation jobs (Pienkowski et al., 2021). Furthermore, many might choose to work in conservation out of care for nature and humanity depends on it (Pienkowski et al., 2021; Sandbrook, 2019). But in some cases, the vocational nature of conservation may encourage exploitative practices, such as long-term unpaid or low-paid work, that disproportionately affect those from disadvantaged backgrounds and at early-career stages (Fournier & Bond, 2015; Vercammen et al., 2020). Many conservation roles can blur the boundary between personal and professional lives. For instance, conservationists often work outside regular office hours, might be based in remote locations, and spend significant time away from friends and family (Campos-Arceiz et al., 2013; Ramos et al., 2017).

Some in the sector can have conflicting responsibilities and loyalties, which can be distressing. For instance, protected area rangers can come from or live in the same communities they are required to police, which may create tensions with friends, neighbors, and family (Moreto, 2016). These challenges are not equally experienced within the sector and can vary by job role, geography, race, ethnicity, sexual orientation, religion, gender, and other identities and social relations (Chaudhury & Colla, 2021; Jones & Solomon, 2019). For example, multiple recent studies examine workplace stressors (e.g., isolation from family, poor health and safety, and inadequate compensation) experienced by conservation rangers (e.g., Anagnostou et al., 2022; Belhekar et al., 2020; Gao & Li, 2021; Moreto, 2016; Singh et al., 2020). Pienkowski et al. (2023) surveyed 280 conservationists in 3 organizations in 3 countries and found that field-based employees were more likely to report imbalances between workplace efforts and rewards, in turn associated with higher psychological distress.

Furthermore, many conservation professionals train and work in higher education institutions. Excessive workloads, job insecurity, lack of organizational support, and other factors threaten the mental health of academics across disciplines (Hamilton, 2019; Hodge et al., 2020; Urbina-Garcia, 2020). Many of these challenges have parallels with those in other sectors. The effort–reward imbalance (ERI) model, developed by Siegrist (1996), consistently predicts poor mental health in the workplace (Duchaine et al., 2020; Rugulies et al., 2017; van der Molen et al., 2020). According to the ERI model, people work with the expectation that their efforts will be compensated with rewards; an imbalance occurs when efforts exceed rewards (Siegrist, 1996). Many of the items in the ERI instrument correspond to the workplace challenges described above. For example, the instrument includes questions about workload, job demand, job security, and compensation. We drew on the ERI model to examine workplace challenges associated with psychological distress. We controlled for a range of covariates, including gender, age, years of experience, physical health, social support, and physical security, which are expected to be associated with psychological distress (Davey et al., 2001; Drapeau et al., 2012; Ohrnberger et al., 2017; Uchino, 2006; Viertiö et al., 2021).

Working in conservation can also be rewarding. Many people across numerous sectors seek work that aligns with their values or contributes to societal causes (Berg et al., 2010). 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 (Papworth et al., 2018). Engaging in value-aligned work can provide satisfaction and meaning in conservationists' lives (Pienkowski et al., 2021). Some types of conservation work also provide beneficial opportunities to spend time in nature, travel, learn, and interact with colleagues and other groups. Generally, work can be a source of social support, personal development, social status, and other benefits, whereas unemployment and poverty are major risk factors for poor mental health (Ridley et al., 2020). We captured several of these positive aspects by adapting the ERI instrument.

These workplace 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 working conditions and mental health of its members. For individuals, good working conditions can enhance job satisfaction and quality of life beyond work (Waddell & Burton, 2007). 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 (Kahya, 2007). There are also pragmatic reasons why organizations should care about staff mental health. In 2016 in the United Kingdom, poor mental health was predicted to cost employers between £33 billion and £42 billion (Monitor Deloitte, 2017). Good working conditions can increase staff engagement, creativity, and productivity while reducing costs from absenteeism, presenteeism (working while unwell and unproductive), and staff turnover (Stevenson & Farmer, 2017). Good work conditions may also reduce stress-induced workplace conflict and incentives for misconduct (Lau et al., 2003; Moreto, 2016). In many countries, employers have a duty of care toward their staff; failure to fulfill this duty might pose liability risks. Across the sector, a more productive and innovative workforce might be better able to deliver conservation action.

Good working conditions benefit mental health (Waddell & Burton, 2007). Efforts to support mental health at work can involve promoting the positive, preventing harm, and helping manage poor mental health regardless of the cause (Lamontagne et al., 2014; Stevenson & Farmer, 2017). Healthcare, education, emergency services, and other sectors have a history of investigating and acting to support workers' mental health. For example, numerous reviews and meta-analyses explore risk factors for poor mental health among healthcare workers and interventions to support them (e.g., López-López et al., 2019; Petrie et al., 2019). In contrast, there is little empirical research linking working conditions to the mental health of conservationists (but see Belhekar et al. [2020], Gao & Li [2021], and Pienkowski et al. [2023]). Yet, there is growing recognition of the need to better support those in environmental sectors, including regarding their mental health. For example, the International Ranger Federation aims to professionalize ranger roles and plans to develop minimum standards for working conditions and worker welfare (URSA, 2021). Recent editorials in *Nature Ecology and Evolution* (2022) and *Nature Climate Change* (2018) call attention to "environmentalists" mental health, including the effects of working conditions.

We sought to provide empirical evidence to help inform such efforts by examining workplace factors associated with psychological distress among conservation professionals. We reiterate that psychological distress is not a mental disorder, and high levels of distress cannot be used to diagnose mental illness (Drapeau et al., 2012). However, severe psychological distress is "indicative of impaired mental health" (Viertiö et al., 2021) and may occur along a continuum of mental illness (Patel et al., 2018). Specifically, we evaluated a priori hypothesized associations among workplace conditions, personal characteristics, and psychological distress (Table 1; Appendices S2 & S3).

METHODS

An Ethical Review Board at the University of Oxford approved the study protocol (R62487/RE002). The ethical protocol included obtaining informed consent from participants (Appendix S4).

We used snowball and self-selection approaches to sample conservation professionals through an internet survey (Appendices S2 & S5). A draft survey was piloted among 23 researchers and practitioners in the United Kingdom, India, and Uganda. Minor adjustments were made to the survey wording, instructions, and structure following piloting.

We recruited participants in 3 ways from July 2019 to August 2020 (2 recruitment drives in July 2019 and May 2020). First, we created a list of 216 conservation organizations operating in countries speaking the survey languages (see below). This list was developed through a keyword search of websites and social media for organizations with email addresses. We sent emails to the organizations on the list, asking for the survey to be shared among staff and networks. In parallel, we shared the survey through relevant mailing lists and newsletters identified through professional societies and elsewhere. For example, we shared the survey through the mailing lists of all Society for Conservation Biology thematic and regional groups. We also disseminated the survey through social media, principally Twitter and Facebook. Finally, the survey was advertised to attendees at the International Congress for Conservation Biology 2019.

