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Women's thirty-year contribution to cheetah conservation: An insight into volunteer-based conservation program supported by female scientists

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Women make up a small percentage of the scientific community, including conservation. Today, conservation efforts are vital for the survival of many species, however there is a gender bias within the conservation field. Encouraging more women into conservation could be a key to increasing efficiency and success in conservation goals of organizations and governments. Here we investigate the long running Earthwatch, working guest and intern volunteer programs of the Cheetah Conservation Fund (CCF) to understand women's involvement with volunteer based conservation, and questionnaire data to understand women's contribution to conservation after volunteering and what challenges women face in conservation. Our results showed there was significantly more female volunteers than male volunteers (p-value <0.000) and on average, females contributed to 73.7% of the volunteer population annually. Volunteer's age at time of volunteering varied between the three volunteer programs. Women's motivations for volunteering and challenges that women face in conservation was dependent on the volunteers' age. CCF's holistic approach to conservation, volunteers' love for cheetahs and ability to gain practical skills were the leading motivations why women volunteered with CCF. Many (87%) of the female interns said volunteering was a means of helping them gain employment. Women's credibility, family responsibility and personal safety were the main challenges that women face working in conservation today. Addressing gender disparities in every stage of career progression will lead to overall improved conservation outcomes.

KEYWORDS

female, conservation, cheetah, STEM - science technology engineering mathematics, volunteer, intern

Introduction

Most of the world's biodiversity today is threatened with extinction (Wake and Vredenburg, 2008; Ceballos et al., 2020), and the survival of many species relies heavily on conservation (Zegeye, 2017). *Ex-situ* conservation programs are known to help with species survival by maintaining insurance populations, and reintroduction of populations, that were once extinct in the wild (Russello and Amato, 2007; Xia et al., 2014; Grant et al., 2021). Many *in-situ* conservation programs help mitigate human-wildlife conflict, and provide community-based education programs throughout the species home range to ensure the survival of the species (Gusset et al., 2009; Sapkota et al., 2014). This is also the case for *in-situ* cheetah (*Acinonyx jubatus*) programs in Africa (Marker and Boast, 2015; Marker et al., 2020).

Despite the growing need for increased conservation efforts, there is a gender bias within the conservation field (Lievano-Latorre et al., 2020; Diele-Viegas et al., 2022). For STEM (science, technology, engineering, and mathematics) based fields, women make up only 28% of the global work force (UNESCO, 2017). There are various barriers and bias that contributes to promoting unequal opportunities and therefore women's contribution to scientific research (Davies et al., 2021). Barriers include 1) leave and pay inequity, 2) women's heavier care, domestic and office workloads, 3) conscious and unconscious bias which include discrimination and harassment and 4) lack of recognition (e.g. less funding or under cited in peer-review literature) (Elder and Schmidt, 2004; Sardelis and Drew, 2016; Jones and Solomon, 2019; Jones et al., 2020; Giakoumi et al., 2021). The lack of promotion and the gender pay gap are the leading reasons why most women leave the STEM industry (Hunt, 2016). According to Alvarez and Lovera (2016), it is only recently that the Conference of the Parties to the Convention on Biodiversity has taken tangible steps in an effort to mainstream gender in different biodiversity policies. It is therefore clear that women have not been accorded to have equal opportunities in research and conservation science in history.

The first step to increase diversity among leaders who drive research decisions and guide conservation science is gender diversity (Vollan and Henry, 2019). Recent research shows that having a gender equilibrium in conservation can positively influence conservation outcomes (Giakoumi et al., 2021), thus highlighting the need to encourage more women into conservation and removing the gender bias. Men and women bring different perspectives to conservation and climate-related issues, and the lack of gender diversity could impact research (James et al., 2022). Despite their under-representation in conservation, women have significant knowledge about the environment which they pass onto to other women through cultural (song, dance, storytelling) and daily labor practices (Goldman et al., 2021).

The Cheetah Conservation Fund (CCF), a science driven conservation organization based in Namibia, is dedicated to saving the wild cheetah. This non-profit organization was founded in 1990 by a female American conservation scientist, with operations being carried out by professional staff and the support of volunteers. Volunteers are a vital component in supporting the daily operations of CCF and therefore the conservation of the cheetah. Environmental organizations, both governmental and private, rely on unpaid volunteers to further the cause of preserving and assisting the threatened natural environment (Bruyere and Rapee, 2007). Worldwide, volunteers contribute the equivalent of US$48.8 billion (volunteer worth in Africa) and US$561.8 billion (volunteer worth in North America) per year in volunteer labor (Salamon et al., 2011). Without the assistance of many thousands of committed volunteers worldwide, the environmental movement would not exist (Bruyere and Rapee, 2007). For conservation organizations, like CCF, volunteer-based tourism provides additional labor while generating extra funds (Brightsmith et al., 2008). This means the donation dollar stretches further, thus allowing conservation organizations to spend more money in other essential areas, instead of spending limited funds on staff salaries.

