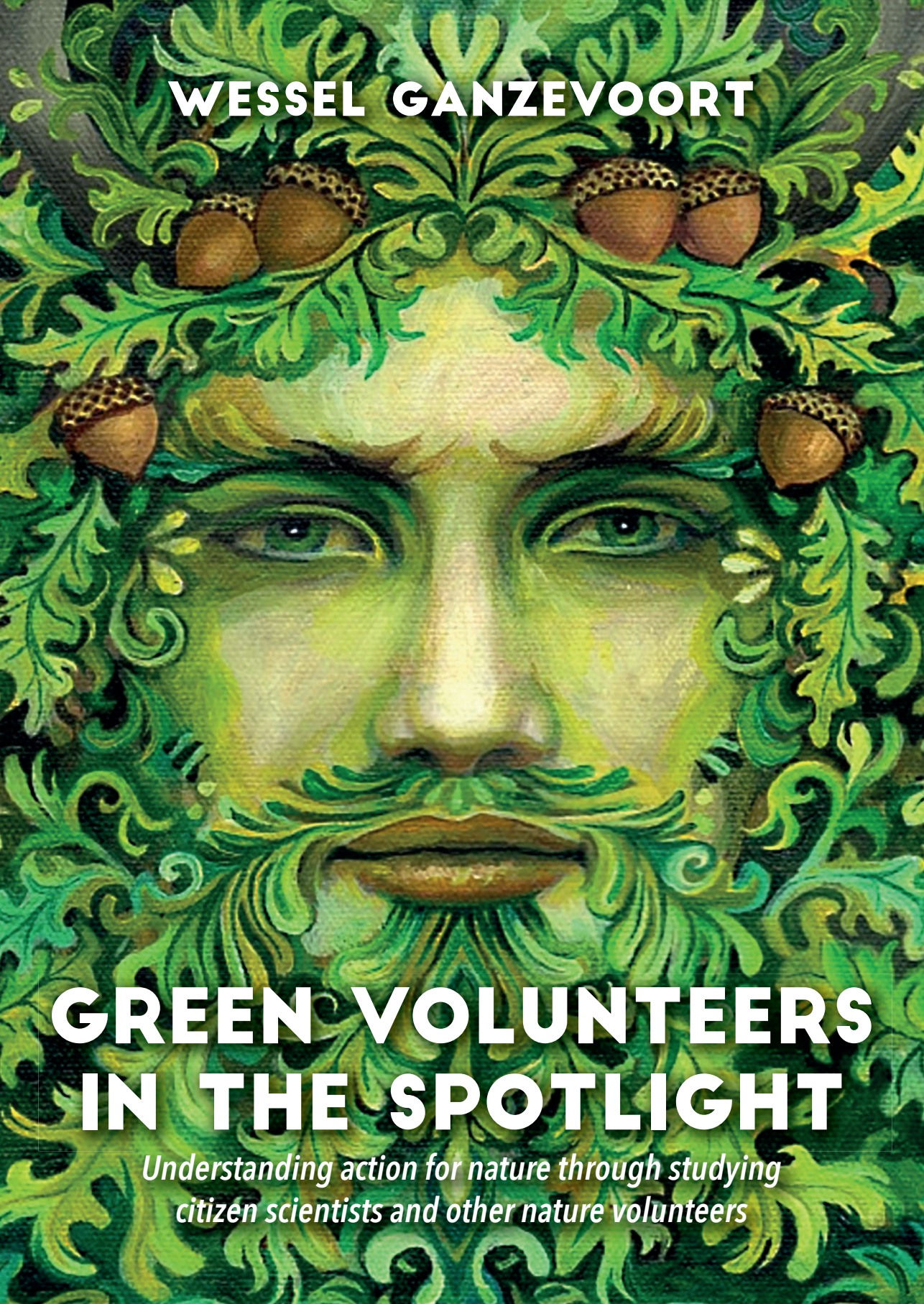




WESSEL GANZEVOORT

GREEN VOLUNTEERS IN THE SPOTLIGHT

*Understanding action for nature through studying
citizen scientists and other nature volunteers*

Green Volunteers in the Spotlight

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through studying citizen scientists
and other nature volunteers*

Wessel Ganzevoort

Colofon

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Green Volunteers in the Spotlight

*Understanding action for nature
through studying citizen scientists
and other nature volunteers*

Proefschrift

ter verkrijging van de graad van doctor
aan de Radboud Universiteit Nijmegen
op gezag van de rector magnificus prof. dr. J.H.J.M. van Krieken,
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door

Wessel Bote Ganzevoort

geboren op 18 oktober 1991
te Utrecht

“I almost altered my title to ‘The love and study of the living bird in nature’, but reflected that in the eyes of a number of ornithologists, the use of the word ‘love’ would be unscientific. So I compromised with ‘knowledge’, secure in the assurance that love of the object to be known always contributes to a wider knowledge, and that study without love tends to sterility.

I also want to stress the importance of the amateur: and this approach does justice to his role, for by etymology, the amateur is one who loves his subject for its own sake.”

From the essay titled ‘The British contribution to our knowledge of the living bird’ (Huxley, 1959, p. 103)

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Introduction

1.1 Setting the scene: Voluntary action for nature

On the 7th of November 2019, the Dutch National Database Flora and Fauna (NDFF) celebrated the milestone of gathering 150 million validated observations (Feskens, 2019). The goal of the NDFF is to unite dispersed flows of data on Dutch plants and animals, and through validation and standardization work towards enhanced opportunities for interpreting these data (NDFF, n.d.). Natural history organisations¹ such as Sovon Dutch Centre for Field Ornithology and Dutch Butterfly Conservation are crucial partners in this endeavour, as these organisations are key researchers and custodians of biodiversity data in the Netherlands. Natural history organisations in turn are strongly dependent on volunteers, who dedicate their time and effort to observing nature and recording and sharing these observations.

Nature volunteers play a crucial role beyond natural history as well. Whether it is getting people of all ages to experience the natural environment and teaching them about flora and fauna, helping landscape managers plant trees or remove invasive species, or the coordination, communication and administration of volunteering projects and neighbourhood initiatives: citizens' voluntary action for nature² is of crucial importance. This is neither a recent nor an exclusively Dutch phenomenon. Miles et al. (1998, p. 28) noted more than 20 years ago that nature restoration initiatives in Illinois 'would not be carried out if it were not for volunteers', with their efforts corresponding to an estimated monetary value of over \$2.5 million over a five-year period. Just to offer one recent example, in the spring of 2020 the Great Iberian Acorn project (*la Gran Bellotada Ibérica*) engaged thousands of Spanish

¹ Throughout this thesis, I will use both the term 'natural history organisations' and 'species organisations' to refer to the Dutch 'soortenorganisaties', which are professional organisations focussed on the collection, validation and curation of observation data on flora and fauna. In the Netherlands, these organisations have a specific taxonomic focus, share a dedication to both research and conservation, and tend to rely strongly on volunteers for recording and submitting biodiversity data. The term PGO ('Particuliere gegevensbeherende organisatie', or 'Private Data-managing Organisation') is also used for these organizations (Lawrence & Turnhout, 2010).

² In this thesis, I understand action for nature as those actions that directly concern biodiversity, nature restoration or maintenance, nature or wildlife education, and advocacy, coordination and administration in nature-oriented projects and organizations. As such, while broader pro-environmental behaviours (such as recycling campaigns, pollution mitigation or energy saving) can sometimes be one component of these actions, I focus here on those actions specifically focused on flora, fauna and the natural environment. The 'green' in 'green volunteer' thus reflects the Dutch differentiation between the 'green' (nature) and 'grey' (environmental quality) sectors, which I recognise to be different from how the term is sometimes used to refer to a broader class of behaviours (e.g. switching to 'green energy'). In Chapter 2, I will provide further reflection on the criteria I adopted.

and Portuguese volunteers with the aim to plant 25 million acorns to combat desertification and deforestation (MED-O-MED, 2019). As Sloane and Pröbstl-Haider (2019, p. 158) succinctly note, 'Volunteers have always been the foundation of nature conservation'.

Of course, behind all these impressive achievements are people. People with different backgrounds, varying motivations, and divergent experiences that all influence how they relate to their volunteering. One illustration from Dutch natural history is the story of friar Willibrordus, who passed away in 2019. For almost twenty years, he contributed observational data to the phenological research project Nature's Calendar, and did so practically every week over the telephone (Van Vliet, 2019). His data on blooming plants in the monastic garden are highly valuable for research purposes. However, his story is also a vivid tale of motivations to take action for nature: about one man's personal connection to nature, a love for flowers and butterflies, curiosity and excitement about patterns and changes in nature, and a desire to learn and to teach (Van Vliet, 2019).

This is what drives the research brought together in this thesis: a wish to understand why people take action for nature. As such, the first question we ought to ask ourselves is: Why is it important to understand action for nature? This is the starting point for the next section.

1.2 The importance of understanding action for nature

Threatening news about biodiversity loss rears its head constantly, warning of a global defaunation wave (Dirzo et al., 2014) or even a sixth mass extinction event, the latest since the dinosaurs (and many other species) were wiped out around 66 million years ago (Barnosky et al., 2011). Researchers have also detected population declines within species, furthering concerns of ecosystem collapse (Rosenberg et al., 2019). Such worrying news also extends to their habitats; Brooks et al. (2002) highlight how especially areas rich in biodiversity (so-called 'hotspots', such as tropical forests) are under severe threat. A Dutch example is the recent *Living Planet Report* (Wereld Natuur Fonds, 2020), which highlights severe losses in agricultural landscapes especially: population sizes of associated species demonstrated average reductions of almost 50% since 1990 (p. 44).

The recent global assessment of biodiversity and ecosystem services, carried out by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Ser-

vices (IPBES), affirms many of these concerns (IPBES, 2019, pp. 11-12). While there are many successes to be celebrated, the assessment nonetheless paints a worrying picture, highlighting trends such as far-reaching human impacts on natural lands and the aforementioned loss of biodiversity and its associated loss in terms of resilience. The assessment also notes the importance of incorporating diverse valuations of nature into policies and incentives, and warns that these currently tend to prioritise economic growth over protecting nature (IPBES, 2019, p. 14). Importantly, it argues that ‘most international societal and environmental goals, such as those embodied in the Aichi Biodiversity Targets and the 2030 Agenda for Sustainable Development, will not be achieved based on current trajectories’ (p. 14), and that ‘individual and collective action for transformative change’ will be needed (p. 16). This entails a joint commitment of policy actors, different business sectors, but also citizens across the world to take action for nature.

The identification of a gap between ambitions and practice in terms of protecting nature and biodiversity naturally leads to the question why stimulating further action for nature appears to be so difficult. At the individual level, a large body of literature from fields such as environmental psychology has identified a host of explanations, reaching beyond specific action for nature to also include more general sustainable behaviours such as recycling or energy saving. Influential factors may include the power of routine, time or financial constraints, people’s values and their influence on attitudes and personal norms (Fornara et al., 2020; Schultz & Zelezny, 1999), a lack of awareness of alternatives, and perceptions of self-efficacy and social support (Klößner, 2013; Martin et al., 2016b).³ Other literature points towards more institutional factors; for instance, reduction in meat consumption is hampered by pricing and subsidies that make alternatives unattractive or unavailable for consumers even if the intention is there (Bryła, 2016).⁴ In other words, it is difficult for citizens to take action if policy and market institutions and policies do not support nature-friendly choices, or even actively work against them (as reflected in IPBES’ above-noted argument on commitment of public and private actors). Hajer et al. (2015) share a similar observation regarding the United Nations’ Sustainable Development Goals (SDGs). The authors note that there is great transformative potential in the SDGs in terms of positioning an inspiring vision, but also argue that this potential is not fully realised in part due to current regulation sometimes undermining rather than supporting sustainable actions (p. 1656), and because the SDGs emphasise governmental action rather than other actors (including citizens, p. 1653).

³ For an overview of many of these factors, see Knippenberg (2012, pp. 41-77).

⁴ In the words of Prévot et al. (2018, p. 7): ‘individual behaviors are implemented not only if they are intentional, but also if the context is favorable’.

There is another element to creating this supportive societal context for the transformative potential of action for nature, beyond subsidies or certifications. Abson et al. (2017) argue that systems such as nature protection or food production are difficult to change, in part due to common solutions taking the form of technological fixes or adjustments of relatively small mechanism (e.g. increasing funding for an existing subsidy programme). The authors draw on Meadows’ (1999) work on leverage points to position these as ‘shallow’ points of leverage for effecting change, as they do not intervene at the level of the overarching design of and power in a system, or especially the underlying goals and worldviews of the actors involved (Abson et al., 2017, p. 32). They argue that these ‘deep’ leverage points, which fundamentally question the intent and design of a system, hold much greater potential for realising the necessary transformative change (p. 33).

These and other literatures are highly informative to gain an understanding of why necessary actions for nature are not happening at a sufficient pace, and the sort of individual and societal factors that may offer ways to stimulate these actions. Despite all the doom and gloom, however, it is important to recognise that many people across the world already take action for nature. Krasny et al. (2014b, p. 183) argue a similar point, noting that ‘the possibility that humans (...) may become positive drivers of ecosystem change is often absent from the discussion’. As such, while investigating factors that hamper action for nature is valuable, research also ought to pay attention to those already involved in such actions. In line with this focus, when addressing the transformative potential of green volunteering in this thesis I refer to its potential to offer opportunities for connecting with and taking action for nature, which in turn contribute to more sustainable human-nature relationships and a more supportive environment for nature conservation now and in the future.

One example of a related research programme is the BIOMOT project, which investigated the motivations and life stories of over a hundred highly committed actors for nature across Europe (Van den Born et al., 2018). While the BIOMOT project focussed on a group of highly committed actors for nature, action for nature is carried out by a larger and diverse group of individuals, including people for whom action for nature is a relatively small part of their lives. This is where the green volunteers I introduced at the start of this chapter return to the spotlight. Despite the crucial role of diverse green volunteers mentioned in section 1.1, their background, motivations and perspectives require more attention in empirical research (Woosnam et al., 2019, p. 2), also with the aim to further our understanding of action for nature.

