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CITIZEN SCIENCE

Research Article

PEOPLE AND NATURE | BRITISH ECOLOGICAL SOCIETY

Diversifying environmental volunteers by engaging with online communities

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Abstract

1. Environmental volunteering can benefit participants and nature through improving physical and mental well-being while encouraging environmental stewardship. To enhance achievement of these outcomes, conservation organizations need to reach different groups of people to increase participation in environmental volunteering. This paper explores what engages communities searching online for environmental volunteering.
2. We conducted a literature review of 1,032 papers to determine key factors fostering participation by existing volunteers in environmental projects. We found that the most important factor was to tailor projects to the motivations of participants. Also important were promoting projects to people with relevant interests, meeting the perceived benefits of volunteers and removing barriers to participation.
3. We then assessed the composition and factors fostering participation of the NatureVolunteers's online community (n = 2,216) of potential environmental volunteers and compared findings with those from the literature review. We asked whether projects advertised by conservation organizations meet the motivations and interests of this online community.
4. Using Facebook insights and Google Analytics we found that the online community were on average younger than extant communities observed in studies of environmental volunteering. Their motivations were also different as they were more interested in physical activity and using skills and less in social factors. They also exhibited preferences for projects which are outdoor based, and which offer close contact with wildlife. Finally, we found that the online community showed a stronger preference for habitat improvement projects over those involving species survey-based citizen science.
5. Our results demonstrate mismatches between what our online community are looking for and what is advertised by conservation organizations. The online community are looking for projects which are more solitary, more physically active and more accessible by the organized transport. We discuss how our results may be used by conservation organizations to better engage with more people searching for environmental volunteering opportunities online.

6. We conclude that there is a pool of young people attracted to environmental volunteering projects whose interests are different to those of current volunteers. If conservation organizations can develop projects that meet these interests, they can engage larger and more diverse communities in nature volunteering.

KEYWORDS
citizen science, environmental volunteering, motivations, nature conservation, online

1 | INTRODUCTION

Environmental volunteering is widely recognized as making important contributions to conservation and environmental stewardship as well as having the potential to foster physical and mental well-being (Kragh, Stafford, Curtin, & Diaz, 2016; Molsher & Townsend, 2016). Most recent research focus has been on the societal benefits of environmental volunteering such as increased social interaction, improved health and learning new skills (Miller et al., 2002; Molsher & Townsend, 2016; O'Brien, Townsend, & Ebden, 2010; Pillemer, Wagenet, Goldman, Bushway, & Meador, 2009). It is, however, also vital to consider how best to increase the benefits of environmental volunteering to environmental stewards as global conservation becomes increasingly dependent on voluntary support. For example, in the UK, conservation organizations now rely on volunteer support for the delivery of many of the country's biodiversity and environmental strategies (DEFRA, 2019a). This dependence is likely to increase as there has been a 29% decrease in public sector funding allocated to biodiversity in the past 5 years (DEFRA, 2019b). There is already concern among conservation practitioners that available levels of public sector funding will fail to halt the acceleration of biodiversity decline (RSPB, 2018). Consequently, there is a growing demand for engaging environmental volunteers and since 2000 there has been a 46% rise in the amount of time contributed by volunteers to conservation activities in the UK (DEFRA, 2019a). This increased reliance on environmental volunteers is found in many countries including the United States (McKinley et al., 2017), Australia (Irga, Barker, & Fraser, 2018) and Canada (Pearson et al., 2019).

In tandem with the growth of environmental volunteering, there has been a diversification of types of volunteering opportunities. In addition to traditional opportunities centred on participation in direct, practical habitat improvement (Ellis, Wainwright, Berney, Bulman, & Bourn, 2011; Frey & Spellerberg, 2011; de Sá Dechoum, Giehl, Sühs, Silveira, & Ziller, 2019) there has been a proliferation of environmental citizen science projects, where people contribute to ecological research by, for example, helping to conduct species surveys, digitizing paper records and identifying species in camera trap recordings (Bison, Yoccoz, Carlson, & Delestrade, 2019; Dickinson et al., 2012; Parsons, Goforth, Costello, & Kays, 2018; Petrovan & Schmidt, 2016; Zooniverse Inc., 2020). This growth in environmental citizen science opportunities can harness a growing public interest in environmental volunteering.

Recent research indicates that the strongest relationships between pro-environmental behavioural intentions exist when intrinsic motivations are met and pro-environmental behaviours are aligned and similar in nature (Maki et al., 2019; Stafford & Jones, 2019) rather than rely on more general pro-environmental behaviours such as findings by McDougle, Greenspan, and Handy (2011) where people who exhibited environmental behaviours, such as recycling or taking eco-friendly transport, were more likely to volunteer. Consequently, to maximize environment stewardship gains, it is essential that charities and other organizations involved in engaging environmental volunteers are well informed on where and how best to find them.

Much of the recent surge in environmental awareness is channelled through online social and digital media environments such as Facebook, Twitter and News channels (Mallick & Bajpai, 2019). The internet is an enormous global influence in people's lives (Castells, 2014) and consequently, it is of huge potential benefit to organizations looking to expand their volunteer base if they can successfully engage with people searching online. A recent study indicates that in rural areas 85% of households in the EU-28 had an internet connection, rising to 91% in cities (Eurostat, 2019). In addition to the potential pool of people searching online being enormous, the internet provides access to a different demographic pool to that of current environmental volunteers. In 2019, about 83% of women and 75% of men on the internet used the social media channel Facebook (Omnicore, 2019), of which 29.7% were aged 25–34 years, the most common age demographic (Zephoria, 2020). This is mirrored on the social media channels Twitter and Instagram, where 25- to 34-years age group represented 29% and 35% of users, respectively, in 2019 (Omnicore, 2020; Statista, 2020). By contrast, the current pool of environmental volunteers is largely composed of older people, with studies consistently identifying 40- to 70-year-olds as the most common age group participating in environmental projects (Asah & Blahna, 2013; Cherry, 2018; Davis, Taylor, & Martin, 2019; Domroese & Johnson, 2017; Jones, Childers, Andre, Corin, & Hite, 2018). Indeed, in 2017/18, 65- to 74-year-olds had the highest rates of volunteering in the UK and 25- to 34-year-olds had the lowest (NCVO, 2019).

We argue that expanding the pool of environmental volunteers is vital for enhancing the global impact of environmental citizen science and other types of environmental volunteering on both environmental stewardship and well-being. An important way of achieving this is to enhance the understanding of how to best engage people searching online for environmental volunteering opportunities. Currently,

much research on what enhances engagement has been based on evaluating existing volunteers. In this paper, we compare the composition and motivations of an online community interested in environmental volunteering with what is known for existing volunteers. Could current projects be missing important groups of people interested in environmental volunteering and if so, how can they best be encouraged and welcomed in?

In this paper, we first carry out a scoping review of the literature to determine the key factors fostering participation of existing volunteers in environmental projects. We then conduct empirical research based on an online community of 2,216 potential environmental volunteers using our website NatureVolunteers https://www.naturevolunteers.uk/ and compare findings with those from the literature review.

Our research questions are as follows.

From the scoping literature review:

1. What are the key factors identified in the literature as fostering participation of existing volunteers in environmental projects?

From the empirical study of the NatureVolunteers online community:

2. Does the composition of the online community of potential volunteers differ from that of current volunteers?
3. What type of environmental volunteering projects appeal to the online community of potential volunteers?
4. Do the types of volunteer projects being offered by conservation organizations match the interests expressed by the online community of potential volunteers?