The survey was forward translated by a professional translation service and then back translated into English by members of the research team. Discrepancies were discussed, and forward translations were corrected. The survey was translated from English into French, Spanish, and Portuguese because these are the most commonly spoken languages by country. These languages are poorly represented in East Africa, so the survey was translated into Kiswahili. The Khmer translation of the survey was available when the survey was deployed, so it was also included, but no respondents completed the survey in this language.

Variables

Psychological scales can include sets of items used to measure cognitive, emotional, or behavioral variables. Psychological distress scales are often used in epidemiological studies on the correlates of poor mental health. The Kessler psychological distress scale (Kessler-10) is a well-validated (i.e., measuring what it is designed to measure), easy-to-interpret, and quick-to-administer instrument that has been used widely across multiple populations (e.g., Dingwall & Cairney, 2010; Easton et al., 2017; Kessler et al., 2002; Min & Lee, 2015). The Kessler-10 consists of 10 Likert-scaled items asking how frequently symptoms are experienced, each with 5 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 (*no distress*) to 50 (*severe distress*). Those scoring 25–29 are likely to be moderately

TABLE 1 Personal characteristics and occupational risk factors expected to be associated with psychological distress in 2 models with different combinations of explanatory variables[a] (Appendix S3).

Expected association with distress[b]	Response variable name[c]	Model the variable is in	Description or statement[d]
–	Dispositional optimism	Both models	Latent variable derived from the Life Orientation Test—Revised (Scheier et al., 1994)
–	Situational optimism	Both models	Latent variable describing situational optimism about conservation outcomes over the next decade (Pienkowski et al., 2022a); correlation between situational and dispositional optimism included in analyses
–	Gender	Both models	Female or male (reference level female)
?	Age*	Both models	Age in years
?	Years in conservation	Both models	Years working in conservation
?	National or nonnational	Both models	Working in one's country of nationality or not (reference level: national)
?	Education	Both models	University or nonuniversity education (reference level is nonuniversity).
–	Physical health†	Both models	Physical health in general
–	Personal relationships†	Both models	Satisfied with personal relationships
–	Friends and family support†	Both models	Satisfied with support from your friends and family
–	Friends and family time†	Both models	Satisfied with amount of time spent with friends and family†
+	Effort–reward score	ERI-score model	Adapted effort–reward imbalance score (Siegrist et al., 2004).
+	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 organization I work for does not have enough funding to achieve its main aims."
+	Organizational instability†,‡	ERI-item model	"The organization I work for may not exist in 5 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."§
–	Do not expect undesirable job change†	ERI-item model	"I have experienced or I expect to experience an undesirable change in my work situation."§
–	Good job security†	ERI-item model	"My job security is poor."§
–	Respect and prestige†	ERI-item model	"Considering all my efforts and achievements, I receive the respect and prestige I deserve at work."

(Continues)

TABLE 1 (Continued)

Expected association with distress[b]	Response variable name[c]	Model the variable is in	Description or statement[d]
–	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."
–	Social pride†,‡	ERI-item model	"My friends and family are proud that I work in conservation."
?	Position	Both models	Academia and research or practice and policy (reference levels is academia and research)
+	Dangerous at night*,†	Both models	"It is dangerous to go outside at night alone."
+	Dangerous situations†	Both models	"My work puts me in dangerous situations."
+	Not feeling safe†	Both models	"I do not feel safe, even where I live."
+	Working hours	Both models	Number of work hours per week

[a]Two models: effort–reward imbalance (ERI)-score model, includes ERI score but excludes each item of the ERI instrument; ERI-item model, includes each item of the instrument but excludes the ERI score.
[b]Key: – expected negative association with distress; +, expected positive association; ?, no expected direction of association.
[c]Key: *, variables moderately correlated with other explanatory variables ($r > 0.6$) removed from statistical analyses post hoc; †, ordinal exogenous variables treated as numeric; ‡, conservation-specific items added to original ERI instrument (Siegrist et al. 2004).
[d]Key: §, reverse coded, meaning the response scale for this item was inverted.

distressed, and those scoring 30 or above are likely severely distressed. 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 (Pienkowski, Keane, et al., 2022; Scheier et al., 1994) (Appendix S6). This instrument includes 3 positively worded (scored 0–4) and 3 negatively worded (scored 4–0) items with 5 response levels ranging from strongly disagree to strongly agree (Scheier et al., 1994).

Latent situational optimism was estimated using a 10-item instrument developed by Pienkowski, Keane, et al. (2022). In summary, the 5 strategic goals of the Convention on Biological Diversity's Aichi Biodiversity Targets were considered to represent broadly held conservation aspirations (CBD, 2010). Pairs of statements were developed based on each of these targets. Respondents were asked about the likelihood that each statement would be achieved in the next decade. Response levels ranged from *definitely will not* (scored 0) to *definitely will* (scored 4). This latent variable was estimated using the factor structure described in Pienkowski, Keane, et al. (2022) (Appendix S7).

The ERI instrument is an established and validated tool used in numerous studies of occupational health worldwide (Rugulies et al., 2017; Siegrist et al., 2019; van der Molen et al., 2020). The original ERI instrument includes 3 Likert-scaled items describing efforts and 7 describing rewards (Siegrist et al., 2004). We adapted this instrument by adding 3 new effort items and 2 reward items specific to the conservation sector that we derived from relevant literature (Appendix S8). The 3 new effort items sought to capture challenges linked to individual and institutional underresourcing and concerns about organizational survival. The 2 new reward items related to respondents' satisfaction with their contributions to conservation and belief that their friends and family were proud they worked in the sector. The ERI scores were calculated as

$$\mathrm{ERI}_i = \frac{e_i}{r_i c_i}, \tag{1}$$

where i is the individual, e is the sum score of effort items, r is the sum score of reward items, and c is the number of effort items divided by the number of reward items. Other covariates identified as potentially important from the literature are described in Table 1.

Statistical analyses

All analyses were performed with R 4.0.2 (R Core Team, 2020). 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 (Appendix S9). Missing values were replaced with synthetic ones following multivariate imputation

with chained equations, which created 10 imputed data sets (Appendix S10) (van Buuren & Groothuis-Oudshoorn, 2011). Five observations from those reporting nonbinary gender identities were removed from the statistical analyses because their inclusion introduced statistical separation.

Two multivariate structural equation models were fitted. The first (ERI-score model) included the total ERI score for each respondent but excluded individual instrument items. The second model (ERI-item model) included each item of the ERI instrument but excluded total imbalance scores. The ERI-score model and ERI-item model were estimated for each of the 10 imputed data sets with the robust weighted least squares estimator and polychoric correlation. This approach was robust to the inclusion of ordinal and other noncontinuous data types. Both models fit the data well (Appendix S11). For each model, estimates and variances were pooled using Rubin's (1987) rules, and coefficient estimates were presented in standardized units. The post hoc supplementary analyses (in Appendix S12 to Appendix S20) used the same general modeling approach described above.