1.3 Debates surrounding green volunteering

The previous section positioned my work in the broader literature on the transformative potential of action for nature, and argued for the importance of studying green volunteers. In my research on green volunteering, I specifically aim to put a spotlight on the volunteers themselves: their activities ('what?'), their demographic profile ('who?'), their motivations ('why?'), as well as their perceptions, experiences and concerns regarding their volunteer work. As shown in section 1.4, these dimensions shape the central research questions of this thesis. These elements were chosen based on their crucial importance for both research and practice (see section 1.5), and are highlighted as requiring more empirical examination in diverse bodies of literature. In this section, I draw on three of these literatures to show why and how they highlight participants' background, motivations and experiences. Firstly, in terms of the transformative potential of green volunteering, the aforementioned work by Abson et al. (2017) highlights the importance of worldviews and how people relate to nature, which evokes the literature on connection with nature (or the lack thereof). I thus discuss insights from this body of literature in section 1.3.1. Secondly, one of the types of green volunteering central to this thesis, biodiversity recording, is presently receiving great attention in terms of 'citizen science', a broader development of citizens taking up an active role in carrying out research. Since citizen science is the target of increasing scholarly attention in different fields, and has been a mainstay in research on biology and ecology, insights from this literature are important to incorporate into the present study: I do so in section 1.3.2. Finally, aside from green volunteering people are engaged in volunteer work for many causes, and the literature has discussed a pluralisation of motivations for volunteering, something that has important consequences for understanding its role and potential (including for green causes) in contemporary society. As such, section 1.3.3 sketches this development in the nature of volunteer work and its implications for my work on green volunteering.

1.3.1 Contact and connection with nature: On the 'extinction of experience'

A recurring point of concern in discussions on the human-nature relationship is the increasing loss of our direct contact with nature, sometimes referred to as the 'extinction of experience' (Miller, 2005). Our opportunities for direct encounters with plants and animals in daily life are on the decline, with urbanisation trends considered a key driver (Mabelis & Maksymiuk, 2009, p. 63; Turner et al., 2004). As of 2018, more than half the global population lives in urban areas, with the figure rising to over 80% in the United States (United Nations Department of Economic and Social Affairs, 2019). Linked to this, Kareiva (2008) discusses a downward trend in

nature-based recreation across several countries. As these trends are unlikely to reverse in the near future, the extinction of experience is likely to worsen over time.

Why then is this considered an important issue? One oft-discussed dimension is the variety of health benefits of being in nature, which often feature in discussions on the importance of nature and greenspace (e.g. Martin et al., 2020). Several studies have adopted an experimental approach to look more closely at the specific contribution of exposure to nature on wellbeing. These studies, often among student samples, have generally shown beneficial effects of nature exposure. For instance, using vignette, nature walks, diary and photography methods, Ryan et al. (2010) found that being outdoors was related to greater subjective vitality, especially when natural features were present. Mayer et al. (2009) reported that both real and virtual nature exposure was associated with several positive emotional and cognitive outcomes, including attentional capacity, and that these outcomes were stronger for real than virtual nature. Positive affect and feelings of elevation (e.g. inspiration or wonder) were also higher for participants engaging with natural settings in two studies comparing engagement in nature to urban landscapes (Passmore & Holder, 2017) or puzzle solving (Passmore & Howell, 2014). Nature contact has also been investigated as a physical or mental health intervention, for instance through the development of nature walks as a mindfulness exercise (Schuling et al., 2018).

People's estrangement from nature is also described in terms of people's knowledge of nature and biodiversity. From the idea that 'collective ignorance ultimately leads to collective indifference' (Miller, 2005, p. 430) arises a concern that a reduction in direct contact with nature may also weaken our knowledge of it, in turn reducing our desire to be in and care for nature: a downward spiral. Kareiva (2008, p. 2757) phrases a similar sentiment: 'People care about what they know'. This in turn has spurred studies of how people think and reason about nature, such as the work of Levé et al. (2019) on lay conceptions of the word 'biodiversity'. Concerns are also raised over a loss of species identification knowledge and an associated decline in the number of taxonomists, both professional and volunteer (Hopkins & Freckleton, 2002). Hooykaas et al. (2019) investigated the ability of the Dutch general public to identify a set of 27 native species, finding relatively low levels of species literacy, especially among schoolchildren. The authors argue that this finding 'may even point to an increasing separation between people and nature' (p. 8), illustrating how concerns about a lack of knowledge of nature relate to discussion on the extinction of experience. Another concern in terms of biodiversity knowledge is the so-called 'shifting baseline syndrome' (Soga & Gaston, 2018), a form of 'generational amnesia' where each generation grows up with an increasingly impoverished

nature, yet lacks the knowledge of species richness from previous generations to fully grasp what has been lost.

Beyond the dimensions of health and knowledge, however, the extinction of experience is also argued to have severe implications for people's emotional connection with nature and attitudes of care and stewardship. The human connection with nature is studied using a host of different methods, including a diversity of quantitative measures (Tam, 2013). These measurement scales may emphasise an emotional connection with nature (Kals et al., 1999; Perkins, 2010), a more cognitive construct⁵ eliciting the degree to which people hold egocentric or ecocentric ideas of nature (Mayer & Franz, 2004), the degree to which people include nature in their self-concept (Martin & Czellar, 2016; Schultz, 2001), or a combination of affective, cognitive, and experiential dimensions (Nisbet et al., 2009). People's connection with nature has also been studied in terms of their connection to specific natural places (Colley & Craig, 2019; Folmer et al., 2013a; Ryan, 2005; Wynveen et al., 2012) or their ideas about the appropriate relationship between humans and nature (Braito et al., 2017; Van den Born, 2007, 2008). Connection with nature was found to play a role in the aforementioned relationship between being in nature and wellbeing (Capaldi et al., 2017) and is also argued to be an important factor for understanding why people engage in pro-environmental behaviour (Nisbet et al., 2009), including action for nature.

Considering this importance of connection to nature, it is no surprise that Miller (2005) describes the extinction of experience as fundamentally about a waning connection between humans and nature. As such, reconnecting humans and nature has been argued to be an important step towards mobilising the transformative potential of citizen action for nature. In fact, Abson et al. (2017) position interventions relating to the human-nature connection as one of three key deep leverage points to effect changes in the design and intent of systems of importance to nature and biodiversity:

How people perceive, value and interact with the natural world fundamentally shapes the goals and paradigms underpinning many systems of interest. Although not always immediately apparent, the functioning of a system is influenced by the degree to which humanity's reliance on the natural world is acknowledged, and the extent

to which a close relationship with nature is identified as essential to a 'good life'. (p. 34)

The dimensions of health, knowledge and connectedness all point towards the importance of direct contact with nature, and concerns regarding a perceived lack of such experiences. It is also important to note, however, that the extinction of experience may differently affect people of different age, gender or socio-economic or cultural background. An especially common thread in this literature is children's contact and connection with nature. An evocative work in this context is Louv's (2005) book *Last Child in the Woods*, a clarion call for the importance of providing children with the freedom to explore the natural environment (if the subtitle *Saving our Children from Nature-Deficit Disorder* did not make this sufficiently clear). The extinction of experience among children also links with related concerns over their swiftly decreasing 'right to roam', the degree to which they are allowed to travel and play outside unsupervised (Derbyshire, 2007). The importance of this concern is backed by research illustrating the diverse benefits of playing outside in nature in terms of physical and mental health as well as creativity and social skills (Chawla, 2015). In addition, childhood experiences in nature are linked to being in nature as an adult (Thompson et al., 2008) and appear to play an important role in motivating commitment to nature and action for nature later in life (Asah et al., 2018; Van den Born et al., 2018). In other words, the loss of children's contact and connection with nature appears of particular concern to many authors, also for future action for nature.

Other issues of diversity in nature contact are also reported. For instance, Ambrose-Oji (2009) highlights how different barriers may affect diversity in natural area visitation, ranging from perceived barriers to be in nature to physical barriers, with the latter being a specific point of attention for e.g. the elderly and people with a disability. In terms of perceived barriers, some studies have looked at how gender (Kong et al., 1997; Skår, 2010) or ethnic and cultural background (Buijs et al., 2009; Elmendorf et al., 2005; Kloek, 2015; Rishbeth, 2001) can influence how people experience and relate to nature or green spaces. These and other examples highlight how people's background influences how they experience and connect with nature (Jacobs, 2020), further demonstrating the importance of understanding the 'who' of action for nature.

The concern for the extinction of experience, and interest in ways to reconnect humans and nature, signals an argument for studying green volunteering. Could green volunteering offer one avenue to achieve this human-nature (re)connection? Some authors have indeed made this argument, such as Schuttler et al. (2018) who dis-

⁵ It should be noted that Mayer and Franz (2004) themselves characterised their Connectedness to Nature Scale as measuring an emotional connection to nature. However, Perrin and Benassi (2009) have argued that it actually measures cognitive rather than affective beliefs.

cuss volunteer participation in biodiversity recording as having significant potential to foster opportunities to experience and reconnect with nature. From the field of ecological restoration, Weng (2015, p. 138) similarly argues that ‘volunteering for restoration projects gives people opportunities to connect with the environment personally’ (see also Larese-Casanova & Prysby, 2018). Green volunteering provides opportunities for enjoying nature and the outdoors (O’Brien et al., 2010) and some types of green volunteering, especially biodiversity recording, may hold significant potential in stimulating learning about biodiversity (Cosquer et al., 2012; Sewall & Fleischner, 2019).

In summary, the literature demonstrates a significant concern with a loss of both direct contact and connection with nature, as well the diverse benefits of nature contact. In turn, reconnecting people with nature is argued to be a key step in order to mobilise the transformative potential of action for nature, and green volunteering may offer an important avenue. This section has also highlighted the importance of recognising diversity in the profile of individuals taking action for nature; as such, gaining insight into the background of current participants is one of the core research questions of this thesis.

1.3.2 Citizen science and sharing biodiversity data

The collection of data on flora and fauna, and the research that depends on these data, is strongly reliant on the effort of volunteers who dedicate their time to observe and monitor the natural environment. Just to give one example, RAVON (the Dutch species organisation for reptiles, amphibians and fishes) engaged more than 3000 volunteers in observing and monitoring these species in the Netherlands in 2017 and 2018 (Joosten & Creemers, 2019, p. 16). The total number of Dutch volunteer recorders has been estimated to be somewhere around 15,000 (Lawrence & Turnhout, 2010, p. 355; Mabelis & Maksymiuk, 2009, p. 71), although these estimates only capture recorders active as organisational volunteers for the Dutch species organisations. The number would be much higher if we include individuals who share biodiversity data on their own accord and/or a more incidental basis. The number rises further if we include large national campaigns such as the Dutch Garden Bird Count (*Tuinvogeltelling*), organised every January by the Dutch Society for the Protection of Birds. This project welcomed the contributions of a few thousand participants in 2003, up to over 40,000 in 2013, and reaching a new record of 90,000 participants in 2020 (Vogelbescherming Nederland, 2013, 2020).

The term ‘citizen science’ is often used in contemporary academic (and increasingly, societal) discussion for research where participating citizens take up an active

role in carrying out research (rather than just being the object of study, as in e.g. survey research). Involved citizens may cover a range between interested individuals with no prior knowledge of the topic, to ‘amateur experts’ with knowledge and experience rivaling that of any ‘professional’ scientist. Their activities may include (input in) formulating the research goals or questions, designing the methodology, carrying out data collection or analysis, dissemination of the results, or a combination of any of the above. In addition, while citizen science is often a collaboration between scientists employed at a research institute and participants from broader society, some projects may feature little involvement of institutional scientists at all. Chapter 2 will delve into more detail on the different definitions, domains and forms of citizen science.

While on the rise in many fields, the study of nature and biodiversity is arguably the most well-known and prominent field of citizen science: there is a long-standing tradition of volunteers (e.g. amateur natural historians) documenting diversity and change in the natural world. Historical archives have revealed examples dating back several millennia, such as Japanese officials, journalists and botanists carefully monitoring the phenology of the cherry blossom (Primack et al., 2009). Ornithology is another example of a field of natural history with a strong tradition of involvement of dedicated volunteers (Greenwood, 2007), with regular birdwatchers and long-running projects like the Christmas Bird Count (National Audubon Society, n.d.) and the North American Breeding Bird Survey (Hudson et al., 2017) contributing to our understanding and protection of bird populations across the world. Recent reviews of the disciplinary focus of present-day citizen science projects (Hecker et al., 2018) and publications (Kullenberg & Kasperowski, 2016) have shown that the vast majority are found in the fields of ecology, biology, environmental sciences and conservation. Among environmental citizen science projects active in Europe, Turbé et al. (2019, p. 5) found that over two thirds relate to nature or biodiversity.

The increasing attention paid to citizen science in both the scientific literature and policy documents can be attributed to several factors. On the one hand, there is great enthusiasm about the potential for citizen science to combat the perceived rise in scepticism about science by offering people the opportunity to take part in genuine research. Project organisers may specifically aim for a more positive view of science, or greater understanding of the scientific process, as a learning outcome of citizen science projects (Bonney et al., 2016). Other hoped-for learning outcomes include increased awareness of or knowledge about the topic under study (whether that be cancer or climate change), behaviour change, or empower-

ment of participants (Branchini et al., 2015; Den Broeder et al., 2017; Turrini et al., 2018). Citizen science offers opportunities to actively engage participants in several stages of the research process (see section 2.1.2), and may allow joint reflection on how research projects can be made more relevant to participants or broader society (Leeuwis et al., 2018, p. 153). The increasing enthusiasm for citizen science may thus also relate to a rising emphasis on the ‘social responsibility’ of science (Glerup & Horst, 2014), for instance in terms of attributing a stronger role to societal actors in shaping research agendas and priorities.