1.1 | Scoping review of the literature

We conducted a review of literature on improving participation within nature conservation projects. This enabled us to determine what the most important factors were for participating in environmental projects, the composition of the populations sampled and the methods by which data were collected. The search terms used were (Environment* OR nature OR conservation) AND (Volunteer* OR 'citizen science') AND (Recruit* OR participat* OR retain* OR interest*). We reviewed all articles identified in the Web of Science database and the first 50 articles sorted for relevance in Google Scholar on 22nd October 2019. Articles were first reviewed by title, secondly by abstract and thirdly by full text. They were retained or excluded according to criteria agreed by the authors of this paper. These criteria were as follows: that the paper topic was volunteering in the environment, including citizen science, community-based projects and conservation abroad, and included the study of factors which could improve participation in projects. Papers were excluded for topics irrelevant to this study, the most frequent being the outcomes of volunteering for participants (such as behavioural change and knowledge gain), improving citizen science data and the usefulness of citizen science data. The remaining final set of selected papers was then read to extract information on the factors influencing participation, the population sampled and the data collection methods.

In total, 1,032 papers were reviewed of which 31 comprised the final selected set read in full. Four factors were identified in these papers which improve volunteer recruitment and retention. These included, tailoring projects to the motivations of participants; promoting projects to people with relevant hobbies and interests; meeting the perceived benefits of volunteers; and removing barriers to participation. The most important factor was found to be tailoring projects to the motivations of volunteers and was cited in 74% of the papers (Figure 1a). Twelve motivations were identified in these papers, with the most frequent being social interaction and learning new skills (Figure 1b). A potential bias in data collection methods was highlighted by the relevant papers identified in our literature review in that 80% of the papers sampled populations which were already considered volunteers. Only six papers included information from populations of people outside the volunteer groups involving the general public, university students, hobbyist bird watchers and divers (Figure 1c). Interviews and surveys were used to collect information on people's motivations to volunteer in 54% and 33% of papers, respectively (Figure 1d).

Our review of the literature revealed a range of subjects that encourage or hinder people's ability to take part in environmental projects. Our literature review found motivation to be the most important factor. Measham and Barnett (2008) found that motivations varied between volunteer groups studied and recommend that conservation organizations recognize these differences and tailor projects to improve retention. It is evident that although the motivations are similar for both citizen science and practical management projects, their relative importance differs among participants. Domroese and Johnson (2017) found that volunteers in the citizen science Great Pollinator Project were most motivated by the opportunities to learn and contribute to science and conservation. This is consistent with motivations observed in similar studies (He, Parrish, Rowe, & Jones, 2019; Hermoso, Martin, Stotz, Gelcich, & Thiel, 2019; Hobbs & White, 2012; Jones et al., 2018; Martin & Greig, 2019). The motivations of people taking part in practical management projects reflected the higher value they tended to put on social opportunities, such as meeting like-minded people (Asah & Blahna, 2013; Hobbs & White, 2016) and contributing to the community (Pan, 2012; Takase, Hadi, & Furuya, 2019). They also exhibited a wider variety of motivations; Liarakou, Kostelou, and Gavrilakis (2011) and Hobbs and White (2016) found that the opportunity to experience contact with nature was highly valued. By contrast, Takase et al. (2019) found that Japanese citizens were strongly motivated by improvements to physical well-being.

The scoping review of research on current volunteers found that they sought a range of key benefits. Overall, the scoping literature highlights that volunteers believe that their involvement in projects should also be enjoyable, and contribute to

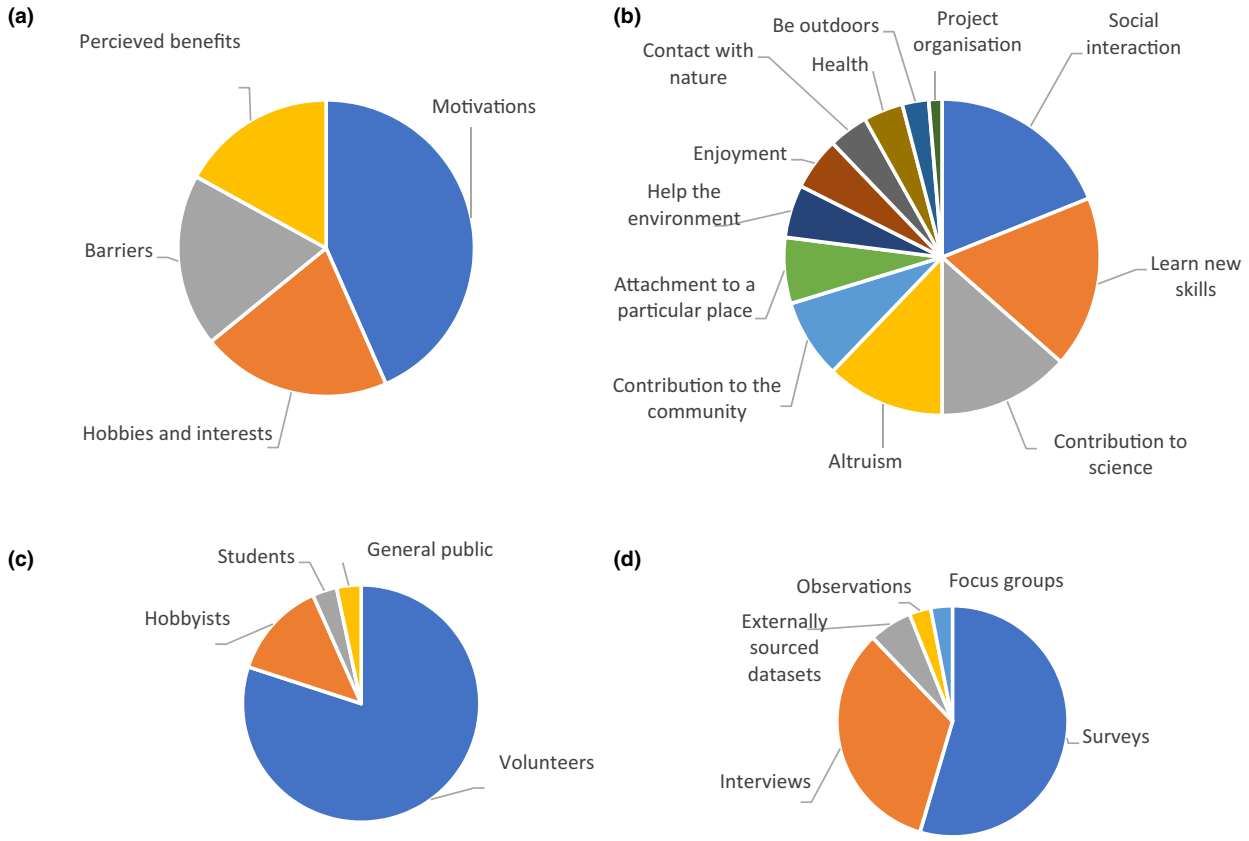

FIGURE 1 Literature review findings. (a) Factors which improve recruitment and retention in environmental projects. (b) Motivations to volunteer. (c) Potential sampling bias identified. (d) Potential data collection method bias identified

their overall health (Hobbs & White, 2016) and life satisfaction (Higgins & Shackleton, 2015; Hobbs & White, 2012). There were also some differences. The opportunity to learn new skills, particularly for career development, was identified as a key benefit important for some volunteers (Liarakou et al., 2011; Pan, 2012) while for others, key benefits from volunteering were contributing to science and research (Domroese & Johnson, 2017; Hobbs & White, 2012; Martin & Greig, 2019) and gaining social interactions (Bushway, Dickinson, Stedman, Wagenet, & Weinstein, 2011; Jones et al., 2018; Pan, 2012).