The motivations for why women get involved in conservation may differ for women across the world. For some women in Africa and other parts of the developing world, the need to conserve biodiversity is crucial because of their dependence on the natural environment for subsistence and the association of the natural environment with cultural and spiritual values (Alvarez and Lovera, 2016). Additionally, people pursue volunteer-based tourism for their own satisfaction and for their opportunity for personal and profession growth (Han et al., 2019). Further understanding of volunteer motives for taking part in nature conservation programs is therefore crucial in designing and implementing programs aimed at utilizing the talents and labor that volunteers contribute to conservation efforts in an increasingly significant way (Caissie and Halpenny, 2003). Since its founding, CCF has hosted volunteers from around the world, from many STEM-based disciplines such as biomass demonstration, genetics, ecology, veterinary medicine and conservation. Volunteers are able to participate in activities from across CCF's different disciplines. CCF volunteers can be categorized into three groups, Earthwatch, working guests, and student interns with each program playing an important role in CCF's 31 year history. Earthwatch volunteers participated with CCF as a group of volunteers, who registered with Earthwatch Institute for a set duration based on the expedition length until 2013 when the program stopped coming to CCF, while student interns often volunteer as part of their higher education, or just after they have finished school and working guests are typically people who

want to volunteer while on holiday, or professionals volunteering their time with a specific CCF program. Volunteers are able to apply to join CCF's volunteer programs from an online application process and are selected based on their skills and attitude towards conservation. Gender and nationality plays no part in the recruitment of volunteers into CCF's volunteer programs. Hard working and passionate volunteers have been known to gain paid internships or offered a paid position with CCF after completing their volunteer program. Other individuals have been able to gain employment with other conservation organizations.

Here we analyze CCF's past Earthwatch, working guest and intern volunteer programs and female based questionnaire data to understand women's motivations into volunteering at CCF, how they have contributed to the conservation of the cheetah and some of the challenges women faced in the conservation field.

Methods

Volunteer program database

A volunteer database was compiled using information obtained from CCF's comprehensive volunteer database from 2000 - 2021. Limited information was available for volunteers in the 1990's and early 2000's. However, Earthwatch volunteers were a major group of volunteers before early 2000 when CCF's Research and Education Centre was opened. Where possible, information for all of the volunteers were included in the analyses.

Some of the volunteers (3.5% (*n=22*) Earthwatch, 16.2% (*n=115*) and 1.0% (*n=5*) working guests and interns) were unable to be assigned a gender due to either having a unisex name, or the database only having an initial recorded, so these volunteers were excluded from gender based analyses. Over half (71.5%; *n=507*) of the Earthwatch volunteers, and 6.7% (*n=52*) of the working guests were unable to be assigned a year they volunteered, so these volunteers were excluded from any year-based analyses. The year of volunteering was included for all interns.

Volunteer demographics (age at volunteering, length of volunteer program and repeat volunteer) was averaged and compared between male versus female volunteers per volunteer program and overall (male and female volunteers) between the three volunteer programs. The volunteer demographic results presented with the standard deviation is the mean unless otherwise stated. A chi-square goodness of fit test was performed at the 0.05 per cent significant level using R version 3.5.2 (R Core Team, 2017) to compare the difference between the overall (interns, working guests and Earthwatch) number of female and male volunteers. Women's contribution to each volunteer program was analyzed by calculating the percentage of female volunteers per year.

Administered survey

Two questionnaire surveys were developed based on the type of volunteer experience at CCF (intern/working guest or Earthwatch volunteers) and were sent to all female volunteers *via* email. Each questionnaire survey consisted of a combination of 11 opened-ended and closed-ended questions (Appendix A and B). They were asked to return the survey *via* email within 16 days. Survey participants included past volunteers from across different age groups and different nationalities, representing a good sample of CCF's past volunteers. Participation in the survey was voluntary, and all survey statistics were analyzed using Microsoft Excel 2013. For open-ended questions, the answers were scored and categorized to compare women's responses. Participants often indicated multiple categories within their answers, so one participant's answer was scored to the multiple corresponding categorizes. For the purpose of this study, only the questions addressing the three main aims were included in the analyses.

Results

Volunteer database analysis

Between 1990 and 2021, CCF hosted a total of 1,905 volunteers at their Namibian headquarters. Of this, 768 volunteers were working guests, 486 student interns, 709 Earthwatch volunteers (1997-2013) and 57 (3%) people had volunteered as a multi-program volunteer (e.g. Earthwatch volunteer who later returned to volunteer as either an intern or working guest). There were significantly more female (*n=1,321*; 69.6%) volunteers than male volunteers (*n=438*; 23.0%; $x^2 = 458$, *df=1, p-value <0.000*) (Table 1). The majority (75.4%; *n=43*) of the multi-program volunteers were female.

Women's involvement in CCF's volunteer programs have ranged annually between 54% and 100% for interns and working guests, and between 60% and 100% for Earthwatch volunteers (Figure 1). Annually, there is an average of 72.9% women interns and 74.6% female working guests. Female Earthwatch volunteers represented 80.9% of the Earthwatch volunteer program each year. There has been a constant growth in CCF's volunteer programs since 1990, excluding 2020 and 2021 where there was a drastic decline in the intern and working guest volunteer programs due to the Covid-19 pandemic (Figure 1).