However, citizen science is more than a public engagement exercise; another key reason for the rising prominence of citizen science is its promises for the advancement of science and conservation. One of these promises has to do with its scope. Especially the rise of the internet and technologies such as smartphones have greatly increased the possibilities for people to collect and share ever-increasing amounts of data about their environment or themselves (Andrachuk et al., 2019; Newman et al., 2012; Wynn, 2017). In the ‘Age of Big Data’ (Lohr, 2012) and considering the utility of datasets covering large spatial or temporal scales for investigating questions or hypotheses that were hitherto difficult to study (Kobori et al., 2016; Schröter et al., 2017; Tulloch et al., 2013b), engaging volunteers in the research process opens up many new opportunities for science. In turn, these opportunities offer important avenues to inform conservation monitoring, decision-making or management priorities (Chandler et al., 2017; Danielsen et al., 2014; McKinley et al., 2017).

In other words, the biodiversity data collected by volunteer recorders is of great importance to science, policy and management: this may include ecological research, identification of priority species in conservation policy, decisions on landscape planning and management, or even court cases related to flora and fauna. For instance, in the conflict surrounding the culling of fallow deer (*Dama dama*) in and around the Dutch National Park Zuid-Kennemerland, volunteer-collected data on butterflies and other species were cited as successful argument for the continuation of deer management (Raad van State, 2017). In terms of research, one example is the Global Biodiversity Information Facility (GBIF), founded in 2001 to bring together datasets on species records across the world. As of January 2020 the GBIF database has contributed to over 4000 peer-reviewed publications (GBIF, n.d.), and Irwin (2018, p. 481) cites an estimate of 50% of its data points originating from the efforts of volunteers. There is significant potential for biodiversity citizen science to inform policy and management (Converse et al., 2016; Levrel et al., 2010; Nascimento et al., 2018), as demonstrated by its application in e.g. monitoring

both common and endangered species (Andrews et al., 2019; Jiguet et al., 2012) and surveying invasive alien species (Adriaens et al., 2018; Crall et al., 2010). Involving local stakeholders in monitoring the environment can allow for faster and more effective decision-making based on collected data, especially at the local level (Becker et al., 2005; Danielsen et al., 2010; Fulton et al., 2018).

However, some barriers hamper the utilisation of data collected or analysed by citizens in science, policy and management. I briefly touch upon the two main ones here: negative perceptions of citizen science data among scientists and decision makers, and tensions surrounding the sharing of these data. I focus here on biodiversity data, though many of these issues are also pertinent in other fields of research.

Despite the impressive achievements and potential noted above, several authors have discussed sources of (and strategies to combat) scepticism regarding the utility of citizen science data (e.g. Freitag et al., 2016; Riesch & Potter, 2014). An important one is data quality: since volunteers may vary widely in their background knowledge and experience with research, citizen science data is often regarded as being of lesser (or at the very least, more varying) quality compared to data collected by ‘professional’ scientists. Much has been written about this debate, including a number of studies that have compared biodiversity data collected by citizen scientists and those of ecologists. While an in-depth discussion of the topic of data quality is beyond the scope of this thesis, these studies indicate that biodiversity citizen scientists can collect data on a par with those collected by researchers (Beaubien & Hamann, 2011; Kosmala et al., 2016), if factors such as training (Ratnieks et al., 2016) and taxonomic breadth (Kremen et al., 2011) are taken into account.⁶ Craglia and Shanley (2015) note that it is important to take the goals of a citizen science project into account: are the data intended for a scientific journal article, or an early warning system for invasive species? In addition, they argue that while quality criteria are important in citizen science, this is no different for any other form of research: ‘Either there is a good fit between research questions, methods, data, and conclusions, or there isn’t, regardless of methods or data source’ (p. 687). Indeed, issues of data accuracy and variability may affect institutional scientists just as much as volunteers (Specht & Lewandowski, 2018), and procedures for data quality assurance, data validation and appropriate analysis are as important in citizen science as they are in any form of science (Aceves-Bueno et al., 2015, p.

⁶ However, some studies report more concerning assessments of data quality (e.g. MacKenzie et al., 2017).

503; Stepenuck & Genskow, 2018).⁷ Importantly, it may also help to combat the ‘image problem’ of citizen science if its use in existing research and management decisions was more widely communicated. For example, Cooper et al. (2014) reviewed the literature on climate change impacts on bird migration, and found that while half the papers they reviewed made use of data collected by citizen scientists, few made any explicit mention of this. As the authors note, ‘the stigma may persist unless researchers begin to draw attention to the citizen-science elements in their research papers’ (p. 3).

Biases in the collection of data may also be a concern in citizen science. For example, some common biases in biodiversity citizen science may include spatial ones (sightings being more common in large cities and near roads, i.e. more accessible areas (Petrovan et al., 2020; Tanner et al., 2020)) and temporal ones (e.g. the so-called ‘weekend bias’, with the weekend offering volunteers more opportunities to collect data (Cooper, 2014)). In addition, volunteers may be more inclined to share observations of rare, unknown or otherwise exciting finds, and less likely to report common species or especially a lack of sightings (Dickinson et al., 2010, p. 163). Aside from these sorts of biases, in some citizen science projects there may be concerns about hidden agendas of participants, especially in projects where participants’ health or property is at stake. Roy and Edwards (2019) discuss water quality monitoring in Flint, Michigan, and how a few citizen science participants appeared to deliberately report incorrect data in order to maintain a crisis narrative. Of course, similar to the issue of data quality discussed in the previous paragraph, it is important to note that biases and value judgments are not exclusive to citizen scientists (Elliott & Rosenberg, 2019).⁸ As noted by Chari et al. (2017, p. 10), ‘while it is fair to consider the issue of bias, everyone, expert or amateur, citizen scientist or industry scientist, has conscious and unconscious biases; holds various moral and ethical values; and is influenced by social, cultural, and professional norms’.

In terms of the second main barrier, the sharing of citizen science data, privacy is an important tension. While these tensions often come to the fore in citizen science that involves providing data about oneself (such as some biomedical projects), they also arise in biodiversity citizen science. For instance, submitted sightings of flora or fauna often include information of volunteers’ location and behaviour.

⁷ As stated by Brown and Williams (2019, p. 566), ‘the issue is how data are collected, not by whom (professionals or volunteers)’.

⁸ For example, Van der Wal et al. (2015) found different spatial biases in bumblebee records from both a national repository and a citizen science initiative, suggesting complementarity of both approaches.

While this grants promising opportunities for understanding or predicting their behaviour (e.g. Boakes et al., 2016; Lopez et al., 2020; Tulloch et al., 2013a), there are notable implications for privacy (Anhalt-Depies et al., 2019; Bowser et al., 2014). In biodiversity projects, however, the privacy of the monitored species may also be at risk: sharing the location of some plant or animal may invite poaching, or invite a rush of enthusiast that risks disturbing species or habitats. While such dilemmas have increased in prominence with the rise of online platforms for collecting and visualising data, they predate these developments. One example is the rediscovery of the large copper (*Lycaena dispar*)⁹ in the Netherlands in 1915 (Janssen, 2015). When the butterfly was rediscovered, Dutch and international entomologists flocked to its likely location to add the large copper to their collections (and in the interest of profitable trade), spurring those responsible for its rediscovery to try to keep the exact habitats a secret for as long as possible (pp. 29-31).

However, even more subtle tensions may arise in sharing biodiversity data, ones that appear to have received less attention in the literature. Lawrence and Turnhout (2010) illustrate how the centralised and standardised processing of biodiversity records in databases for use in science and policy may conflict with the personal meaning that the data have for volunteer recorders. Several factors play into this conflict. Ellis and Waterton (2004, p. 99) discuss how volunteers may experience a loss of control when they submit their data into a database without having insight into how these data inform research or decision-making. For committed volunteers this can lead to feelings of exclusion and take a toll on their loyalty, especially if the data are perceived to inform decisions that run counter to volunteers’ intentions (Turnhout, 2020, p. 189). Lawrence and Turnhout (2010, pp. 357-359) add the importance of trust in the organisation handling the data for volunteers’ decision to share them. While volunteers may attribute strong importance to contributing to science or policy, the loss of the local and personal context and meaning of their data raises tensions: ‘Although it might seem that the data are merely ‘raw’ data, the values and motivations involved in their recording are still attached to them’ (p. 358).

These observations thus further highlight the importance of studying these motivations and views of green volunteers. These insights from the literature indicate that citizen science data play an important role in our understanding of the natural world, yet (like any data) need to be gathered, handled and used in a responsible way. Importantly, while discussions on data quality and potential biases feature

⁹ Known in Dutch as the ‘grote vuurvliinder’.

prominently in the literature, I have also shown how a responsible approach to sharing biodiversity data requires sensitivity to the motivations, expectations and experiences of the involved volunteers, as biodiversity citizen science may involve a highly personal connection with nature. Gaining insight into the 'who', 'what' and 'why' of biodiversity citizen science is thus an important element of my work on green volunteering.

1.3.3 Volunteering in the 21st century

Some of the key concerns of nature organisations related to volunteering include diversity among volunteers and increasing difficulty in attracting and maintaining them (Actieplan Groene Vrijwilligers, 2018), which link to the literatures on connection to nature and citizen science discussed above. However, while this thesis focusses on green volunteering, these issues are not exclusive to projects related to nature and biodiversity. The scholarly literature on volunteering in general has discussed many of the same issues, yet (as noted in the next section) the insights of this body of literature appears to have informed the study of green volunteering to a relatively limited degree. This is a missed opportunity, as this scholarship addresses an important development in the very nature of volunteering, which bears great relevance to green volunteering as well. As such, this section draws on insights from the volunteering literature regarding this contemporary development.

The Netherlands is characterised by an active tradition of voluntary participation. A study on volunteering patterns in the Netherlands ($N = 7654$) found that 48.5% of respondents had carried out volunteer work for an organisation at least once that year, a number that appears stable across the past few years (Arends & Schmeets, 2018, p. 4). This study also indicated that Dutch citizens most commonly volunteer for sports associations, schools, nursing and religious or cultural organisations (p. 5) and that they dedicate a significant amount of time on volunteering, with 63.7% spending at least one hour a week (p. 7). It should be noted that this study focussed on voluntary participation in the activities of formal organisations; these numbers would likely be significantly higher if more informal forms of volunteering, including citizen initiatives, are included as well.

However, despite this strong tradition of active volunteering, some rumbles of discontent have become apparent among both practitioners and scholars in the field. Concerns have been raised among Dutch professionals about a perceived drop in the hours spent volunteering on average, and organisations report increasing difficulty engaging sufficient numbers of volunteers (KNHM foundation, 2019, p. 5). These concerns about difficulties in recruiting and maintaining volunteers are

voiced in several other countries as well (Brudney & Meijs, 2009, pp. 565-566). In addition, a lack of diversity among volunteers is often highlighted, especially in terms of age and ethnicity (KNHM foundation, 2019, p. 6) and education (Ges-thuizen & Scheepers, 2012). These concerns all relate to the sustainability of the current approach to volunteering, developments that may subtly change how we look at volunteering (including green volunteering) in the 21st century.

Importantly, some scholars have argued that broader societal trends of individualisation may be changing the underlying motivations for volunteering, and the role of volunteering in people's lives. Dean (2015) offers a worrying perspective: discussing neoliberal trends of seeing volunteering increasingly as a purely individualised choice in service of personal development (e.g. 'job-hopping' among volunteering 'jobs'), he cautions against the detrimental effects of 'a society where people are more likely (or encouraged) to abandon commitments and loyalties' (p. 142). However, other commentators have provided a somewhat different perspective on these developments. For instance, Aarts et al. (2014, pp. 112-113) note that these individualising trends in society do not necessarily imply a reduced importance of groups; rather, group affiliation becomes more fluid, flexible and self-selected, but no less important. Regarding the impact of this development for volunteering, Hustinx and Lammertyn (2003) depart from the similar observation that presently 'willingness to participate in volunteering seems to be more dependent on personal interests and needs than on service ethic and a sense of obligation to the community' (p. 168). However, they discuss this change as a pluralisation of motivations for volunteering, rather than a shift from 'traditional' to 'modern' volunteers (p. 171). As traditional sources of collective identity weaken in importance (with the church often noted as an example), volunteering becomes a way for people to shape and express their personal identity (Grönlund, 2011).¹⁰ However, Hustinx and Lammertyn (2003, p. 174) caution that this more individualised mode of volunteering does not imply a lack of altruism or compassion; rather, 'other- and self-directed impulses ... come to strengthen and enrich each other'. In other words, the more flexible way people approach volunteering opportunities these days should not be too easily regarded as arising from a lack of altruistic motivation.

Regardless of whether this change is seen as a shift or a pluralisation, at the very least we can observe a change in the way participants relate to their volunteer work,

¹⁰ This too fits within a broader societal trend linked to individualisation. Aarts et al. (2014) argue that 'instead of a predetermined identity based on the familiar categories (background, social class, age, gender, etc.), people increasingly construct their own identity' (p. 114, own translation).

both in terms of opportunities, motivations and goals but also their experiences while volunteering. In light of these developments, the background, motivations and experiences of the volunteer thus become an increasingly important factor for consideration in volunteer management. This led Brudney and Meijs (2009, 2013) to propose a shift to a different perspective on volunteers and volunteer management. Rather than a relatively instrumental and organisation-centric perspective on volunteering, characterised by a short-term view and recruitment based on organisations' needs, they advocate a perspective that considers volunteer energy as a common resource, one that must be nurtured over the long term, across organisations and with a strong emphasis on volunteers' needs and experiences (Brudney & Meijs, 2009, pp. 574-577).

In summary, this section has sketched a key development in the field of volunteering. On the one hand, the pluralisation of motivations from a strong collective orientation towards a mix of collective and self-expressive motivations alters how volunteers engage with volunteering organisations and why they volunteer in the first place. This has triggered different organisational responses: a normative strategy to promote volunteering, as well as attempts to adapt to the changing nature of volunteering, which demands a less organisation-centric perspective (Hustinx & Meijs, 2011). Thinking about volunteering from the perspective of the volunteer, however, requires insight into their motivations and their experiences in volunteering, as well their profile, background and future intentions. If we want to understand green volunteering as a form of action for nature, these dimensions are thus crucial to take into account. As highlighted in the next section, they form the central research questions of this thesis.