It is also evident that to enlarge and diversify the community of people engaging in nature volunteering, it is essential to be able to recognize and overcome the barriers to participation (Hobbs & White, 2012). The barrier to engagement that is most commonly presented is time and this is particularly the case for the young and employed compared to older and retired participants (Bushway et al., 2011). Time is identified as a key limiting factor across many different types of volunteering activities (Higgins & Shackleton, 2015) and can limit hobbyist involvement (Hermoso et al., 2019). The other barriers sometimes identified are access to sites (O'Brien et al., 2010) and that for some types of projects some volunteers will not have the knowledge required, or confidence in their abilities, to complete projects adequately and will need more training and support from project managers (Domroese & Johnson, 2017; Martin & Greig, 2019).

The second part of this paper compares the findings on motivations and barriers to participation based on the above scoping review of current volunteers with our empirical analysis of the motivations and barriers to participation of people searching online for nature volunteering opportunities.

2 | METHODS FOR THE EMPIRICAL STUDY

2.1 | The online community

The NatureVolunteers website https://www.naturevolunteers.uk/ was set up in 2018 with funding support from the Higher Education Innovation Fund to expand the range of people accessing nature volunteering opportunities in the UK. It is designed to particularly appeal to people who are new to nature volunteering including young adults wishing to expand their horizons, families looking for ways connect with nature to enhance well-being and older people wishing to share their time and life experiences to help nature. In addition, it was designed to be helpful to professionals working in the countryside and wildlife conservation sectors who wish to enhance their skills through volunteering. As part of the website's development, we created and used an online project database, www.naturevolunteers.uk (hereafter referred to as NatureVolunteers), to assess the needs and interests of our online community. Our research work

was granted ethical approval by the Bournemouth University Ethics Committee. The website collects entirely anonymous data on our online community of website users that enables us to evaluate what sort of projects and project attributes appeal the most to our online community. As part of the guidance on using the search function, visitors using the website to find projects are informed that this fully anonymous information is collected by the website to enhance and share research understanding of how conservation organizations can tailor their future projects to better match the interests of potential volunteers.

The NatureVolunteers website enables UK conservation organizations to freely advertise their volunteer projects by providing some key information about their projects. People looking for volunteer projects can then use the website to find projects that best match their interests. We developed the website's project search function to include important factors to consider when volunteering, according to literature. Social interaction and skills development are frequently stated in the literature as key benefits of environmental volunteering (Miller et al., 2002; Molsher & Townsend, 2016; O'Brien et al., 2010; Pillemer et al., 2009), and were therefore incorporated into the search process. In addition, there is growing evidence in literature of the benefits to volunteers' physical health (O'Brien et al., 2010; Pillemer, Fuller-Rowell, Reid, & Wells, 2010; Seymour, 2018) and mental well-being (Christie & Cole, 2017; Koss & Kingsley, 2010; Kragh et al., 2016). Physical health was therefore incorporated into the search process, but mental well-being was not explicitly included as it overlaps greatly with social interaction, getting out in nature and doing physical activity. Beyond the benefits, barriers to participation are identified in literature as factors which prevent people from taking part in projects. Two barriers identified in environmental volunteering are access and time. Accessibility of sites to potential volunteers must be considered, such as the requirement for private transport and the availability and cost of public transport (O'Brien et al., 2010). Society is currently time poor and availability is frequently compromised by work and family commitments (O'Brien et al., 2010). Recognizing these barriers is essential in overcoming them and reaching new people (Hobbs & White, 2012) and they were therefore incorporated into the NatureVolunteers project search tool. In our study, we divided our types of environmental volunteering into citizen science and practical management projects. Conservation-related citizen science projects include data collection and/or processing for scientific research and monitoring (Silvertown, 2009). Practical habitat improvement projects involve practical management tasks such as habitat restoration and maintenance (Domroese & Johnson, 2017). In order to maximize clarity of meaning to people new to environmental volunteering, we avoided the term 'citizen science' and instead used the term 'species surveys'. Similarly, for the practical management projects that included conservation management and restoration work we used the term 'improving habitats' on our NatureVolunteers website.

On the website, users searching for projects were firstly asked to specify their expectations of projects. These expectations encompass the benefits of volunteering by asking whether the project includes social interaction, whether particular skills are required or can be developed and whether physical activity is involved. The barriers to participation are incorporated by asking whether the project is suitable for families, and whether organized transport is provided. Users were asked to rate the importance of the five project expectations on a Likert scale of 1–5 (Not at all = 1, Not really = 2, Neutral = 3, It would be nice = 4, Yes essential = 5). Users were then asked to specify the content of the project. Content relates to the type and attributes of the project. Firstly, users were asked to select the project type(s) that interests them out of three categories which includes, species surveys, improving habitats and others. Users could provide an example of what they meant by 'other'. Secondly, users were asked to select keywords relating to the project out of 12 categories—outdoor based, indoor based, close contact with wildlife, wildlife survey, habitat management, helping other people, plants, mammals, birds, amphibians and reptiles, insects and seashore. For both project type and keywords, users could select as many as they wished. The same questions were asked of conservation organizations when advertising volunteer projects.

Our online community was built up over 2018–2019 through open advertisement of the website nationally through the social media channels of our partner conservation organizations, through a range of public engagement in science events and nature-based festivals across southern England and through our extended network of friends and families, their own social media networks and the NatureVolunteers website's own social network on Facebook and Twitter.

2.1.1 | Demographic

Ethical consideration ensured that all data used in this study are entirely anonymous and were collected using standard analytics openly provided by Facebook and Google Analytics. This is commonly used across millions of websites to assess website traffic. We assessed the demographics of people who follow NatureVoluteers on Facebook to deduce information on our website users. Data collected automatically by Facebook showed that our followers regularly interacted with content on our page and clicked through to the website. We also assessed demographic information collected from NatureVolunteers using Google Analytics which is a web analytics service that tracks and reports website traffic. Our privacy policy outlines this and states that the information will be used for statistical analysis. In addition to being anonymous, only NatureVolunteers staff with website admin access are able to view the data. The dataset for Google Analytics comprises of a variety of anonymous information on website visitors including their age group, gender, the technology they used to access the website and the interests they express through their online travel and purchasing activities. The dataset for Facebook comprises of anonymous information about people who have 'Liked' the NatureVolunteers Facebook page including age group, gender, country, city and language. For both datasets it is not possible to determine the information of one user that

is, their age group, gender and interests as the data instead provide an overview of information indicating that 20% of female users were interested in nature.

To determine if the motivations and interests expressed by volunteers in literature were representative of wider society, NatureVolunteers was exhibited at three UK public engagement events during May and June 2019; Hullabaloo Festival (Isle of Wight), The Great Wildlife Exploration (Bournemouth) and Festival of Nature (Bristol). This allowed us to engage with people who may not have ordinarily considered volunteering and encourage people to use the website. A combination of surveys and semi-structured interviews were used to collect information from the public regarding demographics and volunteering. In line with our ethics approval, no personal data were collected that could identify individuals and all participants gave informed consent for their anonymous information to be used for research purposes. The semi-structured interviews consisted of conducting the survey in a conversation with the respondent, rather than the respondent filling in the questionnaire privately and responses were recorded immediately by the interviewer. Hullabaloo Festival was a free discovery and exploration event where NatureVolunteers had a small display and surveys available. The Great Wildlife Exploration was a Bioblitz designed to highlight the importance of urban greenspaces where we had a stall with wildlife crafts promoting NatureVolunteers. The Festival of Nature was the UK's largest nature-based festival in 2019 where we again had wildlife crafts available promoting NatureVolunteers. The surveys conducted at these events sampled a population of people who already expressed an interest in nature and the environment by attending the events and visiting the NatureVolunteers stand. These people are arguably easier to recruit as volunteers than those expressing no interest.