The Earthwatch volunteers originally volunteered for a period of a month, then decreased to three weeks in 1999, and two weeks in 2000, as this was the design of the volunteer

TABLE 1 Overview of CCF's volunteers expanding 31 years including volunteer age and length of volunteering.

		Working Guest			Intern			Earthwatch		
		Male	Female	(U) Total	Male	Female	(U) Total	Male	Female	(U) Total
	Total	177	567	(24) 767	120	361	(5) 486	155	441	(113) 709
Age (yrs)	N	90	259	352	95	279	374	12	36	48
	Min	15	14	14	17	16	16	16	18	16
	Max	79	78	79	54	69	69	79	88	88
	Avg	40.4	39.2	39.4	22.9	23.9	23.6	45.1	57.3	54.3
	SD	16.4	16.6	16.5	5.3	6.5	6.3	19.8	17.6	18.6
	Median	38.5	37	37	22	22	22	41	61.5	58
Length of stay (wks)	N	157	427	599	108	338	453			
	Min	0.25	0.25	0.25	1	0.25	0.25			
	Max	108	52	108	52	52	52			
	Avg	6.6	5	5.4	10.5	8.4	8.8			
	SD	13.8	7.3	9.4	9.3	7.3	7.9			
	Median	2.5	2.5	2.25	8	6	6			
Repeat volunteering	N	22	35	57	8	10	18	4	5	9
	Min	2	2	2	2	2	2	2	2	2
	Max	6	13	13	4	3	4	2	2	2
	Avg	2.9	2.8	2.8	2.3	2.1	2.1	2	2	2
	SD	1.3	2	1.8	0.7	0.3	0.5			
	Median	2.5	2	2	2	2	2			

Earthwatch volunteer program ran from 1997-2013 and *U* represents the number of unknown genders of volunteers.

program. For the working guests, people volunteered for 5.4 weeks (± 9.4) and interns volunteered for 8.8 weeks (± 7.9) (Table 1). For both working guests and interns, the shortest volunteer period was two nights (0.25) and the maximum volunteer period was 2 years for working guests and 1 year for interns. Men had a slightly longer (6.6 ± 13.8 weeks for working guests; 10.5 ± 9.3 for weeks for interns) volunteer period compared to women for both working guests and interns (5 weeks for working guests and 8.4 weeks for interns) (Table 1). More working guests (7.4%) returned to volunteer multiple times compared to interns (3.7%), although there was no difference between the number of times a volunteer would return for further volunteer experiences between the two groups of volunteers (Table 1).

Interns were the youngest volunteer group (23.6 ± 6.3 years), compared to working guests (39.4 ± 16.5 years) and Earthwatch volunteers (54.2 ± 18.6 years) (Table 1). Male working guests (40.4 ± 16.4 years) were slightly older than female working guests (39.2 ± 16.6 years), whereas female interns (23.9 ± 6.5 years) were slightly older than male interns (22.9 ± 5.3 years) (Table 1). There was a larger age difference between male (45.1 ± 19.8 years) and female (57.3 ± 17.6 years) Earthwatch volunteers.

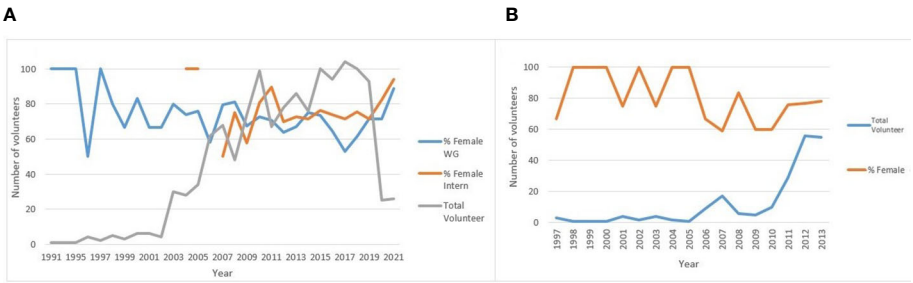

FIGURE 1
Percentage of women's involvement with CCF's **(A)** intern and working guest (WG) volunteer programs and **(B)** Earthwatch volunteer program with total representing the total number of volunteers per year.