Sensitivity analyses included using a more conservative definition of *conservation professional* (Appendix S13), removing dispositional optimism (Appendix S14), replacing situational optimism with a measure of collective conservation goals progress (Appendix S15), exploring the role of age (Appendix S16), disaggregating the analysis by gender (Appendix S17), using the original ERI instrument (Appendix S18), examining changes in responses during the COVID-19 pandemic (Appendix S19), and looking at regional variations (details in Appendix S20).

RESULTS

Prevalence of psychological distress among respondents

Our survey was completed by 2311 respondents from 107 nationalities working in 122 countries (Table 2). Of these, 2213 were completed in English, 55 in French, 24 in Portuguese, 17 in Spanish, and 2 in Kiswahili. Most respondents had a university-level education. Over one-half were from and worked in Europe or Northern America. Thirty-two respondents were from northern Africa and western Asia. Respondents had a mean Kessler-10 score of 20.9 (SD 7.0) and a median score of 20.0 (interquartile range = 9.0) (distribution of scores in Appendix S12). Among the respondents, 14.8% had scores suggesting moderate distress (25–29), and a further 13.0% had scores indicating severe distress (>30).

Workplace conditions associated with psychological distress

Two structural equation models were implemented with 2306 observations. Workplace characteristics were associated with psychological distress in both models (Figure 1a). For instance, those reporting 1 SD higher ERI scores had 0.27 SD higher psychological distress than those at the mean (ERI-score model). Many of the individual ERI 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). 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). 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).

Personal characteristics associated with psychological distress

Many of the covariates related to respondents' personal characteristics were also associated with psychological distress. Dispositional optimism was negatively associated with distress in both models (Figure 1b). For instance, those with 1 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 negatively associated with psychological distress, but the effect size was comparatively small. Those with 1 SD greater situational optimism than the mean reported 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 were negatively associated with distress in both models. For instance, those in conservation for 5 years reported 0.19 SD higher distress than those in conservation for 15 years (ERI-score model). The results also suggested comorbidity 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 3 social support measures (relating to satisfaction with personal relationships and support from and time spent with friends and family) 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).

The results of the sensitivity analyses suggested that our findings were insensitive to different modeling assumptions. Further, we found no significant difference in the levels of psychological distress between those who responded before and during the COVID-19 pandemic or that the pandemic had a confounding effect on ERI scores (Appendix S19).

TABLE 2 Characteristics of respondents to an online survey of conservation professionals on working conditions, personal characteristics, and psychological distress by gender.[a]

Characteristic[b]	Overall $n = 2311$	Women $n = 1208$	Men $n = 969$	Nonbinary $n = 5$	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 or nonnational					
National	1704 (77%)	920 (76%)	755 (78%)	5 (100%)	24 (75%)
Nonnational	509 (23%)	287 (24%)	214 (22%)	0 (0%)	8 (25%)
Unknown	98	1	0	0	97
Education					
Nonuniversity	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)
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)
Nationality (region)					
Central and southern Asia	249 (11%)	117 (9.7%)	129 (13%)	0 (0%)	3 (9.4%)
Eastern and southeastern Asia	116 (5.2%)	79 (6.5%)	37 (3.8%)	0 (0%)	0 (0%)
Europe and North America	1308 (59%)	752 (62%)	526 (54%)	5 (100%)	25 (78%)
Latin America and Caribbean	157 (7.1%)	80 (6.6%)	76 (7.8%)	0 (0%)	1 (3.1%)
Northern Africa and 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
Work region					
Central and southern Asia	233 (11%)	104 (8.6%)	127 (13%)	0 (0%)	2 (6.2%)
Eastern and southeastern Asia	179 (8.1%)	112 (9.3%)	67 (6.9%)	0 (0%)	0 (0%)
Europe and North America	1,187 (54%)	680 (56%)	478 (49%)	5 (100%)	24 (75%)
Latin America and Caribbean	158 (7.1%)	78 (6.5%)	78 (8.0%)	0 (0%)	2 (6.2%)
Northern Africa and western Asia	30 (1.4%)	10 (0.8%)	19 (2.0%)	0 (0%)	1 (3.1%)
Oceania	152 (6.9%)	87 (7.2%)	63 (6.5%)	0 (0%)	2 (6.2%)
Sub-Saharan Africa	274 (12%)	136 (11%)	137 (14%)	0 (0%)	1 (3.1%)
Unknown	98	1	0	0	97

[a]Continuous variables: means (SD); categorical variables: counts (percentage).
[b]Key: LOTR, Life Orientation Test—Revised; ERI original, scores from original effort–reward imbalance instrument (Siegrist et al. 2004); ERI new, scores from a modified effort–reward imbalance instrument that includes 5 new items specific to conservation; work country, country in which respondents were working at the time of the survey.

DISCUSSION

More than 1 in 4 in our sample of conservationists had scores suggesting moderate or severe distress. Workplace challenges (such as high job demand and organizational insecurity) and rewards (such as feeling as if one is contributing to conservation), and imbalances between them, were associated with this distress risk. Individuals with low dispositional and situational optimism, poor physical health, and limited social support, women, and early-career respondents were most at