2.2 | Data collection

Online search and project criteria were extracted from the online NatureVolunteers database for the period 1 January to 25 October 2019.

2.3 | Data analysis

All statistical analyses were performed using R version (3.4.1; R Core Team, 2017). To begin with, we used descriptive statistics to explore which project expectations and content were the most appealing for the NatureVolunteers online community. We then examined the link between project expectations and project content. Data was sequentially reduced during analysis to explore all relationships. Firstly, all responses were analysed. Secondly, the project type 'other' was removed. Thirdly, responses were aggregated by combining the negative responses (1s and 2s) and the positive responses (4s and 5s), with the addition of a double weight for the extreme values (1s and 5s). This changed project expectation responses to 'no', 'neutral' and 'yes'. Finally, we removed all responses which selected more than one project type or keyword and therefore analysed only the response which had only selected one. To better examine relationships between project expectations and keywords selected, the keywords were grouped according to similarities. First, we compared searches which selected indoor-based and outdoor-based projects. Then we compared searches which selected projects that offered close contact with wildlife and helping people. Finally, we compared responses to the different types of wildlife; plants, mammals, birds, amphibians and reptiles, insects and seashore. The same sequential aggregations of data that are described above were also conducted on these groups. We tested the significance of interactions between the importance of project expectations and project content selected by users at all levels of data aggregation using chi-square tests of independence. Chi-square tests were also used to determine if the types of projects advertised by organizations met the interests of NatureVolunteers online community.

3 | RESULTS

3.1 | Does the composition of the online community of potential volunteers differs from that of current volunteers?

Data collected from the NatureVolunteers Facebook community show that the categories with the highest number of followers are females between the age group of 25 and 34 (Figure 2a). The website traffic data from Google Analytics supports this as it found 31% of

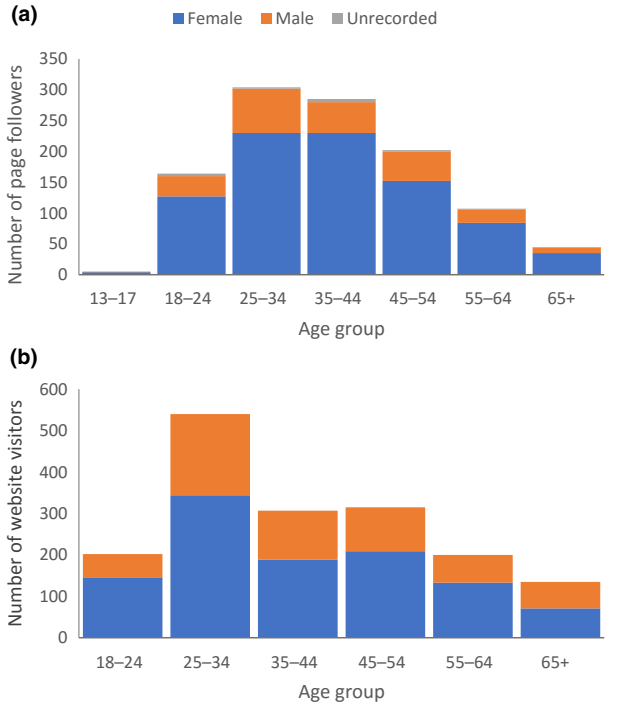

FIGURE 2 Demographic of (a) followers of the NatureVolunteers Facebook page (n = 1,112) and (b) website visitors according to Google Analytics (n = 1,699)

website visitors to be aged between 25 and 34 and 64% to be female (Figure 2b).

In total, 100 completed surveys were received from the events NatureVolunteers exhibited at; 21 from Hullabaloo Festival, 25 from the Great Wildlife Exploration and 54 from the Festival of Nature. At Hullabaloo Festival information on gender was not recorded for all responses and was consequently entered as 'unrecorded'. Most respondents were aged 34–41 (n = 24), closely followed by age58 or over (n = 20) 26–33 (n = 15), 18–25 (n = 14), 42–49 (n = 12), 50–57 (n = 10) and 17 or under (n = 5). Combining across all the responses, 26 recorded their gender as male, 54 as female and 20 as rather not say (Figure 3a). There was an approximate 50:50 split between people who had volunteered before and people who had not. About 87.5% of people who had not volunteered said that they would consider using NatureVolunteers to find volunteer opportunities (Figure 3b,c).

3.2 | What type of environmental volunteering projects appeal to the online community of potential volunteers?

There were 2,216 searches for projects on NatureVolunteers from 1 January to 25 October 2019.

Overall, people wanted projects that offered social interaction, required skills and involved physical activity (Figure 4). By contrast this group largely did not want projects suitable for families. Organized transport had the most polarized responses; it was

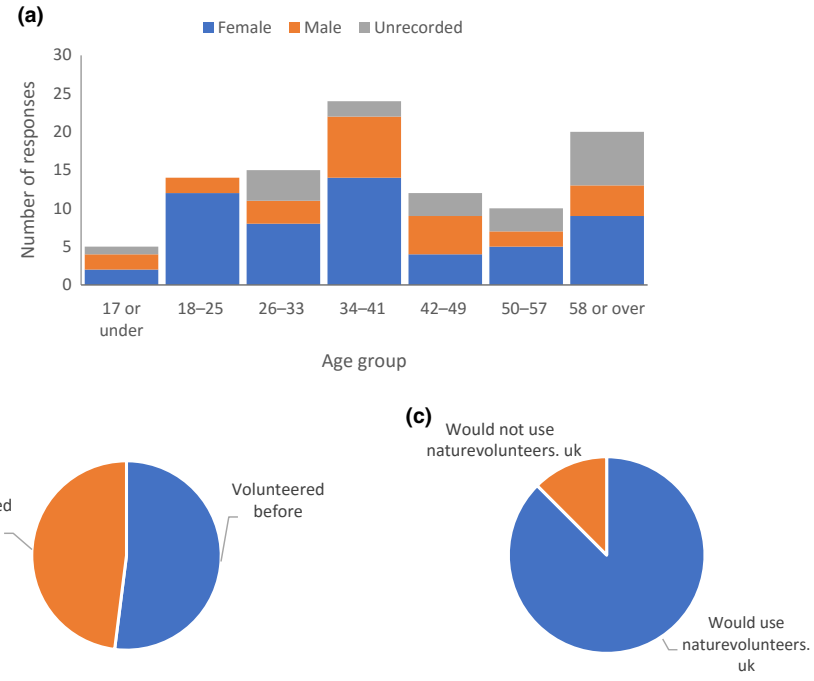

FIGURE 3 Sample population responses to the questions posed in the NatureVolunteers events survey (a) demographic (n = 100). (b) Have you volunteered before? (n = 100). (c) If you have not volunteered, would you consider using NatureVolunteers to find projects? (n = 48)