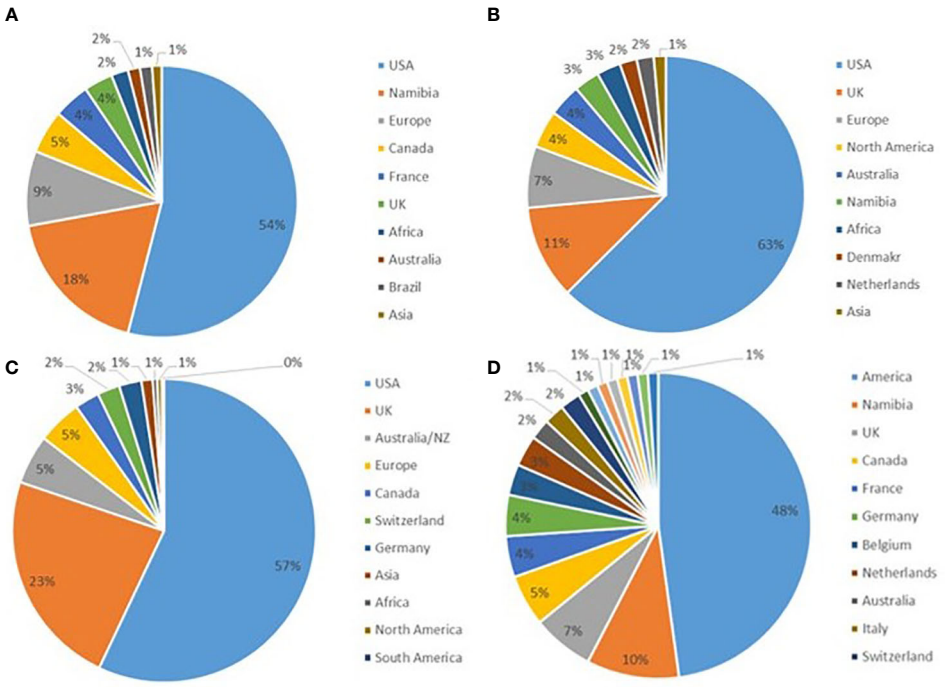

FIGURE 2
Country distribution of female **(A)** interns, **(B)** working guest, **(C)** Earthwatch volunteers and **(D)** survey participants. Countries that had less than 10 volunteers were analyzed as part of the continent.

The majority of the volunteers for all volunteer programs were of American nationality (Figure 2).

Survey responses

A total of 507 working guests, 340 interns, and 347 Earthwatch surveys were sent out to people *via* email. Of this 28.2% (*n=143*), 20.6% (*n=70*), and 30.2% (*n=105*) working guest, intern and Earthwatch, respectively, email addresses were no longer available (returned to sender). A total of 40 (11.0%) working guests, 32 (11.9%) interns, and 21 (8.7%) Earthwatch volunteers returned their completed survey before the deadline (Table 2).

Overall, the main motivation why females volunteered at CCF was because of CCF's approach to conservation (36.3%; *n=33*). People's love of cheetahs (30.8%; *n=28*), and their interest to travel (28.6%; *n=26*) were key aspects in why women chose to volunteer at CCF (Table 3). There was a difference in women's motivations to volunteer, based on their previous volunteer experiences. Earthwatch volunteers primarily joined CCF's programs to travel (57.1%; *n=12*), and for their love of cheetahs (52.4%; *n=11*), while working guests volunteered at CCF for their appreciation of CCF's approach to conservation (47.5%; *n=19*), and their love of cheetahs (35.0%; *n=14*). Interns indicated that they volunteered at CCF to gain practical experience (46.7%; *n=14*), and because of their appreciation of CCF's approach to conservation (43.3%; *n=13*) (Table 3).

When asked if volunteering at CCF was able to help women go into conservation related employment, 87.5% (*n=28*) of the surveyed interns, and 32.5% (*n=13*) working guests replied with '*yes*' (Table 3). The majority (89.5%; *n=17*) of the surveyed

TABLE 2 Demographics of female survey participants from CCF's volunteer programs.

Volunteer type	Sent	Delivered	Replied	Min Age	Max Age	Avg Age	SD	# Nationalities
Working Guest	507	364	40 (11.0%)	35	77	56.7	11.2	13
Intern	340	270	32 (11.9%)	22	52	30.2	6.5	12
Earthwatch	347	105	21 (8.7%)	39	97	64.1	13.7	6
Total	1194	739	93 (12.6%)	22	97	48.9	17.5	19

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TABLE 3 Female responses to survey questions relating to volunteering and women in conservation, for three different types of volunteer experience.