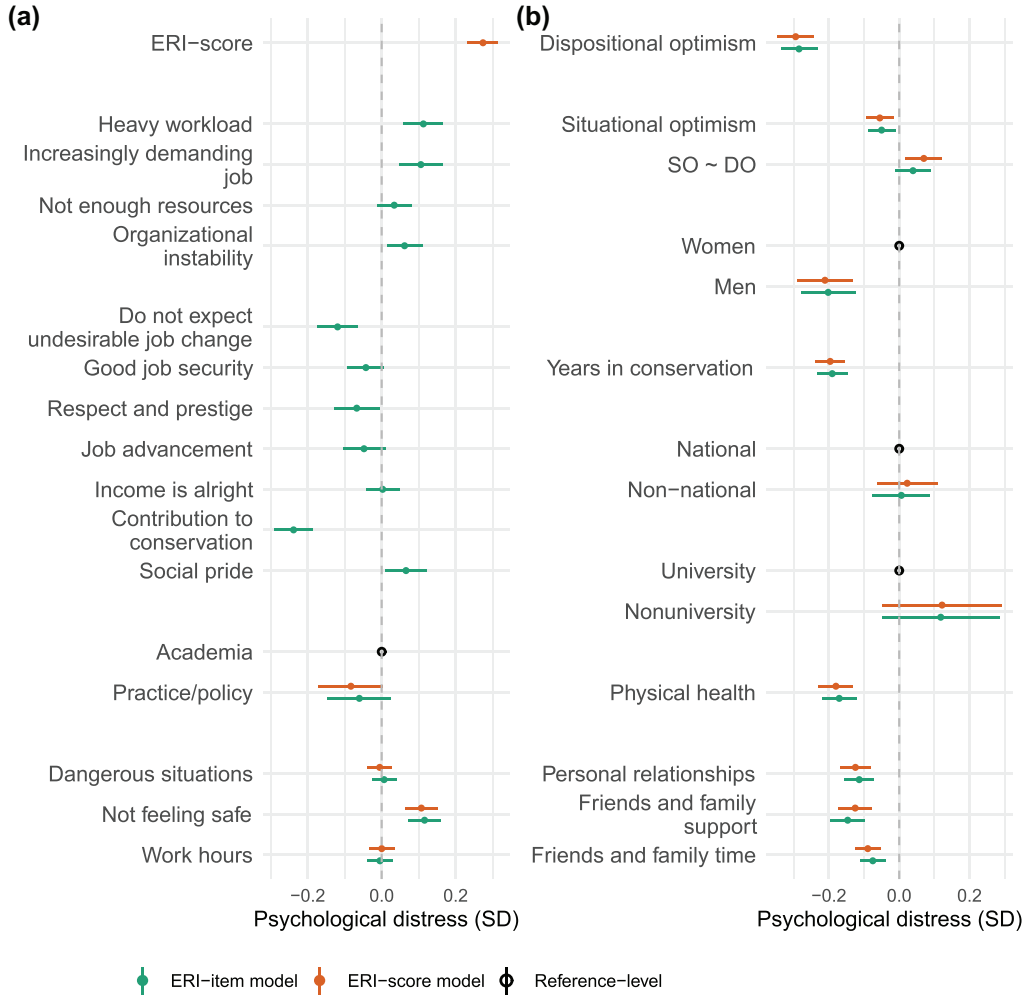

FIGURE 1 The estimated association in standard deviations (SD) between latent psychological distress and (a) occupational risk factors and (b) personal characteristics among 2306 respondents (SO ~ DO, correlation between situational and dispositional optimism). The effort–reward imbalance (ERI)-score model included the ERI score but excluded the individual instrument items, and the ERI-item model included these items but excluded the score. Continuous variables are scaled and centered. Unknown response levels are not shown.

risk. However, most of our sample had a university-level education, worked in desk-based academic and practitioner roles, and responded in English. One-half of the sample was from and worked in North America and Europe. Consequently, our results flag potentially important factors that employers and others in the sector could consider. Future work could examine these risks and protective factors among other groups of conservation professionals underrepresented in our sample. This research could involve, for example, creating databases of all conservation organizations in target countries from which employees could be sampled.

Workplace mental health in conservation

Workplace challenges and rewards in other sectors—such as heavy workload or the expectation of an undesirable job change—appeared to be important determinants of distress in our sample. For example, multiple independent meta-analyses spanning multiple sectors found negative associations between indicators of mental health and ERI, among other factors (e.g., Duchaine et al., 2020; van der Molen et al., 2020). One meta-analysis of 8 cohort studies and 84,963 employees showed that workers exposed to higher ERI had a significantly greater subsequent risk of poor mental health (Rugulies et al., 2017). Furthermore, the positive association between ERI and distress was observed in a companion study among 280 field-based, office-based, and research staff working in 3 conservation organizations in Cambodia, India, and South Africa (Pienkowski et al., 2023). As such, the observed associations between the ERI score (and many of its constituent items) and psychological distress may be widely relevant for the conservation sector.

This result has several implications. First, improved worker well-being may not be solely conditional on addressing the global biodiversity crisis or associated feelings of ecological grief. In other words, conservationists may be supported to thrive at work, even when environmental trends look dire. Second, it implies that some of the workplace challenges faced by

our respondents are not unique to the sector. Consequently, conservation organizations can probably learn much from how other sectors have identified and managed these problems (e.g., López-López et al., 2019; Petrie et al., 2019). For example, 1 randomized controlled trial in an Australian fire and rescue service showed that brief mental health training for managers significantly reduces sickness absence and offered large returns on investment (Milligan-Saville et al., 2017).

Overall, ERI scores were one of our study's most important predictors of distress. Tackling imbalances between challenges and rewards requires a holistic approach, which could be supported by evidence-based guidelines for understanding and improving working conditions. Many generic guidelines exist across the world to help organizations manage staff mental health and well-being. Among these, the U.K. Government's *Thriving at Work* mental health core standards provide up-to-date and accessible advice applicable across organizational sizes and contexts (Stevenson & Farmer, 2017). The *Thriving at Work* report is an independent review based on consultations with experts, employers, those with lived experience of poor mental health, and other stakeholders. Stevenson and Farmer (2017) suggest that users tailor these standards to specific sectors. We combined these standards with insights from interviews and written feedback to offer possible ideas for how employers might support the mental health of their staff (Table 3) (further details on our approach, links to resources, and limitations around each option are in Appendix S21). Our ideas are also summarized in a brochure for employers available from https://doi.org/10.6084/m9.figshare.21428016.v1. These ideas require further evaluation and testing in conservation. However, conservation-specific guidelines could be offered through organizational development platforms such as Capacity for Conservation (www.capacityforconservation.org). These guidelines could be combined with other resources, such as the action plan to professionalize ranger roles developed by the Universal Ranger Support Alliance (URSA, 2021).

When further developing these guidelines, particular attention could be paid to key risk factors we identified. For example, issues of heavy workload and job demand might be managed through participatory job design, flexible working arrangements (including flextime and teleworking), and ensuring that employees do not work beyond contracted hours (WHO, 2022a). Managers and leaders might be trained in time management, organization, and planning to help reduce employee workloads, although evidence of their effectiveness remains uncertain (WHO, 2022a). Other apparent risk factors related to organization and job instability. Systemic underfunding across the conservation sector presents inherent difficulties for employers (Barbier et al., 2018). Therefore, funders might 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 overhead, and helping organizations build rainy-day funds to enhance institutional and employment stability.

Personal characteristics and mental health

Swaisgood and Sheppard (2010) suggest there may be a culture of hopelessness within the conservation sector, potentially leading to demotivation and distress (Pienkowski, Keane, et al., 2022). Those in our sample with lower situational optimism about conservation tended 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 point corroborates other research suggesting that ecological grief emerges partly from feelings of individual and collective powerlessness to prevent environmental degradation (Hickman, 2020).

In 1 study among climate experts, Jovarauskaite and Böhm (2021) found that some cope with the emotional stresses of climate work by focusing on their direct personal actions to tackle climate change. However, this was only 1 of many observed coping strategies; others included seeking social support and avoiding stressful situations. Similarly, qualitative results from a companion study of the same sample of respondents showed that many focus on their contributions to stay motivated in the face of the ongoing loss of nature (Pienkowski et al., 2021). 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 without conservationists. Optimism movements that share examples of positive conservation outcomes, such as Conservation Optimism, Earth Optimism, and Ocean Optimism, may help illustrate this point (de Lange et al., 2022). 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.

Those with low dispositional optimism appeared to be at greater risk of psychological distress, consistent with other findings in other populations (Carver & Scheier, 2014; Conversano et al., 2010). Dispositional optimism is generally stable over an individual's life course (Carver & Scheier, 2014). Therefore, individuals struggling with low dispositional optimism might benefit most from support when working in challenging roles or avoid such positions altogether, where feasible (Pienkowski, Keane, et al., 2022).