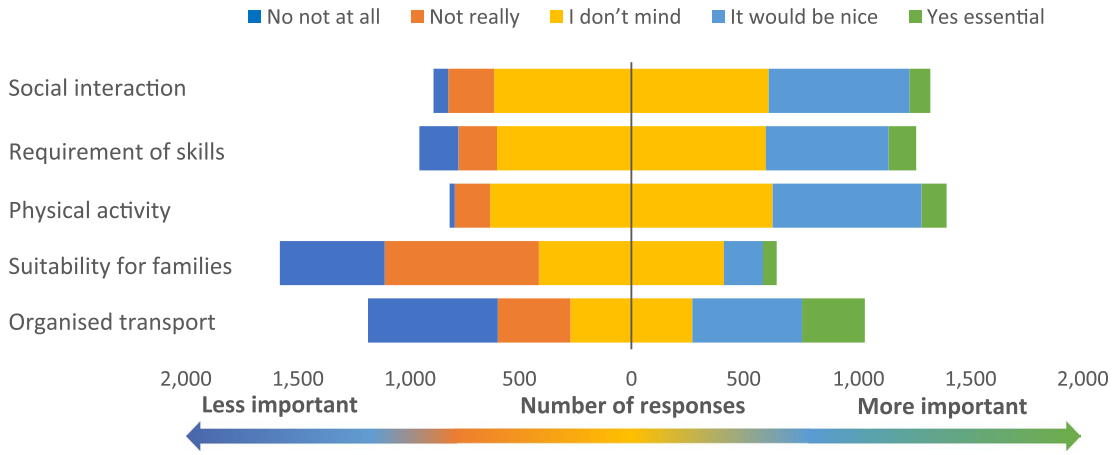

FIGURE 4 Response values on a Likert-scale showing importance of project expectations (n = 2,216). Neutral responses are distributed evenly across the vertical axis at 0. The negative responses are then stacked to the left of the vertical axis and positive answers to the right. The less important the factor is, the more it is skewed to the left. The more important the factor is the more it is skewed to the right

unimportant for some respondents but still considered important by many. There was a strong preference across much of the overall NatureVolunteers community for projects involving volunteers in physical activity. This received the most positive answers (776) and is the most rightly skewed expectation. This high score for positive answers was also found for organized transport (769), social interaction (721) and requirement of skills (671). Suitability for families had the least positive answers (235) and the most negative answers (1,155) and so is the expectation most skewed to the left. The other factor with many negative answers was the organized transport (903). By contrast there were few negative answers for requirement of skills (346), social interaction (271) and physical activity (181).

Figures 5 and 6 show the types of responses received for project content. When choosing the type of project, most people selected habitat improvement projects, followed by species surveys and other (Figure 5). Both types of responses had the same results. For 'improving habitats', 841 and 794 people selected only one response and more than one response respectively. This was followed by 'species surveys' which received 372 and 747, respectively, and 'other' which received 186 and 478 respectively. Where an example of 'other' was provided, these responses could be grouped into leadership, data entry and public engagement. For keywords we found that most people were looking for projects which were outdoor based (only one = 332, more than one = 829) or offered close contact with wildlife (only one = 163, more than one = 863) (Figure 6). Project which surveyed wildlife (only one = 108, more than one = 805), involved habitat management (only one = 129, more than one = 773) or mammals (only one = 43, more than one = 773) were also frequently selected. Less than a third of people were looking for projects focussed on plants (only one = 54, more than one = 584), birds (only one = 32, more than one = 605), seashore (only one = 61, more than one = 569) or amphibians and reptiles (only one = 18, more than one = 522). The least searched for projects were those that involved insects (only one = 21, more than one = 421), helping people (only one = 24, more than one = 350) and were based indoors (only one = 45, more than one = 255).

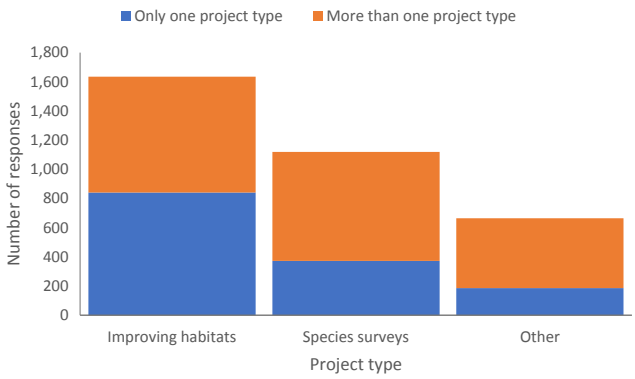

FIGURE 5 Project types selected in online searches (n = 2,216) on NatureVolunteers. The lower blue section shows the responses which selected only one project type and the upper orange section shows the responses which selected more than one project type

3.2.1 | Are there any strong interactions between what people are searching for?

Project content

The expectations of projects differed according to the type of project people were interested in (Table 1). Considering all responses, people who were interested in improving habitats were more likely to choose projects that did not require skills than those interested in species surveys or other projects ($\chi^2(8) = 36.17$, $p < 0.001$). These people were also more likely to choose projects which involved physical activity ($\chi^2(1) = 29.46$, $p < 0.001$). Social interaction, suitability for families or organized transport did not differ according to the type of project selected ($\chi^2(8) = 15.26$, $p = 0.054$, $\chi^2(8) = 6.79$, $p = 0.559$, $\chi^2(8) = 10.92$, $p = 0.206$ respectively). When 'other' was removed from the analysis people who were interested in improving habitats were found to be more interested in projects that were social than those who were interested in species surveys ($\chi^2(4) = 13.6$, $p = 0.009$). The relationships between type of project and skill requirement, and type of project and physical activity remained significant. Organized transport and suitability for families continued to be unaffected by the type of project. Aggregating

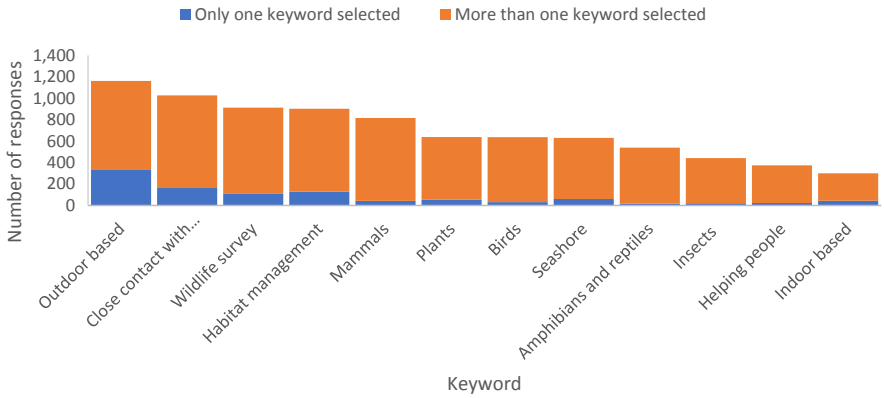

FIGURE 6 Keywords selected in online searches (n = 2,216) on NatureVolunteers. The lower blue section shows the responses which selected only one keyword and the upper orange section shows the responses which selected more than one keyword

TABLE 1 Chi-square results for the sequential reductions of data showing the association between project type and the importance of project expectations

	All responses			With 'other' removed			Aggregated responses			Only one project type		
	χ^2	*df*	*p*-Value	χ^2	*df*	*p*-Value	χ^2	*df*	*p*-Value	χ^2	*df*	*p*-Value
Social interaction	15.26	8	0.054	13.56	4	0.009	13.62	2	0.001	18.88	2	<0.001
Requirement of skills	36.17	8	<0.001	32.22	4	<0.001	44.98	2	<0.001	58.10	2	<0.001
Physical activity	29.46	8	<0.001	11.50	4	0.022	12.81	2	0.002	18.18	2	<0.001
Suitability for families	6.79	8	0.559	4.36	4	0.359	6.19	2	0.045	6.18	2	0.045
Organized transport	10.92	8	0.206	7.62	4	0.107	4.26	2	0.119	5.14	2	0.077

TABLE 2 Chi-square test results for keywords and the importance of project expectations. Types of wildlife comprises plants, mammals, birds, amphibians and reptiles, insects and seashore

	Indoor-based and outdoor-based			Close contact with wildlife and helping people			Types of wildlife		
	χ^2	*df*	*p*-Value	χ^2	*df*	*p*-Value	χ^2	*df*	*p*-Value
Social interaction	4.05	2	0.132	23.02	2	<0.001	7.18	10	0.708
Requirement of skills	20.46	2	<0.001	3.29	2	0.193	15.40	10	0.118
Physical activity	70.46	2	<0.001	8.28	2	0.016	11.76	10	0.302
Suitability for families	3.45	2	0.179	20.71	2	<0.001	8.10	10	0.619
Organized transport	10.26	2	0.006	0.14	2	0.931	6.76	10	0.748

responses revealed a relationship between project type and suitability for families. People who were interested in improving habitats were more interested in projects that were suitable for families than those interested in species surveys ($\chi^2(2) = 6.19$, $p = 0.045$). The significance of the associations between the type of projects and social interaction, requirement of skills and physical activity all increased with aggregation. Organized transport remained unaffected by the type of project selected. Responses which selected only one project type produced the same pattern as the aggregated responses.