1.4 Research goal and questions

As argued in the preceding sections, studying green volunteering holds great promise for increasing our understanding of action for nature. It intersects not just with contemporary debates on how to halt and reverse worrying trends in biodiversity and nature loss (section 1.2), but also with discussions on changes in our engagement with nature, reorientations in how we conceive of volunteering, and the rising attention to citizen science (section 1.3). I have also illustrated how in all these debates, the dimensions of 'what', 'who' and 'why' surface repeatedly. Studying these dimensions thus offers an opportunity to draw together insights from literatures on action for nature, citizen science and volunteering to help understand the findings presented in this thesis and inform questions for future research.

The overarching research goal of this thesis is as follows:

The aim of this thesis is to contribute to our understanding of action for nature through studying the profile, motivations, expectations and experiences of green volunteers in the Netherlands.

Based on this research goal, I formulated the following research questions:

1. What is the profile of Dutch green volunteers, in terms of their socio-demographic profile and activities? (*Chapters 3, 5 & 6*)
2. What are their motivations for green volunteering? (*Chapters 3, 5, 6 & 7*)
3. What are their current experiences, in terms of:
 - a. Their views on data sharing in biodiversity citizen science? (*Chapter 3*)
 - b. Their significant nature experiences? (*Chapter 4*)
 - c. Their learning outcomes? (*Chapter 5*)
 - d. Their attitudes towards / evaluation of their volunteer work? (*Chapter 6*)
4. What are their expectations in terms of future engagement and reasons to continue or quit green volunteering? (*Chapters 6 & 7*)

As such, my research covers the dimensions of 'who', 'what' and 'why' that are further expanded upon in Chapter 2. I approached these research questions using quantitative methods, specifically survey research; section 1.5 will delve further into the methodological design of this thesis.

In addition to studying several dimensions of green volunteers, I do so in different contexts. Figure 1.1 shows how the different types of volunteers discussed in this thesis relate to each other: I conceive of citizen scientists and green volunteers as specific subsets of the general category 'volunteers', and biodiversity citizen scientists can be found where citizen science and green volunteering intersects. In the first three empirical chapters of this thesis, my work is focussed on biodiversity citizen scientists (both generally across the country and within the context of a specific national research project), while in Chapters 6 and 7 I study the larger group of green volunteers, including but not limited to biodiversity citizen scientists. Section 1.6 outlines the contribution and focus of each individual chapter.

As will be discussed further in the next section, this thesis aims for relevance for both our (scholarly) understanding of green volunteering and action for nature, as well as for organisations working with green volunteers in practice. On the theoretical side, my discussions of the literature in this and the next chapter have identified a clear call for more insight into who is engaged in green volunteering, their motivations for taking action for nature, and the experiences of participants in citizen

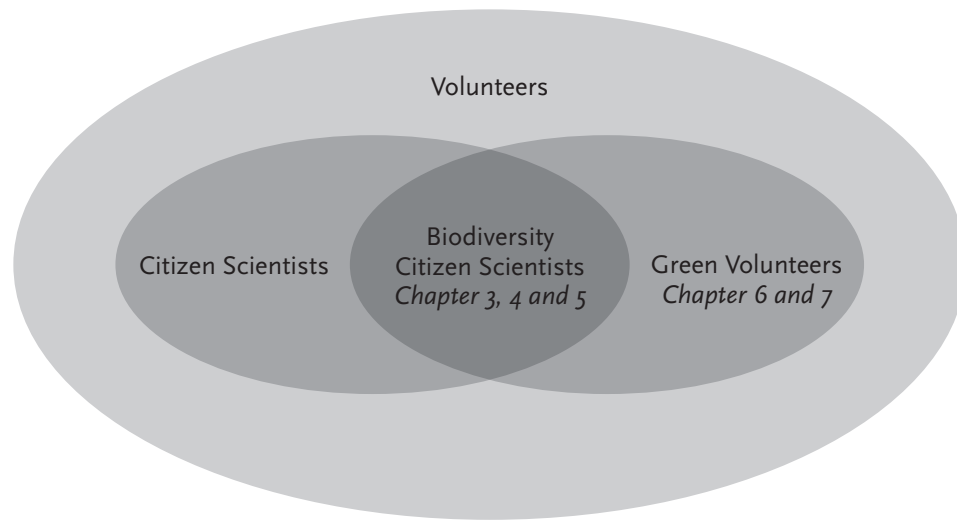


Figure 1.1 | The interrelation among the different types of volunteers discussed in this thesis.

science and other forms of (green) volunteering. Further knowledge on action for nature, besides being of interest for curiosity's sake, is also of relevance for science itself to contribute towards the transformative potential of action for nature. For instance, in line with the aforementioned call of Krasny et al. (2014b) to pay more attention to the positive role human action can play in protecting nature and biodiversity, Bouman and Steg (2019) argue that in broader transitions towards sustainability, a major hampering factor for taking action may be the perception that one's social environment would react negatively:

Research consistently shows that – contrary to popular belief – individuals, groups, and society rather strongly endorse biospheric values, which has great potential in motivating and accelerating pro-environmental change across all societal levels. Yet, individuals structurally underestimate the biospheric values of others, which could hold them back from taking action. To unlock the full potential of people's biospheric values, people need to recognize that biospheric values are widely endorsed within the groups and society they belong to. (p. 29)

Making the background, motivations and experiences of people who already take action for nature visible through scientific research is one way in which this thesis may contribute to stimulating increased recognition of the positive role of humans for nature, which in turn may aid in a broader collective orientation towards action for nature.

Moreover, as shown in Figure 1.1 (and taken up in Chapter 2) I study green volunteering within the context of broader insights related to general citizen science and volunteering. While there are some contributions bringing together insights across these bodies of knowledge (e.g. West & Pateman, 2016) as a whole there is much to gain here. For instance, Weng (2015, p. 142) notes how one lacuna in the literature is a limited interaction between the citizen science and ecological volunteering literatures; the same can be said regarding work on green volunteering and volunteering for social aims. Since all three of these fields struggle with similar concerns regarding the sustainability of volunteering, and have all developed relevant insights, I aim to draw on these diverse literatures in order to contextualise my findings.

As for the practical aims, as described in more detail in the next section (and in several of the empirical chapters) the research reported here arose out of pressing questions among organisations working with green volunteers. Recent publications on citizen science (e.g. National Academies of Sciences, Engineering, and Medicine, 2018) and societal initiatives on green volunteering (De Kracht van de Groene Vrijwilliger, 2016) recognise that knowing your volunteers, and making sure activities align with their background and motivations, are crucial to ensure a sustainable and responsible future for volunteering. Understanding the 'who', 'what' and 'why' of green volunteering may thus support organisations to ensure volunteers' continued appreciation, recognition and support.

In addition, findings in this thesis could be of practical use in terms of recruitment of future volunteers. After all, understanding who is currently volunteering may inform priority areas for recruitment, and the insights on experiences and intentions developed here (e.g. on key nature experiences, learning outcomes or future intentions to volunteer) are of value for developing recruitment strategies. This is also the case for motivations; as argued by Admiraal et al. (2017, p. 149), 'Personal motivations to act for biodiversity are complex, but must be understood more fully in order to grasp where current efforts to motivate people fall short'. Indeed, in Chapter 3 and Chapter 8 I discuss the implications of my findings in terms of recruitment and diversification.

However, while this thesis is dedicated to understanding green volunteering and its transformative potential, it is important to emphasise that it is not necessary the aim of this thesis to generate (or even recommend) an influx of more green volunteers. While studying green volunteering offers valuable insight into the human-nature connection (Dresner et al., 2015; Guiney & Oberhauser, 2009) and

people's action for nature (Ryan et al., 2001, p. 641), there are other ways people may take action for nature (e.g. donating to nature organisations, or pursuing a career in the environmental field) or connect with it (e.g. through recreation). All of these may offer opportunities to encounter or connect with nature, and to learn about or act for nature. The aim of this thesis is not to position green volunteering as a superior form of action for nature compared to others, and I do not seek to 'convince' those otherwise engaged to become a green volunteer.

Rather, nature organisations' ability to flourish depends on their volunteers. At the same time, volunteers' ability to take action for nature depends on whether they are given the opportunity to see their motivations met, whether organisations are sensitive to volunteers' diverse backgrounds, and whether volunteers feel appreciated, supported, recognised and represented in how we talk about their efforts and motivations. Recognising this dimension of action for nature is of crucial importance to any organisation, not just those directly working with green volunteers. For instance, calls have been made for public (policy) language to more closely match how people relate to nature (Van den Born et al., 2018, p. 853). This practical need to understand green volunteers is one to which this thesis aims to contribute relevant insights.

In the next section, I reflect on the methodical design of this thesis, and its implications for interpreting the work reported here.

1.5 Methodological design

Before I launch into an outline of the chapters to come, I want to reflect on some methodological considerations that ought to be kept in mind when reading this thesis. I should note that descriptions of, and reflection on, the methods of sampling, data collection and analysis, and notes on generalisability of the individual studies, can be found in their respective chapters. Here, I focus on some overarching methodological reflections on my work. Specifically, I first discuss how my approach fits within a bigger picture of possible approaches to research. Then, I reflect on how I balanced my scholarly interests with the practice-drive nature of my work. Finally, I end this section with a brief reflection on my own positionality.

1.5.1 On quadrants and questionnaires

This thesis set out to improve our understanding of action for nature. Of course, such a phenomenon is exceedingly complex and has many dimensions, causes, developments and impacts, much more than any one project could possibly cover.

An important step for methodological reflection is thus to demarcate the types of insights I pursue in my work and how this connects to methodological choices. To do so, it is helpful to consider frameworks that map out different perspectives through which to investigate a phenomenon. Here I draw on such a framework, integral theory, which aims to structure different disciplinary approaches to research that can be brought to bear on a phenomenon of interest. Integral theory groups these approaches in a two-by-two matrix according to whether one studies individuals or collectives, and whether the investigation targets subjective inner experience or externally observable behaviours or systems (Esbjörn-Hargens, 2009). Figure 1.2 illustrates how each quadrant thus emphasises the study of distinct dimensions of a phenomenon of interest.

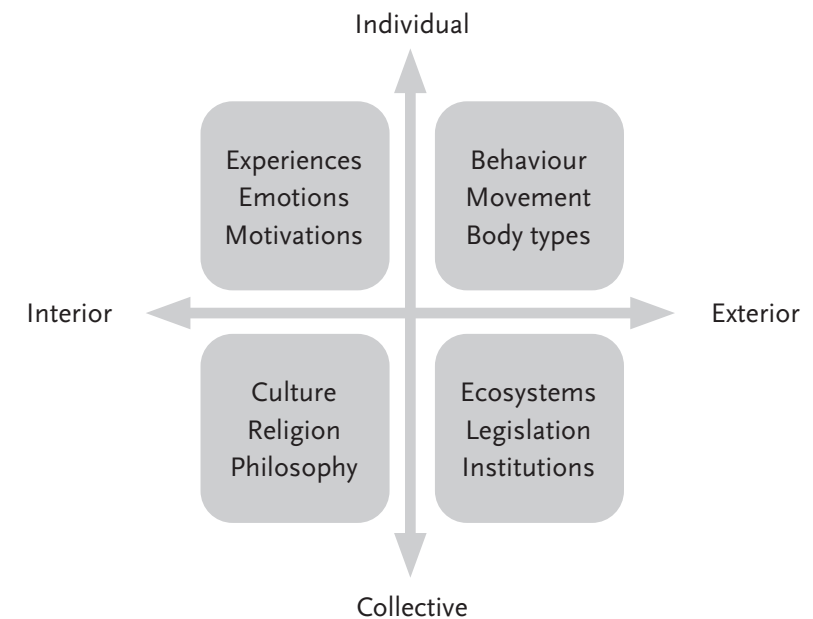


Figure 1.2 | The four quadrants of integral theory, including example areas of inquiry. Based on Esbjörn-Hargens (2009).

Considering my methodological approach (survey research) and research questions, it becomes clear that my work is decidedly located in the upper left quadrant, as I survey each individual respondent on their personal background, motivations, attitudes and experiences. While this approach to research generates useful insights, we must therefore keep in mind that there are also important aspects of green volunteering and action for nature that are beyond the scope of this thesis. Similarly, Snyder and Omoto's (2008) Volunteer Process Model (Figure 1.3) details

several dimensions of volunteering that can be studied to achieve a comprehensive understanding of volunteering over time and at different levels. It pays attention to both the level of the individual volunteers, the social processes taking place in their volunteer work, their interaction with organisations during their engagement, and the broader societal context. In addition, the model highlights the study of both what comes before (factors that may influence the decision to volunteer), the experiences while volunteering, and the impacts of volunteer work (both on volunteers themselves, and on others they engage with). Similar to the Integral Theory model, the Volunteer Process Model helps clarify that my work is largely focussed on the individual level, where it does engage with both antecedents (respondents' background and motivations), experiences (nature experiences, experiences while volunteering) and consequences (learning outcomes, future intentions).

Since my choices in demarcating the object of inquiry (action for nature at the interior and individual level) thus necessarily exclude some other relevant dimensions, I return to these frameworks in section 8.4 in order to identify some promising avenues for further research.

	Antecedents	Experiences	Consequences
Individual	Motivations	Routines	Learning
Interpersonal	Social groups	Group support	Social bonding
Organisational	Recruitment	Training	Volunteer retention
Societal	Cultural norms	Political support	Civic skills

Figure 1.3 | The Volunteer Process Model, including example areas of inquiry. Based on Snyder & Omoto (2008, pp. 7-9).