Women tend to report higher rates of psychological distress than men for multiple and complex reasons, regardless of their profession (Drapeau et al., 2012; Viertiö et al., 2021). Within conservation, women can face unequal compensation, exclusion, harassment, institutional injustice, assumptions of inadequacy, and other forms of discrimination (Jones & Solomon, 2019; Jones et al., 2020). Efforts to address these issues might include offering women mentoring and career development opportunities, improving organizational justice and transparency, and addressing salary inequalities (Jones & Solomon, 2019). Conservation employers might also look at

TABLE 3 Ideas for employers to support mental health and well-being of conservation staff and examples of hypothetical cases.[a]

Ideas	Hypothetical case
Understand experiences, attitudes, and knowledge among staff.	Asili na Watu is a Tanzanian organization 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 the survey results to guide the development of their workplace well-being plan.
Produce, implement, and update a workplace well-being plan.	Bugs Benevolence Society is a medium-sized nongovernmental organization with mostly office-based staff. They found high rates of sick leave due to staff burnout. They formed a committee led by the human resource manager to investigate. The committee found that these issues stemmed from poor work planning and a culture that rewarded overwork. They designed a 6-month plan with senior management for how they would address these problems. The plan included specific, measurable, achievable, relevant, and time-bound (SMART) goals to implement the ideas in this table.
Develop awareness of mental health and resources among all staff.	The National Nature Agency is a governmental organization with over 1000 staff. They have resources to address mental health problems and provide support to staff on their intranet. However, these resources are rarely used. In response, senior leadership asked their human resource team to tailor the mental health 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 well-being and mental health and support available.	As part of their awareness-raising campaign, the National Nature Agency encouraged office managers to set aside informal spaces in each office where staff could socialize and 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 by promoting the positives.	Many of Asili na Watu's staff started working in conservation because they love 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 organized 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 recognizing and reflecting on problems. This report emphasizes the positive contributions of individuals and teams, ensuring that the contributions of all staff are recognized.
Provide good working conditions by removing workplace risks.	Bugs Benevolence Society identified a set of actions for addressing burnout and overwork in their mental health at work plan, including implementing policies around flexible work hours, 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 recognized that organizational instability was a source of distress among staff. So, the leadership team commissioned a working group to evaluate the organization's resilience and long-term sustainability. One of the working group's 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 recognized that issues of overwork stemmed from the organization's culture and management approaches. They organized training for team leaders in strategic planning, time management, and effective leadership. They also altered employee performance evaluations to focus on impacts (e.g., achieving on-the-ground project goals) rather than inputs (e.g., amount of time spent at work) and outputs (e.g., number of reports produced).
Routinely monitor employee mental health and well-being.	The National Nature Agency subscribed to a mood tracker app that employees can use voluntarily. The app allows staff to indicate their feelings and provide anonymous feedback. These anonymized 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.

[a]See Appendix S21 for details, resources 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 (Stevenson & Farmer, 2017).

how other sectors address these issues. For example, Smith et al. (2015) propose 7 strategies for supporting women in science, engineering, and medicine, including implementing flexible family care, recruiting gender-balanced external review committees, developing implicit bias statements, and creating institutional report cards for gender equality. We removed 5 respondents with nonbinary gender identities for statistical reasons. Nonbinary and genderqueer people often face marginalization and are at greater risk of poor health outcomes than cisgender individuals (Scandurra et al., 2019). Further research could examine the relationships between working conditions and mental health among this group, potentially through in-depth qualitative approaches similar to those used by Jones and Solomon (2019) and Jones et al. (2020).

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 (Pienkowski et al., 2021). Moreover, people tend to become less distressed with age, which was strongly associated with experience in our study (Drapeau et al., 2012). Consequently, our results suggest the need for targeted support for early-career conservationists with profiles similar to our sample. Relatedly, lack of experience can be a barrier to entry for those wanting to enter the conservation sector, particularly for those from disadvantaged backgrounds (Fournier & Bond, 2015; Pienkowski et al., 2021; Vercammen et al., 2020). Although unpaid volunteer positions can help some individuals gain experience, employers should ask if their use of unpaid labor propagates inequity and

undermines meritocracy in the sector. They might also examine their hiring practices and adopt competency rather than experience-based recruitment approaches (Pienkowski et al., 2021), especially for junior positions and when evaluating candidates with significant volunteer experience.

Work and nonwork 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 poor mental health (Davey et al., 2001; Ohrnberger et al., 2017; Uchino, 2006). 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 (Kossek et al., 2014). They can also reduce incentives to overwork, such as training team leaders in time management and organization (Green & Skinner, 2005). This training may help leaders set realistic deadlines, value quality over quantity, and increase employees' control of their day-to-day activities.

Nearly one-half of our sample were from those working or training in academic settings. Previous research highlights the challenges faced by academics, including those related to ERI, job insecurity, heavy workloads, and perceived lack of institutional support (Hamilton, 2019; Hodge et al., 2020; Urbina-Garcia, 2020). However, we did not find strong evidence of differences in distress between academics and practitioners in our sample, suggesting the need to manage workplace risk and protective factors across the sector.

Over one-half of the respondents were from and worked in North America and Europe. Although our results were insensitive to the inclusion of regional variables, there were differences in distress between regions (see Appendix S20 for details). Future research could explore the reasons for this variability and if conservation organizations can play a role in tackling these potential regional mental health inequalities.

We focused on some of the workplace risk factors associated with psychological distress. However, many other factors—including the experiences of ecological anxiety, grief, and solastalgia—are also expected to play an important role (Boon, 2022; Clayton, 2018; Gordon et al., 2019). The causes and consequences of this emotional toll are likely to be complex and vary between individuals, groups, and geographies, highlighting important topics for further investigation.

Study limitations and conclusions

There is no comprehensive list of conservation professionals, either at a national or global scale. As a result, we do not know what proportion of the target population we sampled. Furthermore, probability sampling approaches, such as random sampling from a comprehensive predefined list, were not possible. This point highlights inherent difficulties in studying dispersed, poorly defined, but nonetheless important populations. Recognizing this challenge, we sought to maximize the number of responses across the target population using snowball and self-selection sampling. These sampling approaches are useful when it is difficult to identify candidate respondents or where there is no way of directly contacting participants, as was the case in our study. However, this approach has several limitations. First, our sampling approach was vulnerable to self-selection bias. Those wanting to share stronger opinions may have been more likely to participate, potentially biasing some results toward more extreme responses. We used neutral and nonspecific language when inviting participants to help reduce this bias (see Appendix S5). Second, not all people in the target population had an equal probability of being presented with the survey. Those subscribed to conservation mailing lists and newsletters, active on social media, or affiliated with the organizations we contacted were most likely to have seen the survey invitation. Though the exact profile of the target population is unknown, non-English speakers and those working in front-line roles or without university-level education were evidently underrepresented in our sample.