Keywords

The aggregated responses showed that people interested in outdoor-based projects were more likely to not need transport than those interested in indoor-based projects ($\chi^2(2) = 10.26$, $p = 0.006$) (Table 2). They were also more interested in projects that did not require skills ($\chi^2(2) = 20.46$, $p < 0.001$). Contrastingly, the people interested in outdoor-based projects were also more interested in projects involving physical activity than those who were interested in indoor-based projects ($\chi^2(2) = 70.46$, $p < 0.001$). People interested in projects which offer close contact with wildlife were more interested in projects which were not social and were not suitable for families than those interested in projects involving helping people ($\chi^2(2) = 22.03$, $p < 0.001$, $\chi^2(2) = 20.71$, $p < 0.001$ respectively). These people were also more likely to choose projects that involved physical activity ($\chi^2(2) = 8.28$, $p = 0.016$). The type of wildlife selected was not found to influence the expectations of the projects.

3.3 | Do the types of volunteer projects being offered by conservation organizations match the interests expressed by the online community of potential volunteers?

Conservation organizations advertised 247 projects on NatureVolunteers between January and October 2019. Overall the content and expectations of opportunities advertised differed markedly from what the online community was searching for.

3.3.1 | Project expectations

There were significant differences between the provision within projects and demand from online searches for all five projects expectations; social interaction, requirement of skills, physical

activity, suitability for families and organized transport (Figure 7). Half of the projects advertised by conservation organizations strongly provided social opportunities, shown by the right skew of the bar. This is a significant oversupply of these projects when compared with what the online community searched for ($\chi^2(4) = 148.58$, $p < 0.001$). By contrast there was a strong undersupply of projects requiring skills; 15% more people wanted skilled projects rather than unskilled, however, 63% of projects advertised were low skill, shown by the extreme left skew of the bar ($\chi^2(4) = 361.80$, $p < 0.001$). Similarly, there was a significant undersupply of projects which offered physical activity ($\chi^2(4) = 53.05$, $p < 0.001$). In terms of suitability for families, we found that our user community is less concerned about whether projects are aimed at families or individuals than conservation organizations are catering for; organizations are oversupplying projects specifically aimed at either individuals or families ($\chi^2(4) = 79.39$, $p < 0.001$). Finally, organizations significantly oversupplied projects which did not offer organized transport, shown by the slight right skew ($\chi^2(4) = 70.62$, $p < 0.001$).

3.3.2 | Project content

Figures 8 and 9 show the percentage of searches and organizations which selected each project type and keyword. The most advertised project type was habitat improvement projects and accounted for 64% of projects advertised (only improving habitats = 45%, more than one project type = 19%). It was undersupplied considering it was selected in 74% of online searches ($\chi^2(1) = 9.48$, $p = 0.002$). Only 26% of projects advertised by organizations were species surveys, of which

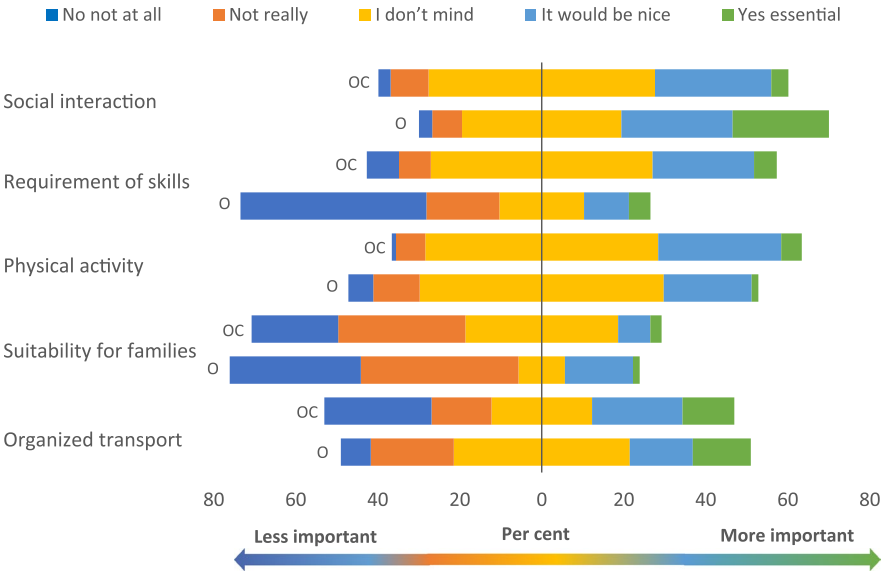

FIGURE 7 Response values on a Likert-scale showing importance of project expectations for organizations (O, $n = 247$) and the online community (OC, $n = 2,216$). Neutral responses are distributed evenly across the vertical axis at 0. The negative responses are then stacked to the left of the vertical axis and positive answers to the right. The less important the factor is, the more it is skewed to the left. The more important the factor is the more it is skewed to the right. A mismatch in the provision of expectations is shown by the difference in skew between each pair of responses

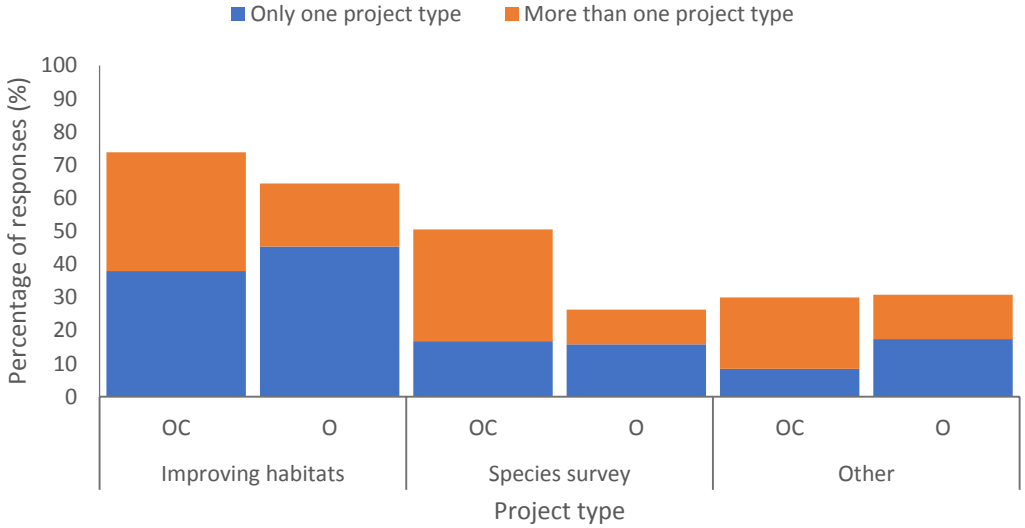

FIGURE 8 Project type selected by organizations (O, $n = 247$) and the online community (OC, $n = 2,216$). The lower blue section shows the responses which selected only one project type and the upper orange section shows the responses which selected more than one project type