In order to gain a more integral understanding despite this demarcation, I draw of diverse strands of literature to inform my work and my understanding of the results. As the preceding sections and Chapter 2 illustrate, these include social scientific studies of volunteers (both qualitative and quantitative), publications from the natural sciences on e.g. ecological research using citizen-science data, conceptual and empirical contributions from the general volunteering literature, and work from science and technology studies on citizen science. This mobilisation of different bodies of literature to aid in answering the research questions helps to do some measure of justice to the complexity of understanding green volunteering and action for nature.

In other words, the research questions are leading, these are strongly driven by concerns from practice (as discussed in the next section), and different bodies of knowledge from different traditions are mobilised to help answer them. In addition, while my work is quantitative, Chapters 4 and 7 also included a qualitative coding analysis of free text responses, which means I do not consider the two approaches to be incompatible. In terms of underlying approaches to research, my work thus matches well with writings on pragmatism, which takes the research question as leading and encourages crossing methodological and disciplinary boundaries if it serves to increase our understanding of the object of research.¹¹ As voiced by Moon and Blackman (2014, p. 1175), ‘pragmatists agree that research should be contextually situated without being committed to any one philosophical position’.

Pragmatism is not without criticism, as it is sometimes accused of sidestepping ontological or epistemological assumptions; these assumptions may come to the fore especially in projects where social and natural sciences (and scientists!) meet (Evely et al., 2008). Indeed, like any method a survey approach has certain underlying assumptions to it, such as the assumption that individual perspectives can be averaged or grouped into a ‘representative’ picture, one that is then assumed to some degree to hold true for a larger population as well (Law, 2009, pp. 247-248). Importantly, however, Howe (1988) argues that the judgments inherent to quantitative research, such as the operationalisation of indicators and choices in the phase of data analysis, imply that quantitative and qualitative techniques are ‘inextricably intertwined’ (p. 12), and that pragmatism as a position rejects the notion of inherent incompatibility. He also notes that pragmatism should not be taken to imply an ‘anything goes’ approach to research; criteria such as how questions can be answered in a comprehensive and consistent manner are important (Howe, 1988, p. 15). As I discuss in the remainder of this section (and in the empirical chapters), in my work this prominently includes a commitment to methodological rigour in survey design, an awareness of how sampling approaches may impact generalisability, and recurring reflection on my own positionality as a researcher.

1.5.2 On balancing commitments to theory and practice

One characteristic of the work presented here is that it is strongly driven by questions and concerns of practitioners. All three empirical studies that my thesis is based on arose out of conversations with, and requests of, practitioners working at major Dutch nature and biodiversity organisations: these include SoortenNL (the

¹¹ For an overview of some characteristics of pragmatism, see e.g. Creswell (2012, pp. 28-29) and Johnson and Onwuegbuzie (2004, p. 18).

Dutch network of species organisations), LandschappenNL (Dutch Landscapes), IVN Nature Education and Naturalis Biodiversity Centre. From the very start, we formulated and shaped the underlying goals, the research questions and the methodological approach in collaboration with professionals whose organisations or projects depend on the efforts of green volunteers. For instance, aforementioned concerns about diversity and continuity of green volunteers are high on the agenda of nature organisations in the Netherlands, which spurred the work described in Chapters 6 and 7. Similarly, the evaluation of learning impacts in Chapter 5 was informed from the beginning by the goals and questions of the project team of the Dutch National Bee Survey.

The input of these professional partners was also crucial in designing the questionnaires used to collect the data, especially to match the phrasing of questions and answers with the terminology and experiences of diverse volunteers. In addition, the feedback from practitioners helped to ensure that lists and response options presented in the questionnaires were as comprehensive as possible. To illustrate this extensive engagement with practitioners' expertise, the first survey study (upon which Chapters 3 and 4 are based) drew on input from three professional partners engaged throughout the research design process, as well as feedback from representatives of ten further Dutch nature organisations and platforms (see Chapter 3 for more details). As noted in several chapters, the efforts and networks of our partners from Dutch nature organisations were also crucial in optimising the distribution of the surveys, ensuring a much wider reach (and concomitant higher response) than if I had been solely tasked with distributing them.

This practice-driven element of my research questions, and my strong commitment to working with partners from practice, has many advantages, not just in terms of research instruments and data collection, but also in terms of ensuring my work would in turn be of interest and use to practice. However, this approach may also entail some specific risks. Importantly, when research questions are strongly informed by concerns from practice, doubts may be raised as to their relevance for advancing scientific understanding of (in this case) green volunteering and action for nature. Phrased more strongly, it would open up my work to accusations of being applied research (e.g. market research) rather than offering any new insight to our academic body of knowledge. This has also been discussed as a possible shortcoming of pragmatism and its pursuit of actionable knowledge (Johnson & Onwuegbuzie, 2004, p. 19). Throughout the different studies, I took several steps to navigate this tension. An important one was my extensive reading throughout the past five years, which enabled me to link practitioners' diverse questions to

discussions in the literature. After all, the distinction between practice-oriented research and theory-oriented research (which the concerns raised above present as a dichotomy) is blurry, and many topics of key interest to practitioners are highly relevant to advancing our scholarly understanding as well. Just to give one example, my investigation of citizen scientists' views on data sharing (presented in Chapter 3) was driven by questions raised by NLBIF, one of the involved partners (and the funder of the study). Yet the results of this inquiry also offered new insights on the increasing academic discussion regarding data sharing in citizen science, and has since informed further research on the topic (Fox et al., 2019). In other words, research design reflected both commitment to our partners and insights from existing scholarship to ensure relevance to the academic literature. This did not preclude the incorporation of some survey questions that were mostly of interest to practice, but it did mean that I always aimed for a joint relevance to theory and practice. Theory thus played different roles in my work: inspiration in the design stage together with practitioners, a methodological source in terms of survey construction and analysis, and debates that allowed me to place my findings in a wider context.

A second way to navigate this tension was a commitment to methodological rigour. While the input of our partners was crucial in designing the different questionnaires, we considered it a crucial responsibility to ensure that principles of good scientific survey design were adhered to. This included connecting to previous studies, ensuring clarity in answer options, and keeping survey length manageable. This also includes important aspects of scientific integrity, such as responsible data management and making sure the entire process from design to analysis was documented. This did mean that I sometimes had to balance between the wishes of different partners, our interests as academics, and the practicality of survey research. This too was a way to ensure that my work would be of relevance both to practice, and to my academic peers.

1.5.3 On positionality

Finally, I want to reflect briefly on my positionality as a researcher. Positionality denotes the 'the stance or positioning of the researcher in relation to the social and political context of the study – the community, the organization or the participant group' (Rowe, 2014, p. 628). While this element of carrying out scientific research is most commonly discussed in the context of qualitative inquiry, section 1.5.1 highlighted how I do not consider quantitative research to be isolated from qualitative judgments of the researcher in study design or interpretation. As such, over the years of conducting this research I have also taken pause to reflect on my own position regarding the topic of inquiry and how this could influence my work.

Most importantly, I should note that I myself am not a green volunteer. In fact, I never have been. As such, when I started my first study in 2015 I felt like an outsider entering a largely unfamiliar world, and quickly had to learn much about different forms of green volunteering and nature-oriented citizen initiatives. I had a passing familiarity with some of these activities thanks to growing up with a parent who was an active green volunteer, but never having done so myself did put me at some distance from my object of study. As noted above, working with many partners from practice has been crucial for me to become acquainted with organisations in the field and their relation to volunteers.

Whether this status as an ‘outsider’ is a good or bad thing, I leave up to the reader. On the one hand, a researcher with extensive personal experience as a green volunteer would perhaps be able to relate more easily to their respondents, and be more intuitively aware of how different green volunteers would relate to diverse motivations and to their personal, social, organisational and natural environments. On the other hand, being an active green volunteer myself could also invite the risk of interpreting my data from the perspective of my own volunteering, and as such constitute a risk to the ‘critical distance’ (Hayward & Cassell, 2018, p. 362) of the researcher.

While I am not involved in green volunteering, I have been an active volunteer (in different functions) for over five years, though for a social rather than ‘green’ cause. While on a whole I do consider this to have been helpful for me to understand some of the realities of volunteering, as noted above this too could introduce biases in how I interpreted my respondents’ stories. Thinking about my positionality, and maintaining a constant critical awareness of how my own volunteering experiences might shape how I look at my data, have helped me to strike a balance between relating to my respondents and maintaining critical distance over the past years.¹²

¹² For example, when looking at a list of difficult or rewarding experiences in volunteer work (Chapter 7), drawing on my own experiences as a volunteer sometimes helped to understand how a certain factor (such as group bonding or conflict) might affect volunteer motivation. However, I was always cognizant of the risk in interpreting respondents’ stories through the lens of my own experiences. Being actively aware of this is how positionality strengthened my ability to strike this balance.

1.6 Outline

In this final section of the introduction, I provide a concise outline of this thesis and how the chapters relate to each other. This thesis consists of eight chapters: this introduction, a literature review, five empirical chapters, and a synthesis. Before proceeding to the outline, it should be noted that each of the five empirical chapters has been published or submitted as a peer-reviewed scientific publication. As such, each also has its own theoretical and methodological section. While their contents have been taken into account while writing the first two chapters and the synthesis, some small degree of overlap cannot be avoided. However, it does offer the opportunity to reflect on these matters in more detail than is possible within the restrictions of a scientific journal article (Mason & Merga, 2018).

In **Chapter 2**, I review existing bodies of literature on (green) volunteering, which both inform the subsequent empirical studies and help to put them into a broader perspective in the synthesis. To structure this chapter, I centre my inquiry on the three key elements mentioned before: ‘What?’ (different forms, activities and definitions of (green) volunteering and biodiversity citizen science), ‘Who?’ (knowledge on who takes part in these activities, and who does not) and ‘Why?’ (studies on motivations for taking part in green volunteering). Throughout this chapter, I draw upon different bodies of literature of direct relevance to the study of green volunteers, including the literature on citizen science, existing work on green volunteers, and the broader literature on volunteering in general.

Chapter 3 and **Chapter 4** present the results of the first empirical study, a survey among 2193 Dutch biodiversity citizen scientists. **Chapter 3** reports the findings of this study in terms of respondents’ profile, the activities they are involved in (for this group, this includes an overview of the species that they focus on), and their motivations. In addition, this study empirically investigates how citizen scientists feel about sharing their data (in line with the questions raised in section 1.3.3), and whether they even consider the biodiversity observations they collect as ‘their’ data. We discuss the implications of our findings for how practitioners could take volunteers’ perspectives on data sharing into consideration.

Chapter 4 focusses on the significant nature experiences of these biodiversity citizen scientists. Based on a qualitative coding of free text responses to the survey, followed by a quantified analysis to gain insight into relative prominence of different experiences, this chapter provides insight into the types of experiences perceived as especially memorable and of personal importance to biodiversity citizen scientists.

We tie these findings to previous studies of significant nature experiences, and highlight how volunteers' data collection on flora and fauna is about much more than data. We discuss the importance of the 'thrill of discovery' and reflect on the interaction between motivations and significant experiences.

Chapter 5 reports the results of an evaluation of the first edition of the Dutch National Bee Survey (DNBS), a nation-wide citizen science project in support of wild bee populations in the Netherlands. In this survey study, we assess the profile, experiences and motivations of a sample of participants, but devote specific attention to the learning outcomes of the DNBS's first edition. Drawing on the literature on citizen science learning outcomes, we use a comparison of pre- and post-participation responses to investigate whether participation affected respondents' connection to nature and bees, intentions to carry out conservation actions, and attitudes towards bees, citizen science and citizenship. We also suggest several avenues for advancing future investigations into citizen science learning outcomes.

Chapter 6 and **Chapter 7** broaden our gaze beyond biodiversity citizen scientists specifically to include a more diverse group of green volunteers, drawing on a national-scale survey among Dutch green volunteers (N=3775). In **Chapter 6**, we focus on a quantitative assessment of participants' profile, motivations, attitudes towards their volunteering, and intentions to volunteer in the future. Aside from the results across the entire sample, for each of these elements we investigate how responses differ for four key types of green volunteers: recorders, restorers, educators and administrators. In addition to incorporating these four different activity types, we also included both organisational volunteers and participants in bottom-up citizen initiatives. We reflect on how the results help us to understand action for nature, and draw on insights from the broader literature on volunteering to discuss implications for organisations working with green volunteers.

Chapter 7 reports a qualitative analysis of green volunteers' reasons to stay and reasons to quit, based on several free text survey questions from the same survey reported in Chapter 6. We investigate patterns in green volunteers' responses to four questions: difficult situations they encounter in their volunteering, factors that keep them going, and factors that either led others, or would lead themselves, to quit. We tie the results to findings among volunteers in other sectors, contributing to the literature on volunteer retention and illustrating some of the everyday realities of nature volunteering.

The final chapter, **Chapter 8**, synthesises the results of the preceding chapters in order to shed light on the research questions. I organise the insights gained through the different empirical chapters to answer the research questions, and discuss how the work presented in this thesis helps further our understanding of action for nature. I end this chapter by developing several implications for practice, as well as recommendations for further research.

2

Literature review

Chapter 1 introduced the research goal and questions of this thesis, and positioned them in several broader scientific discussions. In this chapter, I draw on several bodies of literature to answer three questions central to my own research on green volunteering: What, Who, and Why? As noted in the previous chapter (see Figure 1.1), biodiversity citizen science is one specific subset of the broader phenomena of citizen science and green volunteering, and both citizen science and green volunteering are in turn specific expressions of the general phenomenon of volunteering. As such, while the focus of the work I review is on biodiversity citizen science and broader green volunteering, I also integrate relevant insights from the general citizen science and volunteering literatures.

I start this chapter with ‘What?’, i.e. how the literature has discussed and debated the meaning of terms such as ‘citizen science’ and ‘volunteer’, and the different forms these phenomena can take. In section 2.2, I proceed with ‘Who?’, taking stock of what we know about who takes part in these activities. Finally, section 2.3 tackles the question of ‘Why?’, reviewing published work on motivations for participation in biodiversity citizen science and green volunteering. I pay specific attention to how insights from these bodies of literature informed my empirical work reported in Chapters 3 to 7.