These factors are likely to bias our prevalence estimates, such as the levels of psychological distress. Therefore, we only briefly discuss these prevalence estimates, which should not be generalized across the study population. However, the generalizability of regression estimates from nonrepresentative convenience samples to target populations depends on the heterogeneity of the treatment effect within a population (Coppock et al., 2018). In other words, the generalizability of coefficient estimates depends on how much they vary between different samples of a population. The section "Workplace mental health in conservation" illustrates how many of our findings regarding working conditions are consistent with those across occupational groups and other samples of conservation professionals. Therefore, there is good reason to believe that our findings regarding working conditions are widely applicable. However, we cannot say this definitively. Therefore, our results flag potential opportunities and problems employers and other actors might consider when seeking to better support workers.

Rates of common mental disorders increased during the COVID-19 pandemic (Santomauro et al., 2021). We were surprised to find no statistically significant difference in psychological distress between those who responded before and after 1 January 2020 when controlling for covariates and that the pandemic was not associated with ERI scores. However, understanding why this was the case is beyond the scope of the study. Furthermore, our study was cross-sectional and observational and did not allow for causal inference. As a result, these exploratory findings should be treated cautiously, particularly considering uncertainty about the direction of causation (i.e., risk of bidirectional and reverse causation). Future longitudinal studies could help evaluate the causal relationships suggested by our study.

Ours is the first large study examining mental health and its workplace predictors in an international sample of conservation professionals. Our findings contribute to a growing number of studies focusing on conservationists themselves, shedding light on possible new approaches to help protect nature (Pienkowski, Kiik, et al., 2022). Our sample is unlikely to be representative of conservationists globally. However, our results call attention to potential workplace protective and risk factors that

employers—especially of staff with similar characteristics to our sample—might think about in their organizations. These workplace risk and protective factors should be considered alongside the increasingly well-documented emotional toll of working in the environmental sector. Indeed, providing good working conditions might be essential to help offset the acute ecological grief and anxiety that many conservationists may experience. Equally, respondents' satisfaction with their contributions to conservation was one of the largest predictors of distress. Future researchers could examine why this is and whether helping individuals recognize their contributions supports their mental health.

Some social groups in our sample were at particular risk of psychological distress, particularly women, early-career professionals, and those with low dispositional and situational optimism. Individuals, employers, funders, professional societies, and others should support groups known to have a higher risk of poor mental health in the general population. Moreover, they might examine the root causes of this distress at work, for example, by tackling workplace discrimination or avoiding practices that might propagate social inequalities.

Employers, funders, and professional societies should seek to reduce workplace risks such as overwork and job instability. Simultaneously, they can promote the positives, such as celebrating individual and collective contributions to conservation efforts. Identifying workplace mental health interventions that lead to positive returns on investment would help justify using scarce resources to support conservationists. Adequately supporting conservationists might be increasingly critical going forward, given their essential roles in addressing the global biodiversity and climate crises.

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REFERENCES

Albrecht, G., Sartore, G. M., Connor, L., Higginbotham, N., Freeman, S., Kelly, B., Stain, H., Tonna, A., & Pollard, G. (2007). Solastalgia: The distress caused by environmental change. *Australasian Psychiatry*, *15*, S95–S98.

Anagnostou, M., Gunn, V., Nibbs, O., Muntaner, C., & Doberstein, B. (2022). An international scoping review of rangers' precarious employment conditions. *Environment Systems and Decisions*, 1–25.

Barbier, E. B., Burgess, J. C., & Dean, T. J. (2018). How to pay for saving biodiversity. *Science*, *360*, 486–488.

Belhekar, V., Paranjpye, P., Bhatkhande, A., & Chavan, R. (2020). Guarding the guardians: Understanding the psychological well-being of forest guards in Indian tiger reserves. *Biodiversity*, *21*, 83–89.

Berg, J. M., Grant, A. M., & Johnson, V. (2010). When callings are calling: Crafting work and leisure in pursuit of unanswered occupational callings. *Organization Science*, *21*, 973–994.

Boon, P. I. (2022). Is poor mental health an unrecognised occupational health and safety hazard for conservation biologists and ecologists? Reported incidences, likely causes and possible solutions. *Pacific Conservation Biology*, https://doi.org/10.1071/PC21059

Campos-Arceiz, A., Koh, L. P., & Primack, R. B. (2013). Are conservation biologists working too hard? *Biological Conservation*, *166*, 186–190.

Carver, C. S., & Scheier, M. F. (2014). Dispositional optimism. *Trends in Cognitive Sciences*, *18*, 293–299.

Chaudhury, A., & Colla, S. (2021). Next steps in dismantling discrimination: Lessons from ecology and conservation science. *Conservation Letters*, *14*, e12774.

Cianconi, P., Betrò, S., & Janiri, L. (2020). The impact of climate change on mental health: A systematic descriptive review. *Frontiers in Psychiatry*, *11*, 74.

Clayton, S. (2018). Mental health risk and resilience among climate scientists. *Nature Climate Change*, *8*, 260–261.

Clayton, S. (2020). Climate anxiety: Psychological responses to climate change. *Journal of Anxiety Disorders*, *74*, 102263.

Convention on Biological Diversity (CBD). (2010). *The Strategic Plan for Biodiversity 2011–2020 and the Aichi Biodiversity Targets COP 10 decision X/2*. Author.

Conversano, C., Rotondo, A., Lensi, E., Vista, O. D., Arpone, F., & Reda, M. A. (2010). Optimism and its impact on mental and physical well-being. *Clinical Practice & Epidemiology in Mental Health*, *6*, 25–29.

Coppock, A., Leeper, T. J., & Mullinix, K. J. (2018). Generalizability of heterogeneous treatment effect estimates across samples. *Proceedings of the National Academy of Sciences of the United States of America*, *115*, 12441–12446.

Cunsolo, A., Harper, S. L., Minor, K., Hayes, K., Williams, K. G., & Howard, C. (2020). Ecological grief and anxiety: The start of a healthy response to climate change? *The Lancet Planetary Health*, *4*, e261–e263.

Davey, J. D., Obst, P. L., & Sheehan, M. C. (2001). Demographic and workplace characteristics which add to the prediction of stress and job satisfaction within the police workplace. *Journal of Police and Criminal Psychology*, *16*, 29–39.

de Lange, E., Sharkey, W., Castelló y Tickell, S., Migné, J., Underhill, R., & Milner-Gulland, E. J. (2022). Communicating the biodiversity crisis: From "warnings" to positive engagement. *Tropical Conservation Science*, *15*, 19400829221134893.

Dingwall, K. M., & Cairney, S. (2010). Psychological and cognitive assessment of Indigenous Australians. *Australian and New Zealand Journal of Psychiatry*, *44*, 20–30.

Drapeau, A., Marchand, A., & Beaulieu-Prvost, D. (2012). Epidemiology of psychological distress. Pages 105–134 in Labate L, editor. *Mental illnesses: Understanding, prediction and control*. INTECH.