Question/Answer	Interns (%)	Working Guest (%)	Earthwatch (%)	Total (%)
* Q.1 Why did you volunteer at CCF?				
CCF's approach	13 (43.3)	19 (47.5)	1 (4.8)	33 (36.3)
Loves cheetahs	3 (10.0)	14 (35.0)	11 (52.4)	28 (30.8)
Travel	7 (23.3)	7 (17.5)	12 (57.1)	26 (28.6)
Practical experience	14 (46.7)	8 (20.0)	1 (4.8)	23 (25.3)
Passion	5 (16.7)	4 (10.0)	0 (0.0)	9 (9.9)
School	4 (13.3)	2 (5.0)	1 (4.8)	7 (7.7)
To go into conservation	0 (0.0)	0 (0.0)	6 (28.6)	6 (6.6)
Learn more	0 (0.0)	4 (10.0)	0 (0)	4 (4.4)
Inspired	1 (3.3)	3 (7.5)	0 (0.0)	4 (4.4)
Q.2 Did volunteering help your career				
Yes	28 (87.5)	13 (32.5)	–	41 (56.9)
No	2 (6.25)	23 (57.5)	–	25 (34.7)
Neutral	2 (6.25)	4 (10.0)	–	6 (8.3)
Q.3 Did you join Earthwatch to get involved with conservation				
Yes	–	–	17 (89.5)	
No	–	–	2 (10.5)	
**Q.4 Motivation to join conservation*				
Compelled to help	9 (29.0)	16 (43.2)	15 (75.0)	40 (45.5)
Passion	14 (45.2)	14 (37.8)	4 (20.0)	32 (36.4)
Interest	6 (19.4)	7 (18.9)	2 (10.0)	15 (17.0)
Inspired	3 (9.7)	3 (8.1)	0 (0)	6 (6.8)
Love for cheetahs	1 (3.2)	3 (8.1)	0 (0)	4 (4.5)
Opportunity	0 (0.0)	2 (5.4)	1 (5.0)	3 (3.4)
School	2 (6.5)	0 (0.0)	0 (0)	2 (2.3)
Travel	0 (0.0)	0 (0.0)	2 (10.0)	2 (2.3)
*Q.5 Challenges women face in conservation				
Credibility	15 (55.6)	11 (32.4)	-	26 (42.6)
No challenges identified	2 (7.4)	7 (20.6)	-	9 (14.8)
Safety	6 (22.2)	3 (8.8)	-	9 (14.8)
Pregnancy/family	6 (22.2)	2 (5.9)	-	8 (13.1)
Others	2(7.4)	5(14.6)	-	7(8.2)
Physical challenges	3 (11.1)	3 (8.8)	-	6 (9.8)
Respect	2 (7.4)	4 (11.8)	-	6 (9.8)
Sexism/discrimination	2 (7.4)	4 (11.8)	-	6 (9.8)
Stereotypes	2 (7.4)	3 (8.8)	-	5 (8.2)
Lack of opportunities	2 (7.4)	2 (5.9)	-	4 (6.6)
Q.6 Do men face the same challenges				
No	24 (84.4)	14 (42.4)	-	41 (63.1)
Yes	3 (9.4)	11 (33.3)	-	14 (21.5)
Unsure	2 (6.3)	7 (21.2)	-	9 (13.8)
Equal	0 (0)	1 (3.0)	-	1 (1.5)
Q.7 Is conservation male or female dominated				
Male	16 (50.0)	12 (31.6)	5 (23.8)	33 (36.7)
Equal	5 (15.6)	12 (31.6)	9 (42.9)	26 (28.9)
Female	11 (34.4)	10 (26.3)	3 (14.3)	24 (26.7)
Unsure	0 (0.0)	4 (10.5)	4 (19.1)	8 (8.9)
Q.8 Is there a difference between male vs female ran programs				

(Continued)

TABLE 3 Continued

Question/Answer	Interns (%)	Working Guest (%)	Earthwatch (%)	Total (%)
No	–	–	11 (57.9)	
Yes	–	–	5 (26.3)	
Unsure	–	–	3 (15.8)	
Q.9 How difficult was it for you to join conservation				
Easy	13 (40.6)	14 (37.8)	–	27 (39.1)
Neutral	12 (37.5)	6 (16.2)	–	18 (26.1)
Hard	4 (12.5)	10 (27.0)	–	14 (20.3)
Very Easy	1 (3.13)	6 (16.2)	–	7 (10.1)
Very Hard	2 (6.25)	1 (2.7)	–	3 (4.4)
Q.10 Supported conservation financially				
Yes	–	–	18 (90)	
No	–	–	2 (10	

Dash represents the question was not included in the survey for that volunteer program and * represents open ended questions.

Earthwatch volunteers said they joined Earthwatch to get involved with conservation (Table 3). Nearly half (49.2%) of the survey participants found it either easy or very easy to join conservation (Table 3). Very few (4.4%; *n*=3) survey participants mentioned it was very hard for them to join conservation (Table 3). The majority (90%; *n*=18) of the Earthwatch volunteers admitted to still be financially involved with CCF since their volunteer experience.

Women's biggest motivation to go into conservation was feeling compelled to help nature (45.5%; *n=40*). The second biggest motivation was passion about conservation and the natural world (36.4%; n=32), while only 4.5% (*n=4)* of participants mentioned going into conservation specifically for their love of cheetahs (Table 3). Six (6.8%) people mentioned they were inspired to join conservation as a career, either after volunteering at CCF or inspired by friends and family. For interns, passion (45.2%; *n=14*) was the main motivation to join conservation, while being compelled to help was the main motivation for working guests (43.2%; *n=16*) and Earthwatch volunteers (75.0%; *n=15*) (Table 3).

The main identified challenge that women face in conservation was credibility (42.6%; *n=26*). Other leading challenges included safety (14.8%; *n=9*), pregnancy/family implications (13.1%; *n=8*) and sexism/discrimination (9.8%; *n=6*) (Table 3). Over half of the surveyed interns mentioned credibility (55.6%; *n=15*) as a challenge they faced working in the conservation field. Women mentioned that they had to be more aggressive with presenting their opinions and credibility also extended outside of their organization of work (Table 4). It was also noted that safety was more of a challenge for interns (22.2%; *n=6*) compared to working guests (8.8%; *n=3*) (Table 3). One women shared that she had previously turned down a field position because the safety risk was too great for a women (Table 4). When asked if men faced the same challenges as women, 63.1% (*n=41*) of participants did not believe men have the same challenges. Fourteen (21%) participants said men face challenges in conservation, but were of a lesser degree to their female counterparts.