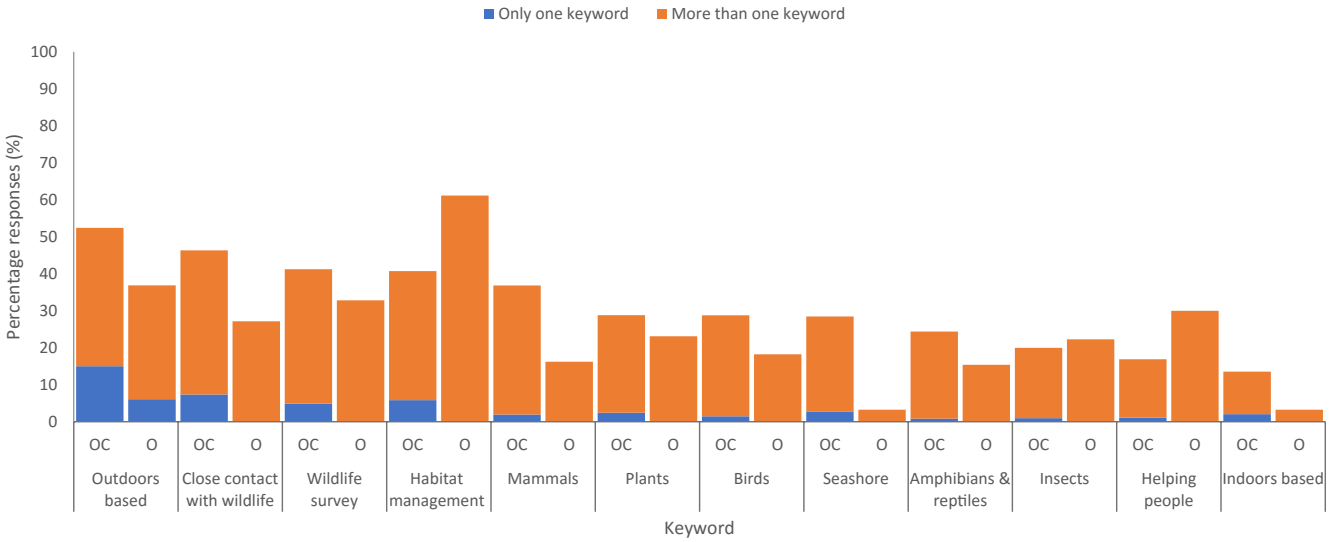

FIGURE 9 Keywords selected by organizations (O, $n = 247$) and the online community (OC, $n = 2,216$). The lower blue section shows the responses which selected only one keyword and the upper orange section shows the responses which selected more than one keyword

16% have only selected species survey and 10% selected more than one project type. This is significantly fewer that the people interested in species surveys ($\chi^2(1) = 51.09, p < 0.001$). No significant differences found for the remaining project type, other, ($\chi^2(1) = 0.85, p = 0.8503$; only other = 17%, more than one project type = 13%).

Seashore projects were the most undersupplied by organizations, accounting for only 3.24% of projects advertised, whereas they featured in 28.43% of online searches ($\chi^2(1) = 72.17, p < 0.001$). Most keywords were found to be advertised less often than they were searched for online; indoors based ($\chi^2(1) = 20.61, p < 0.001$), close contact with wildlife ($\chi^2(1) = 32.33, p < 0.001$), wildlife survey ($\chi^2(1) = 6.18, p = 0.013$), mammals ($\chi^2(1) = 40.8, p < 0.001$), birds ($\chi^2(1) = 11.78, p < 0.001$) and amphibians and reptiles ($\chi^2(1) = 9.49, p = 0.002$). Projects which were outdoor based, involved habitat management and helping other people were advertised significantly more often than they were searched for ($\chi^2(1) = 114.57, p < 0.001$, $\chi^2(1) = 37.07, p < 0.001$, $\chi^2(1) = 24.69, p < 0.001$ respectively). Only outdoor based was selected as a keyword on its own; 6% of advertised projects selected only outdoor based. No significant differences were found for insects or plant projects ($\chi^2(1) = 0.61$, $p = 0.436$ and $\chi^2(1) = 3.31, p = 0.069$ respectively).

4 | DISCUSSION

Overall, our study indicates that enhancing engagement with people searching online for volunteering opportunities offers a clear potential for diversification and expansion of the community of UK environmental volunteers. It is evident that there are groups of people searching online for nature volunteering opportunities who have different motivations and experience different barriers to engagement to than those typical of existing volunteers. Results indicate that the needs and interests of the online community in our study do not match well with the citizen science and other environmental projects available to them. We propose that this discrepancy may be more wide spread and deserves more research given the rapid global growth on online searching for commodities and experiences. We discuss the details of our findings and how organizations might involve more people in environmental volunteering by developing projects that meet the interests expressed by online users.

4.1 | Does the composition of the online community of people interested in environmental volunteering differ from that of current volunteers?

Our current study highlights the existence of an important online community of younger people looking to contribute time to environmental projects. The NatureVolunteers demographic (largely aged between 25–34 and female) differs greatly from those sampled in previous literature on improving participation in environmental projects. The contrast in age range between the NatureVolunteers online community and existing volunteers is particularly marked given that most research of current volunteers has found the age distribution to be much older (Asah & Blahna, 2013; Cherry, 2018; Davis et al., 2019; Domroese & Johnson, 2017). The lack of representation of younger people in environmental volunteering could be due to both a lack of awareness of projects and barriers to participation. Bushway et al. (2011) found younger people who were employed and on lower incomes were more likely to cite time and money as barriers, whereas retirees were the least likely. Our study found a gender bias towards females in the online community similar to that found in some existing volunteer groups (Cherry, 2018; Domroese & Johnson, 2017). However, gender in existing groups varies according to factors such as the type (Cooper & Smith, 2010) and complexity (Davis et al., 2019) of the projects. Our study engaged with people who had not previously volunteered but were interested in the environment/nature through promoting NatureVolunteers at public events. By contrast,

only 6 out of the 31 papers identified in our literature review engaged with people who were not already considered volunteers including divers (Goffredo et al., 2010; Hermoso et al., 2019), birders (Jones et al., 2018; Martin & Greig, 2019) university students (McDougle et al., 2011) and the general public (Davis et al., 2019). We suggest that this arises due to the challenges of identifying a community of people whose focus of interest is not volunteering but is an interest sufficiently aligned to it to foster engagement in a survey about volunteering. In that respect, birders and divers are good communities to choose to sample as the interests that unite their communities (birds and marine environments respectively) are likely to benefit from the efforts of environmental volunteers who, for example, improve habitats.

4.2 | What type of environmental volunteering projects appeal to the online community?

The NatureVolunteers online community particularly wanted projects which involved physical activity. This is expected as one of the perceived benefits of participating in environmental projects is proclaimed to be increased fitness from physical activity, particularly for older volunteers (Bushway et al., 2011; Wagenet, 2010) and also younger volunteers (Hobbs & White, 2016). However, the motivation of physical activity was not found to be as important in our literature review. Only Takase et al. (2019) and O'Brien et al. (2010) found physical activity to motivate volunteers as it contributes to their physical and mental well-being. These two papers specifically tested for a spectrum of mental, social and physical measures of well-being. However, most extant research focuses on exploring gains in mental well-being achieved through 'connecting' with nature or gains in social well-being achieved though working with others. We speculate that this speaks to the urgent need to find solutions to the global burden of public health risks posed by mental illness and social isolation. By contrast physical well-being is already recognized as achieved by engaging in sports and exercise activities.