Duchaine, C. S., Aubé, K., Gilbert-Ouimet, M., Vézina, M., Ndjaboué, R., Massamba, V., Talbot, D., Lavigne-Robichaud, M., Trudel, X., Pena-Gralle, A.-P. B., Lesage, A., Moore, L., Milot, A., Laurin, D., & Brisson, C. (2020). Psychosocial stressors at work and the risk of sickness absence due to a diagnosed mental disorder: A systematic review and meta-analysis. *JAMA Psychiatry*, *77*, 842–851.

Easton, S. D., Safadi, N. S., Wang, Y., & Hasson, R. G. (2017). The Kessler psychological distress scale: Translation and validation of an Arabic version. *Health and Quality of Life Outcomes*, *15*, 215.

Fournier, A. M. V., & Bond, A. L. (2015). Volunteer field technicians are bad for wildlife ecology. *Wildlife Society Bulletin*, *39*, 819–821.

Gao, Y., & Li, B. V. (2021). Evaluation of the status, job satisfaction and occupational stress of Chinese nature reserve staff. *Global Ecology and Conservation*, *29*, e01731.

Gordon, T. A. C., Radford, A. N., & Simpson, S. D. (2019). Grieving environmental scientists need support. *Science*, *366*, 8–10.

Green, P., & Skinner, D. (2005). Does time management training work? An evaluation. *International Journal of Training and Development*, *9*, 124–139.

Hamilton, J. E. (2019). Cash or kudos: Addressing the effort-reward imbalance for academic employees. *International Journal of Stress Management*, *26*, 193–203.

Hickman, C. (2020). We need to (find a way to) talk about… eco-anxiety. *Journal of Social Work Practice*, *34*, 411–424.

Hickman, C., Marks, E., Pihkala, P., Clayton, S., Lewandowski, R. E., Mayall, E. E., Wray, B., Mellor, C., & van Susteren, L. (2021). Climate anxiety in children and young people and their beliefs about government responses to climate change: A global survey. *The Lancet Planetary Health*, *5*, e863–e873.

Hodge, B., Wright, B., & Bennett, P. (2020). Balancing effort and rewards at university: Implications for physical health, mental health, and academic outcomes. *Psychological Reports*, *123*, 1240–1259.

Jones, M. S., & Solomon, J. (2019). Challenges and supports for women conservation leaders. *Conservation Science and Practice*, *1*, e36.

Jones, M. S., Teel, T. L., Martinez, D. E., & Solomon, J. (2020). Conflict and adaptation at the intersection of motherhood and conservation leadership. *Biological Conservation*, *243*, 108487.

Jovarauskaite, L., & Böhm, G. (2021). The emotional engagement of climate experts is related to their climate change perceptions and coping strategies. *Journal of Risk Research*, *24*, 941–957.

Kahya, E. (2007). The effects of job characteristics and working conditions on job performance. *International Journal of Industrial Ergonomics*, *37*, 515–523.

Kessler, R. C., Andrews, G., Colpe, L. J., Hiripi, E., Mroczek, D. K., Normand, S. L., Walters, E. E., & Zaslavsky, A. M. (2002). Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychological Medicine*, *32*, 959–976.

Kossek, E. E., Valcour, M., & Lirio, P. (2014). The sustainable workforce: Organizational strategies for promoting work-life balance and wellbeing. Pages 295–318 in Chen PY, and Cooper CL, editors. *Work and wellbeing*. Wiley Blackwell.

Lamontagne, A. D., Martin, A., Page, K. M., Reavley, N. J., Noblet, A. J., Milner, A. J., Keegel, T., & Smith, P. M. (2014). Workplace mental health: Developing an integrated intervention approach. *BMC Psychiatry*, *14*, 131.

Lau, V. C. S., Au, W. T., & Ho, J. M. C. (2003). A qualitative and quantitative review of antecedents of counterproductive behavior in organizations. *Journal of Business and Psychology*, *18*, 73–99.

López-López, I. M., Gómez-Urquiza, J. L., Cañadas, G. R., De la Fuente, E. I., Albendín-García, L., & Cañadas-De la Fuente, G. A. (2019). Prevalence of burnout in mental health nurses and related factors: A systematic review and meta-analysis. *International Journal of Mental Health Nursing*, *28*, 1035–1044.

Mieg, H. A. (2009). Two factors of expertise? Excellence and professionalism of environmental experts. *High Ability Studies*, *20*, 91–115.

Milligan-Saville, J. S., Tan, L., Gayed, A., Barnes, C., Madan, I., Dobson, M., Bryant, R. A., Christensen, H., Mykletun, A., & Harvey, S. B. (2017). Workplace mental health training for managers and its effect on sick leave in employees: A cluster randomised controlled trial. *The Lancet Psychiatry*, *4*, 850–858.

Min, J. W., & Lee, S. H. (2015). Validation of the K6/K10 scales of psychological distress and their optimal cutoff scores for older Koreans. *International Journal of Aging & Human Development*, *80*, 264–282.

Monitor Deloitte. (2017). *Mental health and employers: The case for investment*. Author.

Moreto, W. D. (2016). Occupational stress among law enforcement rangers: Insights from Uganda. *Oryx*, *50*, 646–654.

Nature Climate Change. (2018). Focus on climate change and mental health. *Nature Climate Change*, *8*, 259.

Nature Ecology & Evolution. (2022). We need to talk about mental health. *Nature Ecology & Evolution*, *6*, 233.

Ohrnberger, J., Fichera, E., & Sutton, M. (2017). The relationship between physical and mental health: A mediation analysis. *Social Science and Medicine*, *195*, 42–49.

Papworth, S., Thomas, R. L., & Turvey, S. T. (2018). Increased dispositional optimism in conservation professionals. *Biodiversity and Conservation*, *28*, 401–414.

Patel, V., Saxena, S., Lund, C., Thornicroft, G., Baingana, F., Bolton, P., Chisholm, D., Collins, P. Y., Cooper, J. L., Eaton, J., Herrman, H., Herzallah, M. M., Huang, Y., Jordans, M. J. D., Kleinman, A., Medina-Mora, M. E., Morgan, E., Niaz, U., Omigbodun, O., & UnÜtzer, J. (2018). The Lancet Commission on global mental health and sustainable development. *The Lancet*, *392*, 1553–1598.

Petrie, K., Crawford, J., Baker, S. T. E., Dean, K., Robinson, J., Veness, B. G., Randall, J., McGorry, P., Christensen, H., & Harvey, S. B. (2019). Interventions to reduce symptoms of common mental disorders and suicidal ideation in physicians: A systematic review and meta-analysis. *The Lancet Psychiatry*, *6*, 225–234.

Pienkowski, T., Keane, A., Tickell, S. C. Y., Hazenbosch, M., Arlidge, W. N. S., Baranyi, G., Brittain, S., de Lange, E., Khanyari, M., Papworth, S., & Milner-Gulland, E. J. (2021). Balancing making a difference with making a living in the conservation sector. *Conservation Biology*, *36*, 1–13.