Survey participants suggested there was no substantial gender bias in conservation. Males, on average, were believed to dominate in conservation (36.7%; *n=33*) compared to 26.7% (*n=24*) who believed women were dominant in conservation (Table 3). Twenty-six (28.9%) survey participants indicated that men and women were equal in conservation. The majority (57.9%; *n=11*) of women said there was no difference between how conservation organizations were operated based on the gender of the person in charge.

Discussion

Women's motivations to conservation

The findings of this study indicate that what motivated women to volunteer more than 15 years ago is still what motivates people today (Bruyere and Rappe, 2007). The motivations for why women volunteered at CCF were consistent with those found by Caissie and Halpenny (2003), in which pleasure seeking and program perks were two of the five motivations. Motivations for why people volunteered at CCF were also consistent with some of those found by Bruyere and Rapee (2007), which included learning and project organization, and gaining job-related experience. In addition women who volunteered at CCF mentioned one of the reasons they volunteered was due to CCF's holistic approach to conservation, which is similar to Bruyere and Rapee (2007). Holistic conservation approaches are important as they take into consideration the underlying social, cultural and economic perspectives when conserving species (Zimmermann and Stevens, 2021). This suggests the reputation of the

TABLE 4 Noteworthy survey responses from female volunteers.

Volunteer type	Age now	Response
Q4. Challenges women face in conservation		
Intern	29	Fieldwork can be downright dangerous as the only women. There is also a boy's club when it comes to getting opportunities
Intern	28	Safety is a key concern of mine and one that has led me to reject project opportunities due to working alone in the field
Intern	24	Respect; if a male ranger walked up to a poacher and told them it's illegal, thy would listen but if a women did the same I don't think it would end well for either parties
Intern	34	Often women have to stand up for themselves and be slightly more "aggressive" or direct because we aren't taken as seriously. This can sometimes cause conflict between co-workers
Intern	30	I think woman have in all the fields more things to prove and to demonstrate to the entire world.
Intern	29	Being female you are not taken seriously most of the time, working with male farmers is challenging as females are often looked upon as being 'soft' or 'tree huggers'
WG	59	Safety will always been an issue to women
WG	56	Getting in – there is still a boy's club at the very top
WG	39	Landowners or agriculture people trust men's opinions more than female opinions
WG	64	Farmers don't take you seriously as a female
WG	51	Farmer would rather speak to male students than me who is qualified female vet
Q.8 Is there a difference between male vs female ran programs		
EW	79	You should be more concerned about saving the species, rather than male/female domination

Question number relates to the question number in Table 3. WG, working guest; EW, Earthwatch volunteer.

organization is an important consideration in deciding which organization to volunteer with. Our results were further consistent with Byrne et al. (2018) in which passion and enthusiasm for the natural environment were driving factors to volunteer in conservation.

People's trust in a volunteer tourism organization influences their intentions to participate with the organization (Han et al., 2019). This could explain the increase in volunteer numbers at CCF over the past 31 years. CCF has maintained a constant engagement with people and the reputation of CCF as a volunteer tourism organization has remained positive over the last three decades. Although this study only focused on the people who have volunteered at CCF's headquarters in Namibia, many international volunteers have also provided their time to important fundraising and education programs outside of Namibia. Many of these international fundraising and education programs would not have been possible without the support of CCF's international volunteers. Thus, suggesting the personnel required to prevent a species from going extinct is a lot larger than the number of volunteers reported in this study.

Despite having significantly more female volunteers than male volunteers across all three of CCF's volunteer programs, there was little to no difference in gender-based volunteer demographics (age at volunteering, length of volunteering, repeat volunteers). However, there was a difference between the average ages of volunteers for the different volunteer programs. Volunteers were given equal opportunities to participate in CCF's programs, and the younger volunteers saw this as an opportunity to start their careers in conservation. This finding is consistent with other studies that show that men and women often start their careers in conservation as equals, and it is only when you look at higher positions that women's gender impacts their ability to succeed in science (Blickenstaff, 2005; Giakoumi et al., 2021).

Additionally, the main motivation for interns to volunteer was to gain practical experience working with either cheetahs or in conservation. Although CCF is based in Namibia, volunteers are able to develop professional skills that are transferrable to other cheetah conversation jobs around the world, by learning directly alongside professional staff in the cheetah's rangeland. Almost half (49.2%) of the women in this study found it easy to gain employment in conservation as a result of them gaining practical experience in conservation and working with cheetahs. For those who did not gain employment in conservation after volunteering at CCF, it was due to them already having an established career outside of conservation or already retired, and they participated in volunteer conservation as a hobby.

In a study by James et al. (2021), there was a positive correlation between women's involvement and environmental outcomes, and the lack of female involvement could therefore affect desired conservation outcomes as women are known to interact differently with the environment. Women's involvement at every level is therefore beneficial to conservation as they bring different perspectives (James et al., 2022).