2.1 The ‘what’ of biodiversity citizen science and green volunteering

This section is dedicated to providing further clarity as to what I mean when using terms such as ‘biodiversity citizen science’ and ‘green volunteering’ in this thesis. When delving into the literature it quickly becomes clear that there is considerable disagreement and debate about what sorts of activities should (or should not) be included under such terms as ‘volunteering’. These debates are not surprising: whereas definitions of natural units or phenomena (such as ‘kilogram’ or the law of gravity) have a universal character, social phenomena can only be understood by taking their context into consideration (Aarts, 2009, p. 19-20). Social phenomena (ranging from marriages to resistance movements) express themselves differently depending on the political, social and historical context, which explains why debate continues to rage when attempting to come up with universal definitions. Like any form of volunteering, green volunteering and biodiversity citizen science are subject to exactly those debates. Considering this, it would be impossible to adequately study these phenomena in this thesis without paying attention to these debates, and explain how I position myself in relation to them.

I start section 2.1.1 with some notes on general definitions of ‘volunteering’, drawing on contemporary reflections on the consequences of adhering to specific definitions of who is (and is not) a volunteer. Then, I describe how these insights on different ways to define volunteering in turn inform my understanding of green volunteering, and the choices I made in terms of demarcating my object of study. Since biodiversity citizen science is one form of green volunteering that this thesis devotes specific attention to, in section 2.1.2 I draw on the citizen science literature to describe some key perspectives on what citizen science is, after which I draw on these insights to demarcate the focus of my inquiry.

In these sections, I will argue two important points that inform my empirical work. Firstly, I will show how I adopted a relatively broad conceptualisation of green volunteering and biodiversity citizen science. Secondly, I will argue how thinking about these definitions is not just a conceptual exercise, as the in- or exclusion of certain activities also directly affects the in- or exclusion of people. This highlights the importance of these debates for questions of profile and motivations as taken up in the remainder of this chapter.

2.1.1 What is green volunteering?

The goal of this section is to show that scientific discussions support both broader and narrower conceptualisations of green volunteering, which inform choices made in my empirical work. ‘Volunteering’ is a term that might appear relatively straightforward to many readers, yet the great variety of activities, roles, backgrounds and aims of volunteers means that definitional questions are actually highly complex (Bussell & Forbes, 2002, p. 245). Since aspects of this debate have important implications for how we can think about green volunteering, this section starts with some highlights of these discussions.

What is volunteering?

Since both researchers and volunteers might have vastly different understandings of what ‘volunteering’ entails, failing to clarify one’s perspective could lead to under- or overreporting of volunteer work in empirical studies¹³, uncertainty over whether one is measuring it accurately, as well as a lack of comparability between studies. One oft-cited contribution is the work of Cnaan et al. (1996), appropriately titled ‘Defining who is a volunteer’. Based on a review of definitions, ranging from

¹³ For example, if a researcher would only ask interviewees if they ever volunteer, without clarifying what exactly they mean by that, interviewees may either answer ‘yes’ despite not meeting the researcher’s criteria, or ‘no’ even if they do, depending on their own understanding of the term. See Chapter 8 for further reflection on this methodological issue.

very strict to very broad, they identified four key dimensions of voluntary work (pp. 369-370):

- Firstly, volunteer work is assumed to be carried out on a voluntary basis. This comes as little surprise, since the two words share common linguistic roots to the Latin term *voluntarius* (Oxford English Dictionary, 2020c). However, broader definitions recognise that there can be pressure or even coercion to volunteer. Haivas et al. (2013, p. 1870) note that, while it may appear counterintuitive for voluntary action to arise out of any sort of control, this may happen either due to strong internally felt obligations, or external requirements (e.g. if required for a university degree).
- Many definitions reflect volunteers receiving no remuneration for their work. The strictest definitions rule out any sort of financial compensation (even cost reimbursement), a broader conceptualisation of volunteering allows for some remuneration. Receiving a full salary, however, is considered one of the fundamental distinctions between employment and voluntary work.
- The third dimension concerns the difference between formally and informally organised volunteer work. While broader definitions include informal citizen initiatives or helping behaviour (e.g. informal neighbourhood care networks), stricter definitions limit volunteering to work carried out under the banner of some formal organisation (foundations, associations, or even companies or governmental organisations).
- Finally, while broader definitions of volunteering allow for the people helped by a volunteer to be close to them (including friends and family), stricter definitions define volunteering as helping strangers with whom one has no connection.

This framework implies that definitions of volunteering can display an impressive range. The most purist would only count individuals as volunteers if they help complete strangers under the auspices of a formal organisation, under no pressure and coercion and receiving absolutely no compensation. As an example of a relatively strict definition, Penner (2002, p. 448) sees volunteering as 'long-term, planned, prosocial behaviours that benefit strangers and occur within an organizational context'. Very broad definitions, however, may include anyone helping other people (such as a caregiver caring for their parent, feeling a strong moral pressure to do so and gaining some financial compensation from them). Wilson (2000, p. 215) provides an example of a relatively broad definition: 'Volunteering means any activity in which time is given freely to benefit another person, group, or organization'. Since such a definition is very broad indeed, other characteristic elements of volunteer work have been proposed. Omoto and Snyder (2002) position volunteering as an on-going and planned engagement, contrasting it with a broader range

of other prosocial or helping behaviours. These include care-giving (described by Snyder and Omoto (2008, p. 3) as 'helping behaviours that take place within an already existing relationship'), philanthropic donations (e.g. financial or blood donors), as well as one-off activities or unplanned helping (Harris et al., 2017). Penner's (2002) aforementioned definition similarly highlights this time commitment and planned nature, noting that 'before people actually agree to volunteer, there is some thoughtful consideration of both the costs and benefits of engaging in this action' (p. 448). However, other conceptualisations do incorporate more sporadic engagements, as in episodic volunteering (Hyde et al., 2016) or ostensibly unplanned forms of helping such as disaster response (Whittaker et al., 2015). In fact, the latter authors demonstrate that informal volunteering in emergencies can be carefully deliberated, rather than a spontaneous expression of unplanned helping.

Another discussion centres on whether volunteering would be most productively characterised as a form of unpaid work, or as a form of leisure more akin to any hobby. Stebbins (1996) argued more than twenty years ago that conceptualising volunteering as leisure made conceptual sense considering its ostensibly voluntary and rewarding nature. He advanced the perspective of 'serious leisure', expressing a degree of commitment and skill development, to counteract the frivolous connotations of the term leisure (p. 222). He also positioned the altruistic dimension of volunteering as central: 'A significant part of what is rewarding and hence leisure-like about volunteering is the unselfish regard for another or a set of others as expressed in particular acts or activities' (p. 219). However, authors such as Overgaard (2019) have criticised the framing of volunteering as leisure, arguing that 'volunteering is, in fact and before all else, unpaid labour' (p. 129). She also notes that the literature has demonstrated a shift from a leisure to a work perspective on volunteering (p. 132). The political and strategic dimensions, and resultant tensions, of what is counted as volunteering and what should be seen as 'work' (and thus perhaps 'employment') become readily apparent, such as in 2019 when the Dutch fire brigade came under scrutiny due to its strong reliance on volunteers, who have almost identical responsibilities compared to paid firefighters (Veiligheidsberaad, 2019).

An important implication of the above perspectives is that voluntary work is most productively conceptualised as a scale, ranging from narrower to broader definitions of volunteering. This helps add some important nuance and avoids somewhat artificial dichotomisations between 'volunteer' and 'not a volunteer'. After all, if someone spends ten hours a week volunteering for their local church, would a remuneration of €10 a month for travel expenses truly disqualify this person as a

volunteer? This perspective on volunteering, as a scale comprising narrower and broader conceptions, is an important insight that directly informs how I understand green volunteering in this thesis: as not just those actions for nature that fit within narrower definitions of volunteering, but also those that fall within the scope of broader definitions. As this section has showed, this understanding of green volunteering is based on several important discussions in the literature.

However, one research project cannot encompass everything covered under a broad definition. In the next two sections, I thus discuss the choices I made in demarcating my object of study within this broad definition, regarding both the included activity types as well as the degree of formal organisation.

Types of green volunteering

Green volunteer work may encompass a diverse range of activities (Measham & Barnett, 2008; Ryan et al., 2001; Weston et al., 2003). These include biodiversity recording through biodiversity citizen science, physical restoration or maintenance work in nature (tree planting, removing invasive species), educational activities with children or adults, and a range of organisational support tasks (e.g. board membership, administration or developing communication materials). In order to categorise the broader phenomenon of green volunteering, in this thesis I group these activities under four overarching (and, as detailed in Chapter 6, not mutually exclusive) types:

- **Recorders** are the biodiversity citizen scientists discussed further under section 2.1.2. They collect data on the natural world by observing flora and fauna and submitting these data to biodiversity data repositories. I include both **structured recording**, data collected at regular intervals along predetermined trajectories in consultation with nature organisations, as well as **unstructured recording** of nature wherever one may be and submitting some of these data.
- **Restorers** carry out physical work in nature or green spaces, whether to plant new green areas, or restore or maintain existing ones. The scale of their activities can range from small-scale local neighbourhood projects (a self-organised citizen group planting bee-friendly vegetation along a nearby bike lane) or larger-scale activities (a large group of landscape volunteers joining in an initiative organised by a conservation organisation to remove Japanese knotweed from a nature area).
- **Educators** focus on transferring knowledge, concern and enthusiasm regarding nature to other people, young and old. This group includes volunteers taking schoolchildren into nature to experience it first-hand, or organising guided walks to improve locals' appreciation for nearby nature, to volunteers at biodiversity museums or botanical gardens.

- **Administrators**, finally, express their nature volunteering by supporting nature appreciation and conservation through management, policy and planning. Corresponding activities include coordination or board membership positions in green organisations, or participation in green area planning discussions or legal disputes around nature.

While all these activities relate to nature and greenspace, not all of them may readily spring to mind when thinking of nature-oriented volunteering.¹⁴ I look both at hands-on work in nature (restoration) and volunteering related to nature observation (recording), but also educational work that may or may not take place in nature, as well as board or policy and planning-related volunteer work. Especially the latter may not always spring to mind when thinking of green volunteer work, and indeed their inclusion broadens my perspective even further than the one initially taken up in e.g. the Dutch programme 'De Kracht van de Groene Vrijwilliger' (2016). However, with management, administration, coordination and policy or planning-related activities being of great importance yet relatively understudied (as noted in Chapter 6), I considered it vital to include them.

In terms of the activities subsumed under green volunteering in this study, two important boundaries were established. Firstly, as mentioned in Chapter 1, a key criterion was for the activities to be directly linked to nature or greenspace. In this light, it is important to comment briefly on the word 'environmental'. This word is commonly used in the English language and scientific literature to refer to the natural environment, and many environmental stewardship projects indeed fall squarely within the activities I include under green volunteering (e.g. O'Brien et al., 2010). Many of these projects also combine nature-oriented goals (such as biodiversity protection) and goals related to environmental quality (e.g. improvement of water or air quality, or combating climate change); for instance, tree planting may be done for both biodiversity aims and climate mitigation or adaptation goals. However, it is important to note that environmental projects with no link to nature or greenspace (e.g. air pollution around an urban factory, or combating plastic waste in shopping streets) are outside the scope of my research.

A second and related boundary had to do with volunteers involved in gardening projects. These projects may take shape in many ways, including gardening in one's personal gardens and in a more public form through allotment or community gardening. My research does not incorporate gardening in one's personal garden

¹⁴ As noted previously, this can be true for green volunteers themselves too (see Chapter 8).

(e.g. planting more native flora there), due to such restoration work lacking ties to any nature or greenspace area beyond one's personal property. This would not preclude the garden as a site itself (e.g. for participation in a garden bird count), yet the act of gardening in one's backyard is not included. In terms of communal forms of gardening, inclusion or exclusion was determined based on whether the community garden has nature-related aims, and could thus be logically understood as an action for nature. Some neighbourhood or community gardens may pursue objectives related to urban greening or biodiversity (e.g. botanical gardens or neighbourhood greening projects related to bees or butterflies), and can also hold great significance in terms of gardeners' connection with nature (Hawkes & Acott, 2013); working in such projects thus falls within my understanding of green volunteering. However, other community gardens focus on goals such as community cohesion or local food production (Harper & Afonso, 2016; Witheridge & Morris, 2016); these gardens have valuable social or health-related aims, but no direct links to action for nature. As such, neighbourhood or community gardening projects were included only if their aims relate to action for nature.

A note on formal and informal green volunteering

One of the dimensions of volunteering discussed previously that carries important implications for how I understand green volunteering in this thesis is the common distinction between formal and informal volunteering. Focussing exclusively on green volunteers for formal organisations would entail studying volunteers for established nature organisations (such as the Dutch regional landscapes), or of more formalised citizen initiatives (such as 'Friends of' groups formed around a specific nature area). However, doing so would overlook a strong tradition of active citizenship in and around nature and greenspace, which at least partly takes places beyond the realms of formal volunteer programmes. Some scholars have highlighted the importance of paying attention to the activities of autonomous active citizens for nature and green citizen initiatives. For instance, Evely et al. (2011) distinguish different participation approaches in conservation projects of formal organisations, but also include self-mobilised conservation projects, noting that the latter 'often emerge through community initiatives and remained relatively independent from government or other formal institutions' (p. 119). Community-initiated stewardship actions in urban environments specifically are sometimes referred to as 'civic ecology practices', defined as 'local environmental stewardship actions taken to enhance the green infrastructure and community well-being of urban and other human-dominated systems' (Krasny & Tidball, 2012, p. 268). These initiatives, carried out by either individuals or groups, often centre on the well-being of both humans and nature in urban environments. Active citizenship has received

increasing attention in both governmental discourse and the scientific literature, also in terms of nature and green space (Mattijsen, 2018, p. 4). Citizen initiatives are highly diverse and differ in their size (from a single individual to a broad community movement) as well as degree of formalisation: while some may transform from loosely connected citizens into a formal group (e.g. an association or foundation) others may opt to organise in an informal way (Van Dam et al., 2014).