The NatureVolunteers online community also showed a preference for projects which offered the opportunity for social interaction and using skills. This is consistent with what has been observed in similar studies (Bruyere & Rappe, 2007; Higgins & Shackleton, 2015). Environmental volunteering provides the opportunity to meet like-minded people, a motivation observed across age groups, genders, current participants and hobbyists (Asah & Blahna, 2013; He et al., 2019; Hermoso et al., 2019; Liarakou et al., 2011; McDougle et al., 2011). Tangentially but interestingly, volunteers motivated by social factors have been found to show more commitment to projects than those motivated by learning (McDougle et al., 2011) and the environment (Asah & Blahna, 2013).

Our results found that the motivations expressed by the online users differed strongly between projects involving species surveys-based citizen science and those involving improving habitats. We found that those interested in improving habitats showed a preference for projects which were social and involved physical activity. They were also less attracted to projects which involved learning new skills than those interested in species surveys. This difference was also recognized by Domroese and Johnson (2017) who found that different primary motivators were cited in research depending on whether volunteers were taking part in citizen science projects or practical management volunteering. They concluded that although motivations of participants in their study of the Great Pollinator Project were similar to those of environmental volunteers, they were primarily motivated by the opportunity to learn and then contribute to science and conservation. This differed from the primary motivations of practical management volunteers which were often motivated by social opportunities (Asah & Blahna, 2013; Hobbs & White, 2016).

Our study has further identified differences in motivations according to additional project attributes. More of our online community expressed an interest in projects which offered close contact with wildlife than in projects which involved helping people although both motivations were frequently cited in literature as important motivators. When comparing the two attributes, we found that people interested in close contact with wildlife were largely not interested in projects which were social. This challenges what is currently available in literature where surveyed volunteers frequently stated both social opportunities and contact with wildlife concurrently. Hobbs and White (2016) found that proximity to the study species and social factors were two of the most important benefits of participating for volunteers. Similarly, Liarakou et al. (2011) found direct contact with nature and the opportunity to make new friendships to be highly ranked motivations for people's involvement. We are unable to find evidence in the literature that supports any suggestion for why online searchers for nature volunteering may be less motivated by opportunities for social interactions than are existing volunteers. We speculate that it may be related to the online community consisting of proportionally more working-age people with much active work and family relationships to maintain but with little time to connect closely with wildlife, thus valuing the latter benefit more highly. If this is the case, then we might expect to find similar patterns immerging globally in industrialized first world societies. Finally, although only a small proportion of the NatureVolunteers online community were interested in projects which were indoor based, we were able to identify significant differences between them and users who were interested in outdoor-based projects. Most evidently, people searching for outdoor-based projects were less likely to need transport than people interested in indoor-based projects. This may indicate that people interested in indoor-based projects do so because they are aware that they have accessibility issues and are limited by a lack of public transport, hence pre-exclude themselves from outdoor projects. There is currently insufficient evidence on the importance of public transport for widening participation in nature volunteering and it would be beneficial to conduct further research into this to establish how potentially marginalized sectors of society without private transport can be better included. Overall, all these differences in expectations that we have identified within our project content and between our results and literature highlight the necessity for

projects to be tailored to the needs of volunteers. People with different interests have different expectations of projects and these expectations need to be met to increase participation.

4.3 | Do the types of volunteer projects being offered by conservation organizations match the interests expressed by the online community?

The differences observed in our study between what projects are available and what the NatureVolunteers online community are searching for could be due to two factors. Firstly, it could be the limited of knowledge amongst environmental stewardship organizations of people's expectations beyond those of current volunteers (Martin, Christidis, & Pecl, 2016). Throughout this study, we have identified inconsistencies in expectations between our sample population and those that have been sampled in literature. Social interaction was found to be the most cited motivation in literature while physical activity was the least. By contrast, our study shows physical activity to be the most important expectation and that overall there was a slight oversupply of projects that offer social interaction. Similarly, the motivation to help people was frequently identified in the literature (Asah & Blahna, 2013; Higgins & Shackleton, 2015; Measham & Barnett, 2008; Pan, 2012; Takase et al., 2019) and was included many projects advertised on NatureVolunteers. By contrast, the online community expressed little interest in this attribute.

Overall, we identify that the needs and interests of the online community are not currently being met completely and suggest there is great global potential for increased participation in environmental volunteering if projects are developed to meet these needs. We show that there is currently a pool of young people attracted to more solitary citizen science and practical management projects with a range of interests that could benefit nature if conservation organizations provide the structures enabling them to do so. An example of good practice that begins to fit this model is the range of citizen science projects available from Butterfly Conservation. Their projects include the long-established UK Butterfly Monitoring Scheme whereby volunteers are provided with paperwork and a transect to monitor weekly, the Big Butterfly Count which is a one-off survey in the Summer, and the Butterflies for the New Millennium where volunteers can contribute as much or little as suitable (Butterfly Conservation, n.d.).

It is also likely that differences between what projects are available and what online communities search for could be due to limited capacity. Insufficient funding of the conservation sector has resulted in constraints on resources and time (Bottrill et al., 2008). This could impact the ability to purchase equipment and have staff available with relevant expertise to provide the types of project our potential volunteers are interested in. The most undersupplied type of project found in this study was species surveys which vary in complexity. Complex projects often require a considerable level of expertise from participants and require a precise methodological approach (Davis et al., 2019). Simple projects require much less knowledge from participants, but considerable input from others to verify records or to develop technology to do so (Adriaens et al., 2015; Davis et al., 2019). It is therefore unlikely that expansion of either complex or simple projects would be possible with limited resources. This could also explain the undersupply of projects relating to specific species/habitats including plants, mammals, birds, amphibians and reptiles and seashore. It is likely that organizations will continue to need to manage expectations regarding some aspects of citizen science and other environmental volunteering projects so that projects can realistically fit with volunteer aspirations.

5 | CONCLUSIONS

Our study of people searching online for nature volunteering opportunities in the UK using the NatureVolunteers website demonstrates the potential for using online methods of connecting people with projects to appeal to a larger and differently motivated range of volunteers. We compared results from our empirical study with what is known from a scoping literature review of existing volunteers to identify any differences and discuss how conservation organizations can best address these and so increase their volunteer base. We identify the ways in which conservation organizations are not currently providing projects that meet the needs of our online community. Our online community has a younger demographic range compared to that typical of existing volunteers. Members generally demonstrate a preference for projects which offer physical activity, offer the opportunity to learn new skills and where they can be more solitary. Transport is indicated as a key barrier to participation for many members of this group and so should also be considered by conservation organizations when developing projects. We propose that these mismatches we have identified between the properties of projects currently offered by conservation organizations and the properties sought by our online community may also be widespread beyond the UK. Further research is needed to explore this and identify if there are more global patterns of mismatches between what conservation organizations provide and what appeals to new potential communities of volunteers who are searching online. Modifying nature volunteering projects where possible to better match these interests will enable conservation organizations to harness the transformative 21st century power of online search methods to recruit new pools of volunteers for projects that benefit both people and nature.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORS' CONTRIBUTIONS

A.D. was the Principle Investigator and was in-charge of the overall leadership of this research; R.S., E.T. and P.G. helped with website design and project implementation; K.W. led the writing of the manuscript and analysis of data and A.D. provided mentorship; R.S. and P.G. contributed critically to the drafts.

DATA AVAILABILITY STATEMENT

All data and the Excel worksheets used to generate all figures and tables associated with this paper are freely available at the Digital Dryad Repository: https://doi.org/10.5061/dryad.fxpnvx0qd (Diaz, Winch, Stafford, Gillingham, & Thorsen, 2020).

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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