Other motivations for women volunteering at CCF included 'love for cheetahs' or passion for wildlife or the natural world. This finding is consistent with other studies which also included

that passion and enthusiasm for the natural environment were the main motivations to volunteer in conservation (Byrne et al., 2018; Poor et al., 2021). Guiney and Oberhauser (2009) found almost all volunteers felt nature was strongly important to them and they felt connected with nature when participating in volunteer conservation. These authors also found that connection with nature often started during childhood as volunteers were allowed to explore the natural world as a child, suggesting that people are taught from a young age to love the natural world and this reflects into adulthood. This strong love for nature or a particular animal, can then become a strong motivation which drives people to contribute their part to preserving the environment.

It is also worth considering the fact many of CCF's volunteers are self-funding which might affect people's motivations to volunteer. Despite wanting to find a strong connection to nature or willing to help conservation, only those who could financially afford to volunteer were able to participate in volunteer conservation, due to the financial burden volunteering incurs. Therefore, people with restricted finances are potentially missing out on opportunities to volunteer and develop skills that is important to starting a career in conservation. This could explain why the majority of the volunteers were from the USA.

Women's contribution to conservation

Our results showed that women's contribution to cheetah conservation changes throughout one's life. Younger volunteers (interns) showed a greater interest in contributing to conservation by gaining employment in conservation after their volunteer experience at CCF. Whereas, middle aged (working guests) volunteers were more likely to return for multiple volunteer experiences which contributed to conservation by labour and financially, and older (Earthwatch) volunteers continued to contribute to cheetah conservation by financial donations after their volunteer experience at CCF.

Financial support from individuals has been linked with threat appraisal of the target species and the coping appraisal of the threat of extinction towards the target species (Eylering et al., 2022). In other words, people are more willing to donate to courses/organizations based on how vulnerable to extinction the target species is and how an organisation is preventing the species from going extinct. This willingness to donate financially varies globally and women are more likely to donate than men (Eylering et al., 2022). This is consistent with our findings as 90% of the Earthwatch survey participants stated they were financially connected to CCF through donations.

At present, 47% of CCF's professional staff started their career in conservation *via* CCF's volunteer programs (unpublished data). This highlights the importance of volunteer conservation has, not just to the environment, but also to career progression within the field of conservation.

Women's challenges in conservation

Our results showed that women's credibility is still a main challenge. A number of studies have also highlighted that women struggle to be taken as seriously as men or given the same respect that men receive in the work environment (Holleran et al., 2011; Sardelis and Drew, 2016; Jones and Solomon, 2019). This makes it easier for women to lose their credibility or have their ideas dismissed. This lack of respect or the ability to see women as knowledgeable as men is not just amongst co-workers or managers, but also extends to farmers/landowners who will judge female conservationists and would not be as willing to work with them compared to their male counterparts. This has been observed by four of our survey participants. One survey participant went on to say that women needed to be more aggressive and assertive to get their message across.

Although many of the higher-level conservation positions are dominated by men who often do not see or acknowledge women's challenges in conservation or other STEM based fields (Blickenstaff, 2005; Jones and Solomon, 2019), our results showed that women perceived no influential difference in how men or women run conservation programs. One survey participant did say that organizations should be more concerned about saving a species rather than what gender was in management positions, suggesting no reason why high-level conservation positions should be dominated by men. However, gender bias continues to be seen. Recent research suggests this bias might be narrowing, as today female researchers are publishing more research compared to 60 years ago (James et al., 2022). Although, the same study also showed that men still continue to publish more literature than women. One way to overcome this challenge is the use of a double-blind peer review process which can result in significantly more female led research being published (Darling, 2014). It is essential to include women in conservation, as women are known to interact differently with the environment thus preventing women's involvement in conservation could lead to women's knowledge and perspectives being excluded from conservation actions (James et al., 2021).

Safety was the second leading challenge identified by women in this study and globally it is a big concern for women working in conservation, especially when it comes to field work and having to work in remote locations. For the purpose of this study, safety included both physical and sexual safety. Many female conservationists from Jones and Solomon (2019) study had either been victims of sexual harassment, or were forced to listen to sexual harassment from men in higher positions, with

several of their participants suggesting sexual harassment worsens when doing field work. This is consistent with some of the responses from the participants in this study, where one participant mentioned she had given up project opportunities outside of CCF's volunteer programs due to safety concerns or another women who believed that field work will always remain an issue to women. To help mitigate potential safety issues, women will tend to hire a field assistant when conducting field work (McGuire et al., 2012). Additionally, codes of conduct and sexual harassment policies for field work have the potential to improve field work safety, especially for women, trainees and early career stage conservationists (Clancy et al., 2014).