Following the calls from this literature to pay more attention to informally organised action for nature, I opted to include both formally and informally organised action for nature in my research on green volunteering. This does of course introduce some methodological complications in terms of visibility of these volunteers and reaching them (see Chapter 6 for more details on our approach). However, I would argue that limiting our understanding of green volunteering to only volunteers for formal organisation would carry the more serious consequence of failing to provide insight into a vibrant context for citizens' action for nature. This choice is also in line with calls made in the general volunteering literature. Lee and Brudney (2012, p. 160), for instance, note that the strong emphasis in the literature on formal volunteering has resulted in a lack of knowledge regarding informal activities, which they argue are commonly practiced yet remain outside of the purview of much research on volunteering. These more informal volunteering activities are often excluded from studies assessing the extent of volunteering (Hustinx et al., 2010, p. 414).

This section has first shown how I came to a relatively broad understanding of green volunteering, inspired by literature on definitions of volunteering. Following that, I discussed choices made in demarcating the object of study, both in terms of activity types and degree of formal organisation. I have also argued that this broad definition is important to prevent exclusion of initiatives, individuals and their motivations that may remain understudied if we adopt too strict a definition of what makes a green volunteer. In section 2.1.2, I delve deeper into one form of green volunteering to which I devote specific attention in this thesis, biodiversity citizen science. There, I discuss how considerations of its definitions and boundaries have received considerable attention.

2.1.2 What is biodiversity citizen science?

In this section, I provide greater insight into how I conceptualise biodiversity citizen science, one form of green volunteering that is the focus of my first three empirical chapters. Like in the literature on general volunteering as described in the previous section, the citizen science literature is characterised by rich debate about

definitions and boundaries. Here I review the main points in order to formulate their implications both for how I understand biodiversity citizen science and for choices I made to demarcate my object of inquiry.

Tracing the term 'citizen science': Two trajectories

Despite much debate about what citizen science is (Eitzel et al., 2017) and whether there should be universal definitions (Auerback et al., 2019; Heigl et al., 2019), few publications provide a definition. There are exceptions, of course; for instance, Resnik et al. (2015, p. 476) define citizen science as 'a range of collaborative activities between professional scientists and engaged laypeople (citizens) in the conduct of research'. If we turn to the dictionary in search of a definition, we find that the Oxford English Dictionary defines citizen science as 'scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions' (2020b). The term has seen a great rise in prominence in both academic and societal discussions (as shown by e.g. Engels, 2015, p. 7; Follett & Strezov, 2015), yet scholars have also noted that discussions may depart from rather diverse perspectives on citizen science (Hecker et al., 2019). In this section, I provide an impression of the diversity of practices that may be referred to as citizen science, and position my perspective on biodiversity citizen science herein.

As noted in Chapter 1, the active participation of citizens as researchers is nothing new, especially in the fields of biology and ecology (Miller-Rushing et al., 2012; Vetter, 2011).¹⁵ However, the rise of the university in the nineteenth century increasingly positioned scientists working at labs and universities as the individuals responsible for carrying out research (Strasser et al., 2019, pp. 58-60). Scholars such as Lave (2012) see the rise of citizen science as part of a broader trend of increasing attention to knowledge production involving diverse societal actors, including a rediscovery of the potential for active involvement of citizens in science.¹⁶ The rise of the term 'citizen science' itself in the second half of the 1990s is traced to two distinct understandings of the term, each with its own perspective on its key aims and potential. In order to understand the diversity of practices that make up biodiversity citizen science, it is first helpful to distinguishing these two different origins of the

term (also see Cooper and Lewenstein, 2016; Woolley et al., 2016, pp. 3-4).¹⁷ After I describe these two perspectives, I discuss how this influences the way the literature describes citizen science as an array of practices, and how within this perspective I selected the boundaries of my object of study.

Citizen scientists as data contributors

One use of the term is credited to Rick Bonney (1996), based at the Cornell Lab of Ornithology, an institute that has worked with biodiversity recorders in studying birds for over a hundred years (Cornell University, 2020). In this approach, citizen scientists are engaged mostly as data collectors in projects designed by scientists at research institutes, with the power of the approach arising from the large number of contributors that can be engaged over space (i.e. potentially across the globe) and time.

This method of organising the practice, where scientists design a research project with citizens involved as data collectors or analysts, is what is often referred to when scholars speak of the rising popularity of citizen science. We can find examples of this in many disciplines. Projects focussing on biodiversity and the natural environment abound, for instance related to investigating coral reefs (Marshall et al., 2012), seagrass (Jones et al., 2018) or the plant sciences (Würschum et al., 2019). Biodiversity citizen science projects may focus on different species and take different forms (Cooper et al., 2012; Frigerio et al., 2018), including invasive species detection projects (Gallo & Waitt, 2011) and innovative forms such as BioBlitzes (Postles & Bartlett, 2018) that call upon large groups of volunteers to map the species richness of a specific location in a short space of time. We also find similar approaches in the study of environmental quality, for instance related to drinking water (Brouwer et al., 2018) or plastic pollution (Rambonnet et al., 2019). Other fields that have engaged citizen scientists to collect and analyse data through data submission or fieldwork include topography (Perdana & Ostermann, 2018), archaeology (Smith, 2014) and microbiology (Garbarino & Mason, 2016). Finally, increasingly we can find examples of such projects in the social sciences and humanities (Kullenberg et al., 2018; Purdam, 2014), although those appear more difficult to find (Heiss & Matthes, 2017; Tauginienė et al., 2020).

¹⁵ As Kasperowski and Kullenberg (2019, p. 2) comment, 'It is actually professional science that is 'the new thing', and the citizen scientists have been there all along in the shadows'.

¹⁶ This is also reflected in the existence of many terms for different forms of citizen involvement in research, with scholars differing in their opinion on which of those may relate to, differ from, include or be subsumed under the term citizen science. For some overviews see Berti Suman and van Geenhuizen (2020, p. 551), Clark and Illman (2001) and Newman et al. (2011, p. 219).

¹⁷ Despite these two understandings having distinct origins and emphasizing different goals and rationales, it is important to emphasise that the two perspectives should be considered akin to ideal-types, not as fully separated and mutually exclusive approaches. Sauermann et al. (2020) argue a similar point, discussing these two perspectives as the 'productivity view' and the 'democratisation view' on citizen science.

The rapid development of online functionalities has also inspired scientists to enlist online volunteers to help analyse data. The Galaxy Zoo project (Galaxy Zoo, n.d.-a) that has been running in different incarnations for over a decade is frequently noted as a foundation for the rise in these projects.¹⁸ Volunteers in Galaxy Zoo worked to identify and categorise types of galaxies in images from the Sloan Digital Sky Survey, with the findings resulting in many peer-reviewed publications and even the discovery of new types of galaxies and celestial bodies (Lintott et al., 2009; Straub, 2016). In these projects, volunteers are thus involved in analysing existing raw datasets rather than collecting new data; these datasets are of immense size and impossible to analyse for a team of scholars alone.¹⁹ Like data collection projects, scientists have designed online image identification (e.g. camera trapping) or transcription projects to involve citizens in topics related to biology and ecology (Green et al., 2020; Pring et al., 2019; Zelt et al., 2012) but also in fields such as archaeology (Bevan et al., 2014) and social history (De Moor et al., 2019; Grayson, 2016). Some online data analysis projects also take the form of serious games, such as Foldit (Cooper et al., 2010) from the field of molecular biology, or the quantum physics game Quantum Moves (Lieberoth et al., 2014). Here, units for analysis (e.g. a protein structure) are presented to participants as in-game challenges or levels, while other gamification elements (such as scores and leaderboards) can be used to add a competitive element.

Citizen science as community-driven

However, around the same time as the above conceptualisation of citizen science rose to prominence, one that emphasises the role of citizens as assisting researchers in collecting or analysing data, the same term also started to be used in a somewhat different fashion. The sociologist Alan Irwin (1995) published a volume titled *Citizen Science*, yet his use of the term differs somewhat from the one described above. He describes citizen science as entailing two perspectives on science-society relationships: as ‘a science which assists the needs and concerns of citizens’, but also ‘a form of science developed and enacted by citizens themselves’ (p. xi). In other words, this evokes both a role for citizens in e.g. shaping research goals and priorities, and leaves open the possibility of scientific knowledge to develop without

involvement of academic scholars. While this perspective on citizen science does not stand diametrically opposed to the one discussed in the previous section, it does place a different emphasis.

Citizen science projects that emphasise such an understanding of the term may employ similar designs as the aforementioned projects, but may emphasise a stronger involvement of citizen scientists in the design of the investigation. Carr (2004) argues that, beyond pragmatic benefits to research in terms of scale and scope, environmental science carried out by local communities ‘enables citizen-directed questions to be asked, answered, and acted on by those who are affected by and who affect natural resources in local places’ (pp. 847-848). Citizen science projects on local water or air quality, or community health, often involve local residents directly affected by an issue, and may especially emphasise their voice and concerns in designing the study (Commodore et al., 2017; Gabrys et al., 2016). Here, citizens are not so much assistants but direct collaborators in the research; taken further, some projects may feature scientists as assistants or consultants in projects designed by citizens (e.g. Van Brussel & Huyse, 2019). In addition, as shown by the works of e.g. Ottinger (2010) and Tu (2019) on citizen monitoring of air pollution, citizen science may comprise a contestation of established (e.g. regulatory) science, rather than being characterised by a collegial relationship with it.²⁰

One step further, and a form of citizen science somewhat captured under Irwin’s second meaning of the term, would be projects that hardly involve scientists from research institutes at all, but rather are fully coordinated and enacted by citizens themselves. While less commonly discussed in the citizen science literature, settings such as Do-It-Yourself laboratories or biohacking initiatives offer spaces where citizens can develop measurement tools and analyse data on their own accord (for examples see Dickel et al., 2019; Wylie et al., 2014). Also in the biomedical field do we find a rising number of research projects based on self-tracking, such as patients using smartphone apps and wearable technologies to monitor their vitals and exchange their findings in patient communities to further understanding of diseases and their treatment (Bietz et al., 2019).

Citizen science efforts originating from community passions or concerns are actually a strong tradition in biodiversity citizen science. As noted in Chapter 1 there is

¹⁸ For more examples of citizen science in astronomy, see Marshall et al. (2015).

¹⁹ For instance, the Galaxy project started with a million images that each required classification by multiple people. The experiences with this project illustrate the immense potential of citizen science: ‘With so many galaxies, we assumed it would take years for visitors to the site to work through them all, but within 24 hours of launch we were stunned to be receiving almost 70,000 classifications an hour. In the end, more than 50 million classifications were received by the project during its first year, contributed by more than 150,000 people’ (Galaxy Zoo, n.d.-b).

²⁰ See also Carton and Ache (2017) for examples from monitoring earthquakes and noise pollution, and Cornwell and Campbell (2011) for a case study of contestation in sea turtle monitoring.

a long history of nature enthusiasts collecting data on flora and fauna and contributing to our understanding of the natural world, a tradition much longer than the term citizen science.²¹ These efforts of communities of nature enthusiasts tend to predate the involvement of scholars at knowledge institutes, and many natural history organisations (including Dutch species organisations) may trace their origin to such active citizens for nature (Pocock et al., 2015).

The diversity of biodiversity citizen science

The term ‘citizen science’ is thus used with two somewhat different understandings, with each in turn shaping a wide range of practices. This helps explain why there is such diversity in how the term is used in the literature. One illustration is provided by Shanley et al. (2019, p. 1), who describe citizen science as ‘a range of methodologies that support meaningful contributions of the public to the advancement of scientific and engineering research and monitoring, in ways that may include identifying research questions; conducting scientific investigations; collecting, processing, and analyzing data; developing scientific hardware and software; and solving complex problems’. Such descriptions of the concept illustrate both a diversity in activities undertaken by participants, as well as the diverse aims to which their work may contribute. This is also reflected in different classifications of citizen science involvement that are proposed in the literature (e.g. Parrish et al., 2018; Schäfer & Kieslinger, 2016; Schrögel & Kolleck, 2019; Wiggins & Wilbanks, 2019). One prominent way to capture this diversity of approaches is to place them on a scale, running from projects where scientists organise and coordinate a project and ‘outsource’ a clearly defined task (e.g. the collection of data following a specific protocol), to projects where citizens share (or even have full) coordination and control (e.g. Haklay, 2013; Shirk et al., 2012).

Such a ‘continuum’ understanding of citizen science also reflects diversity in what we may consider ‘science’ to be; as such, it is important to reflect on the ‘science’ of citizen science. One important shared aspect of citizen science projects is that they in some way or another aim to contribute to ‘science’. What exactly ‘science’ is, however, has been the subject of a long and ongoing debate (Halffman, 2019; Hansson, 2017).²² While ‘scientific contribution’ is often measured using metrics

such as the number of peer-reviewed publications (Burgess et al., 2017; Ries & Oberhauser, 2015; Theobald et al., 2015), data collected by volunteers may well be used for many other pursuits. If I take biodiversity citizen science as an example, these may include biodiversity monitoring for policy requirements, contributing to atlas projects on the distribution of specific species, early-warning systems for the presence of invasive alien species, and more generally contributing to a state-of-the-art knowledge base on the natural world. This important point is also reflected in the European Citizen Science Association’s ‘Ten Principles of Citizen Science’ (Robinson et al., 2018), the first two of which emphasise the generation of ‘new knowledge or understanding’, as well as ‘genuine science outcomes (...) for example, answering a research question or informing conservation action, management decisions or environmental policy’ (p. 29). Arguing that assessing science productivity only in terms of peer-reviewed publications ignores how many citizen science projects may not even aim for such an outcome, Wiggins et al. (2018) developed a Science Products Inventory, which includes output ranging from papers, reports, raw data or samples, decision-making or policy support and diverse communication outputs.