Pienkowski, T., Keane, A., de Lange, E., Kapoor, V., Khanyari, M., Ravi, R., Smit, I. P. J., Castelló y Tickell, S., Hazenbosch, M., Arlidge, W. N. S., Baranyi, G., Brittain, S., Papworth, S., Saxena, S., Hout, V., & Milner-Gulland, E. J. (2023). Psychological distress and workplace risk inequalities among conservation professionals. *Conservation Science and Practice*, 1–18. https://doi.org/10.1111/csp2.12918

Pienkowski, T., Keane, A., de Lange, E., Khanyari, M., Arlidge, W. N. S., Baranyi, G., Brittain, S., Castelló y Tickell, S., Papworth, M. H. S., & Milner-Gulland, E. J. (2022). Personal traits predict conservationists' optimism about outcomes for nature. *Conservation Letters*, *15*, 1–10.

Pienkowski, T., Kiik, L., Catalano, A., Hazenbosch, M., Izquierdo-Tort, S., Khanyari, M., Kutty, R., Martins, C., Nash, F., Saif, O., & Sandbrook, C. (2022). Recognizing reflexivity among conservation practitioners. *Conservation Biology*, *37*, 1–12.

R Core Team. (2020). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing.

Ramos, H. M., Mustafa, M., Primack, R., & Campos-Arceiz, A. (2017). What do conservation biologists think about their job and working conditions? *Biological Conservation*, *211*, 183–188.

Ridley, M., Rao, G., Schilbach, F., & Patel, V. (2020). Poverty, depression, and anxiety: Causal evidence and mechanisms. *Science*, *370*, eaay0214.

Rubin, D. B. (1987). Underlying Bayesian theory. Pages 1–76 in Rubin DB, editor. *Multiple imputation for nonresponse in surveys*. John Wiley & Sons.

Rugulies, R., Aust, B., & Madsen, I. E. (2017). Effort-reward imbalance at work and risk of depressive disorders. A systematic review and meta-analysis of prospective cohort studies. *Scandinavian Journal of Work, Environment & Health*, *43*, 294–306.

Sandbrook, C. (2015). What is conservation? *Oryx*, *49*, 565–566.

Sandbrook, C. (2019). From passion to professionalism and back again: The battle for the soul of conservation. Pages 150–151 in Wyborn C, Kalas N, and Rust N, editors. *Seeds of change: Provocations for a new research agenda*. Luc Hoffmann Institute.

Santomauro, D. F., Santomauro, D. F., Herrera, A. M. M., Shadid, J., Zheng, P., Ashbaugh, C., Pigott, D. M., Abbafati, C., Adolph, C., Amlag, J. O., Aravkin, A. Y., Bang-Jensen, B. L., Bertolacci, G. J., Bloom, S. S., Castellano, R., Castro, E., Chakrabarti, S., Chattopadhyay, J., Cogen, R. M., … Ferrari, A. J. (2021). Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic. *The Lancet*, *398*, 1700–1712.

Scandurra, C., Mezza, F., Maldonato, N. M., Bottone, M., Bochicchio, V., Valerio, P., & Vitelli, R. (2019). Health of non-binary and genderqueer people: A systematic review. *Frontiers in Psychology*, *10*, 1453.

Scheier, M. F., Carver, C. S., & Bridges, M. W. (1994). Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): A re-evaluation of the Life Orientation Test. *Journal of Personality and Social Psychology*, *67*, 1063–1078.

Siegrist, J. (1996). Adverse health effects of high-effort low-reward conditions. *Journal of Occupational Health Psychology*, *1*, 27–41.

Siegrist, J., Li, J., & Montano, D. (2019). *Psychometric properties of the Effort-Reward Imbalance Questionnaire*. Centre for Health and Society.

Siegrist, J., Starke, D., Chandola, T., Godin, I., Marmot, M., Niedhammer, I., & Peter, R. (2004). The measurement of effort-reward imbalance at work: European comparisons. *Social Science and Medicine*, *58*, 1483–1499.

Singh, R., Gan, M., Barlow, C., Long, B., McVey, D., Kock, R., Gajardo, O., Spina Avino, F., & Belecky, M. (2020). What do rangers feel? Perceptions from Asia, Africa and Latin America. *Parks*, *26.1*, 63–76.

Smith Kristin, A., Arlotta, P., & Watt, F. M., Solomon, S. L., Initiative on Women in Science and Engineering Working Group. (2015). Seven actionable strategies for advancing women in science, engineering, and medicine. *Cell Stem Cell*, *16*, 221–224.

Stevenson, D., & Farmer, P. (2017). *Thriving at work: The Stevenson /Farmer review of mental health and employers*. Department for Work and Pensions and Department of Health.

Swaisgood, R. R., & Sheppard, J. K. (2010). The culture of conservation biologists: Show me the hope! *BioScience*, *60*, 626–630.

Tusaie, K. R., & Patterson, K. (2006). Relationships among trait, situational, and comparative optimism: Clarifying concepts for a theoretically consistent and evidence-based intervention to maximize resilience. *Archives of Psychiatric Nursing*, *20*, 144–150.

Uchino, B. N. (2006). Social support and health: A review of physiological processes potentially underlying links to disease outcomes. *Journal of Behavioral Medicine*, *29*, 377–387.

Universal Ranger Support Alliance (URSA). (2021). *Action plan for supporting implementation of the International Ranger Federation's Chitwan Declaration and furthering the professionalisation of rangers (2021 - 2025)*. https://www.ursa4rangers.org/ursa4rangers-resources/

Urbina-Garcia, A. (2020). What do we know about university academics' mental health? A systematic literature review. *Stress and Health*, *36*, 563–585.

van Buuren, S., & Groothuis-Oudshoorn, K. (2011). mice: Multivariate imputation by chained equations in R. *Journal of Statistical Software*, *45*, 1–67.

van der Molen, H. F., Nieuwenhuijsen, K., Frings-Dresen, M. H. W., & de Groene, G. (2020). Work-related psychosocial risk factors for stress-related mental disorders: An updated systematic review and meta-analysis. *BMJ Open*, *10*, e034849.

Vercammen, A., Park, C., Goddard, R., Lyons-White, J., & Knight, A. (2020). A reflection on the fair use of unpaid work in conservation. *Conservation and Society*, *18*, 399–404.

Viertiö, S., Kiviruusu, O., Piirtola, M., Kaprio, J., Korhonen, T., Marttunen, M., & Suvisaari, J. (2021). Factors contributing to psychological distress in the working population, with a special reference to gender difference. *BMC Public Health*, *21*, 611.

Waddell, G., & Burton, K. (2006). Is work good for your health and well-being? The Stationary Office. https://cardinal-management.co.uk/wp-content/uploads/2016/04/Burton-Waddell-is-work-good-for-you.pdf

World Health Organization (WHO). (2004). *Promoting mental health: Concepts, emerging evidence, practice: Summary report*. Author.

World Health Organization (WHO). (2022a). *WHO guidelines on mental health at work*. Author.

World Health Organization (WHO). (2022b). *World mental health report: Transforming mental health for all*. Author.

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