Our results also showed that women in their early career stages also struggle with pregnancy/family challenges that are associated with women working in conservation. Interestingly, women who already had established careers did not see family challenges while working. Poor et al. (2021) also found this and suggested mature women were in a better financial position in their careers where they could afford childcare and they didn't see the challenges of raising a family while working. Women tend to be early into their careers around the same time they start planning a family, making it difficult for women to either undertake field work while pregnant or having to leave young children behind for long periods of time. There is also concerns that certain activities (e.g. carrying heavy loads) are linked with increased health complications to women and their unborn child (e.g., increased risk of miscarriage or stillbirth) (Wan et al., 2011). Pregnant women also need to take additional precautions when working in the field, as parasite and disease infections can be more serious for these women (Wan et al., 2011; Makala et al. 2020). Women also tend to be the caretaker of the family and will often be the one responsible for taking care of sick family members (Wan et al., 2011) and often have heavier workloads in providing for the household (Mollel and Mtenga, 2000; James et al., 2021), especially in the African context. These additional requirements put on women by society leads to less time spent on their careers compared to men which could have ripple efforts into promotion or recognition.

Although only a minor challenge for women in this study, having few female based-role models in the forefront can be a challenge to inspire younger women into a conservation career (Byrne et al., 2018). The results from this survey showed that role models can have a positive influence in encouraging women to join conservation, as six women were inspired to join conservation after either listening to a women-led presentation or volunteering at CCF. Mentorship and role models are important for assisting women's productivity in conservation (McGuire et al., 2012). Sardelis and Drews (2016) study showed that women who are already in an established scientific career will often support other female scientists, and provide them with opportunities to share their findings at conferences. Although female-based role models were not a motivation to volunteer at CCF, CCF has a high percentage of female staff, with a high percentage of management and senior positions carried out by women, which provide strong role models for other women in conservation. Institutions in Australia for instance, have realized the gender bias against women and are working to change this and achieve non-gender bias in the Australian scientific community (Byrne et al., 2018). A study by Butler et al. (2018), showed there was a significance difference in how men and women use forest environments, with men typically managing the area for wildlife and commercial timber harvest, while women tended to be less active managers.

The cultural aspect was another challenge which came up in this study. Many societies will place a higher social value on men than females, which leads to gender inequality in education, reproductive health choices and violence against women (Barnett, 1997; Ansari and Shahid, 2022). Social norms are learnt through socialization and can prevent people's freedom (Cislaghi, 2018). Cislaghi (2018) has shown that women's ability to change social norms is possible but it requires a great number of women to behave differently in front of others and both men and women have to accept this new behavior. In addition the volunteer market is still very new in Africa, especially in Namibia, the country in which CCF is headquartered. Most Namibians will volunteer at CCF as interns to complete requirements for their college or university programs, rather than volunteering as an extra curriculum activity or hobby (e.g. working guest volunteer). As a result only those students studying towards a qualification in natural resources management or conservation will apply for a volunteer position at CCF, which might explain why there were fewer female African volunteers in CCF's volunteer programs.

Limitations of study

Although this study highlights gender issues with regards to women in conservation, further research is required to address these issues globally. Our survey responses include a high percentage of American volunteers, which could potentially lead to an American perspective of women in conservation. However, a recent study by Han et al. (2020) has shown people's motivations to participate in international volunteer programs to be consistent across the continents, which allows us to make the assumption our data can be generalized in a global context. It is also worth considering that past volunteers might have felt uncomfortable expressing less then desirable responses and decided not to participate in the survey knowing their answers would be investigated by CCF staff, leading to the potential bias of positive responses from survey participants. This is however an assumption and further investigation from external people would be able to address this potential limitation. Further research is also required to understand male volunteers' motivations for volunteering at CCF and their motivations to join conservation and how this differs to women's motivations.

By understanding the difference in male and female motivations to conservation, organizations will be able to engage equally with both genders to increase and improve conservation programs and remove the gender bias currently seen within conservation.

Conclusion

The Cheetah Conservation Fund has a long history of working closely with volunteers from across the world. This study has shown that CCF has been able to support a high percent (73.7%) of women in conservation through their volunteer programs over the past three decades, while highlighting the motivations, contributions and challenges women face in conservation. Volunteers had different motivations for volunteering which was also influenced by age. Overall, many women chose to volunteer at CCF for CCF's holistic approach to conservation, their passion and love for cheetahs and CCF's ability to allow volunteers to gain valuable experience working with cheetahs and in conservation. Women who had already established their careers were most likely to donate financially compared to younger women who contributed to conservation by working for a conservation organization after volunteering at CCF. Women's safety and credibility were highlighted as the main challenges that women face in conservation. Society needs to help women to overcome these challenges in order for them to be as successful as men in the scientific community as women's involvement in conservation is important at every stage. By mitigating these challenges, and removing the gender bias, more women could potentially be inspired to join conservation, thus being able to strengthen conservation strategies and benefit the conservation of species.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

Author contributions

LM was the senior researcher and developed the original concept. LP expanded the original concept with assistance from AP. The volunteer database was complied by LM, LP and TM. Data collection was completed by LP and LM with data analysis conducted by LP and TM. Manuscript writing was carried out by LP with editing assistance from LM, TM and AP. All authors contributed to the article and approved the submitted version.

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Conflict of interest

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

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fcosc.2022.1028851/full#supplementary-material

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