Importantly, these arguments highlight how the continuum understanding of citizen science at a deeper level also implies different perspectives on ‘science’; the question of whether a volunteer water monitoring project counts as producing ‘genuine science outcomes’ will be answered differently depending on one’s view of what counts as science.²³ This insight has important implications for how I understand biodiversity citizen science: I consider citizen science to include both projects designed from the ‘Bonney’ perspective of citizen science, as well as more community-driven projects as captured under Irwin’s view.²⁴ In doing so, I necessarily also adopt a broader view of science than only peer-reviewed publications; rather, I follow Wiggins et al. (2018) in understanding science outcomes as also comprising contributions such as data shared with peers and resultant contributions to decision-making.

Of course, in designing my inquiry into biodiversity citizen science in the Netherlands, boundaries had to be established to demarcate my object of inquiry. Three important choices were made based on the discussed literature and the research questions: the selection of citizen science activities, the degree to which research-

²¹ Though it should be noted that countries differ in the degree to which they feature long traditions of active citizens studying flora and fauna. Examples of countries with such traditions include the United States, the United Kingdom and the Netherlands.

²² The lack of agreement on a definition of science is not surprising considering the differing characteristics of definitions of natural and social phenomena as highlighted at the start of this chapter.

²³ As illustrated in detail by Weng (2015), such debates exist not only among academics, but can also be an area of significant tension and contestation between staff and volunteers.

²⁴ As well as projects combining elements of both, as again these two understandings are not mutually exclusive.

ers play a coordinating role (linked to the above discussion on the two origins of the term), and our operationalisation of the ‘science’ in biodiversity citizen science. Firstly, as described above citizen science may involve citizens in different steps in the research process. An important demarcation choice made here is that my conception of biodiversity citizen science in this thesis emphasises the collection of biodiversity data in the field, not projects where citizens assemble datasets through analysing existing raw datasets. This choice was made based on both the long tradition of biodiversity data collection by volunteers in the Netherlands (as opposed to these online classification projects, which are still relatively recent), as well as cooperation with the Dutch species organisations as core partners in our inquiry, whose focus is on the collection of biodiversity data through engaging citizen scientists. While a logical choice considering the context and focus of our research, I recognise that some forms of biodiversity citizen science thus fall outside the scope of my research.

Secondly, like with green volunteering more generally, the degree of formal organisation is an important aspect. As we saw when tracing the term ‘citizen science’, and as reflected in its dictionary definition, citizen science is often assumed to involve initiation and coordination by researchers. However, my ‘continuum’ understanding discussed above make clear this is not a prerequisite. I have also argued that this is especially important when thinking about biodiversity citizen science, considering the long tradition of nature enthusiasts taking their own initiatives to investigate the natural world without involvement by researchers. As such, we chose to incorporate both data collection projects coordinated by scholars and researchers at nature organisations, but also included individuals using more community-driven platforms such as [waarneming.nl](https://www.waarneming.nl). Doing so prevented the exclusion of many dedicated individuals sharing their nature observations in a more casual context.

In other words, biodiversity citizen science in this thesis is characterised by both researcher-driven and community-driven efforts to improve our understanding of the natural world through collecting biodiversity data. Citizen science projects in the spirit of Bonney’s perspective are commonplace in Dutch biodiversity monitoring, as both scholars and nature organisations (including the Dutch species organisations) organise many citizen science projects. Examples including the annual bird counts, the Dutch National Bee Survey (see Chapter 5), as well as the standardized monitoring conducted by volunteers under the auspices of species organisations. However, my research also includes those individuals who contribute biodiversity observations beyond such researcher-directed projects, driven by enthusiasm or

personal or community concerns. The first survey among Dutch biodiversity citizen scientists (Chapters 3 and 4) thus included both volunteers engaged in structured monitoring, as well as those sharing their observation in a more unstructured format using the platform [waarneming.nl](https://www.waarneming.nl), which arose out of the community of nature enthusiasts itself.²⁵

This brings me to the last issue of demarcation: the ‘science’ of biodiversity citizen science, which directly informs my research approach in Chapters 3 and 4. The key criterion employed here is that, in order to match with my understanding of biodiversity citizen science, participants all had to share their data to a biodiversity data repository in some way, as these allow for the collected nature observations to contribute to research. In line with the Science Products Inventory, I understand research here to be broader than only academic research at universities, but also conservation-oriented research conducted at species organisations, and monitoring for policy and management at governmental bodies and NGOs. Relevant repositories, organisations and projects that the data could be submitted to thus include the Dutch species organisations and/or centralised databases like the Dutch National Database Flora and Fauna (NDFF), national projects like the Dutch National Bee Survey, or through the platform [waarneming.nl](https://www.waarneming.nl). In other words, I excluded those people who observe flora and fauna but do not record their nature observations, as well as those who record their observations purely in a personal log that they do not share (beyond perhaps a few fellow enthusiasts). This reflects the call from the literature noted above not to define science outcomes too narrowly by focussing only on university researchers and scientific publications. Species organisations and the NDFF are established curators of data used in research, and while the more bottom-up platform [waarneming.nl](https://www.waarneming.nl) describes its key mission more broadly as ‘document[ing] the natural richness of the world, for now and into the future’, it also emphasises its ‘solid collaboration with all research organizations’ that may use the resultant data ([Waarneming.nl](https://www.waarneming.nl), n.d.). However, by including some element of sharing the data with other parties to contribute to a broader understanding of the natural world, I exclude nature observations not shared in any way, as those cannot be said to contribute to science outcomes as described above.

²⁵ Of course, it is important to emphasise that the picture sketched here could be more nuanced. After all, while e.g. the Dutch species organisations do initiate and coordinate many citizen science projects (which thus reflect the researcher-driven understanding of biodiversity citizen science), to some degree these also draw on, and reflect the wishes of, the existing community of nature enthusiasts that collect the data. In other words, they are often not fully implemented ‘top-down’. Turnhout (2020, p. 174) has similarly argued that the way biodiversity monitoring in the Netherlands is organised is a constant interplay between the demands and priorities of nature organisations, policy and volunteers.

2.1.3 Conclusions

Section 2.1 has discussed in detail how terms such as ‘volunteer’ and ‘citizen scientist’ can be understood in different ways, and has shed light on how contemporary debates in the literature have informed how I understand these phenomena in this thesis. I have argued that I adopted a relatively broad definition of green volunteering, both in terms of activities and well as the degree of formal and informal organisation. In addition, I have illustrated how my understanding of biodiversity citizen science focusses on collection of biodiversity data by volunteers, but avoids overly narrow understandings of both the degree to which projects are coordinated by researchers, and the science outcomes to which the data may contribute. In addition, I have detailed how within these broad understandings I established boundaries in order to demarcate the objects of research in this thesis. Finally, throughout this section I have argued that adopting a relatively broad understanding is important in order to prevent the exclusion of green volunteers that may be overlooked under a stricter definition. In the next section, I move to the next key issue: understanding who does (and does not) participate in green volunteering.

2.2 The ‘who’ of biodiversity citizen science and green volunteering

The goal of this thesis is to contribute to our understanding of action for nature by studying green volunteering. If we want to understand why people take action for nature, it is also important to understand who it is that is currently undertaking green volunteering. In addition, if we are to learn more about its transformative potential, it becomes important to inquire how broad the public engaged in this form of action for nature is. Motivations for green volunteering may also be influenced by participants’ profile (Asah et al., 2014; Johnson et al., 2018) and information about profile is important to contextualise volunteers’ experiences or barriers to volunteering (Bushway et al., 2011; Davis et al., 2019; Parrish et al., 2019).

Considering inquiry into green volunteers’ profile is one of my research questions, and a specific priority for our partners in practice when designing this research (see section 1.5), here I provide a concise overview of what previous work on green volunteering has found regarding participants’ profile. I supplement these results with some findings from the literature on general citizen science and volunteering regarding profile and barriers to volunteering, in order to place the profile of green volunteers in context.

While many of the studies on motivations of green volunteers include demographic questions in their research design, the profile of green volunteers is rarely an explicit focus or research question. Rather, the demographic profile of volunteers is assessed not as a point of interest per se, but for the inclusion of demographic variables in analyses of motivations, or designs such as regression models. This brief section highlights some patterns found from reviewing the demographic findings from this literature on motivations for green volunteering. I focus on three common demographic variables: age, gender, and level of education.

2.2.1 Age

Bushway et al. (2011, p. 195) argue that one of the unique qualities of environmental volunteer work is its potential to bring together people of diverse age groups in meaningful action for nature, with this intergenerational aspect sometimes even an explicit goal. Based on published research, however, this ambition appears difficult to realise in practice: many studies on green volunteering report strong representation of volunteers in their 40s and 50s or above. For instance, among the 401 green volunteers surveyed by Bruyere and Rappe (2007), 44% were above the age of 50, while Ryan et al. (2001), Guiney and Oberhauser (2009) and Asah and Blahna (2012, 2013) all reported mean or median ages ranging between 40 up to 60 years of age. Only 5.3% of Asah and Blahna’s (2012) respondents were under the age of 20. Studies on biodiversity citizen science specifically have similarly found high average ages among participants (e.g. Frensley et al., 2017; Larson et al., 2020; Wright et al., 2015). Some studies among green volunteers did find somewhat lower ages: for instance, the 48 Greek participants surveyed by Liarakou et al. (2011) were largely between the ages of 21 and 35. Overall, however, the pattern appears to be for green volunteers to be of a relatively high age.

If we place these findings in a broader context, recent data from the Netherlands show that levels of volunteering in general are highest in middle age (ages 35 to 45), with levels being lowest for the age groups 25-35 and especially above the age of 75 (Arends & Schmeets, 2018, p. 7). Lack of time is often identified as an important barrier to volunteering, as Sundeen and Raskoff (2000) found among teenagers. In addition, Wilson (2012, pp. 188-190) discusses a life course perspective on volunteering, meaning that participation in later life is assumed to be rooted in volunteering experiences, education and/or socialisation early in life. Young people’s socio-economic background, and whether their parents stimulate them to volunteer, may all be of influence in shaping their attitudes towards volunteering. This perspective of socialisation into volunteering is also highlighted by Dean (2016), whose study of youth volunteering shows how youths from middle-class

backgrounds had developed a 'habitus' or ingrained propensity to navigate volunteering opportunities, something lower-class youths lacked. In addition, rapid changes in one's teens and early adulthood (education, housing, relationships) and prioritisation of finding paid employment may all play a role in explaining lower rates of volunteering among younger people.

However, Smith (1999) has also suggested that volunteer organisations struggle to reach out to and appeal to young people, especially in light of the diversifying function of volunteering discussed in Chapter 1. This links to discussions on volunteer stereotypes and stigma: Ho and O'Donohoe (2014) argue that for young people especially, negative stereotypes associated with volunteering can be an important hampering factor, also considering the importance of peer groups at that age.²⁶ Several studies have similarly highlighted the important role of the social environment in the decision to volunteer for youths (Hustinx et al., 2012; Van Goethem et al., 2014). The role of group norms and peers suggests that it will be difficult to recruit younger volunteers if few are currently active in an organisation or initiative. Indeed, authors such as Donald (1997, p. 499) and Martin and Greig (2019, p. 305) have argued that a lack of visibility of existing younger green volunteers can be a crucial barrier for others to become involved.

2.2.2 Gender

In terms of gender, findings appear to differ significantly. Many of the studies on green volunteers' motivations find a majority of female volunteers, running from 58.3% (Liarakou et al., 2011) to around 70% (Kidd et al., 1996; Merenlender et al., 2016). However, several studies found similar proportions of male and female respondents (e.g. Bruyere & Rappe, 2007; Dresner et al., 2015; Mac Domhnaill et al., 2020; Ng et al., 2018), and the study by O'Brien et al. (2010) among 88 British conservation volunteers reported a 72% male majority. In a study of contributors to the Belgian biodiversity platform *waarnemingen.be*, Jacobs et al. (2018) found 70% of registered users to be male. Even within the same study these patterns may differ for distinct populations; for instance, in their study among environmental volunteers in Great Britain and Austria, Sloane and Pröbstl-Haider (2019) found a slight overrepresentation of women among British volunteers (58%), but found them to be strongly underrepresented in Austria (26%).

²⁶ However, stereotypes and stigma associated with volunteering also takes place among adults, especially when the volunteer work concerns individuals or causes that themselves face stigmatization, such as people struggling with addiction, the homeless, or HIV-positive people. For an illustration among AIDS volunteers, see Snyder et al. (1999).

Some studies have not only highlighted differing rates of volunteering between men and women, but also pointed at differences between the types of activities that they carry out. For instance, the study of O'Brien et al. (2010) focussed on practical (and relatively physical) conservation activities in nature, while those green volunteering studies with the highest percentage of women (Abell, 2013; Kidd & Kidd, 1997; Kidd et al., 1996) tended to study volunteers in wildlife education, animal protection and care. However, this explanation appears limited; in fact, Sloane and Pröbstl-Haider (2019, p. 166) explicitly note that 'the dominance of male volunteers in Austria cannot be explained by physical challenges or related tasks'. In terms of volunteering in general, Arends and Schmeets (2018, p. 7) found that Dutch men and women were equally likely to volunteer, but appear to favour different domains (e.g. politics versus education). In terms of explaining such patterns, some scholars highlight the role of biological differences: women are attributed more altruistic or prosocial personalities and higher levels of empathy, and differences in risk-taking and physicality are highlighted (e.g. Wymer, 2011).²⁷ Other work points at factors related to norms about masculinity and femininity: Wymer and Samu (2002, p. 977) argue that caring is taught to be a gendered behaviour from an early age, making it more likely for men to face stigmatisation when volunteering in caring roles. Social control in groups may also play a role, such as when highly gendered groups of current volunteers serve as barriers to entry. In addition, some scholars have noted that women can face structural barriers in the workforce and higher family demands, which may help explain differential patterns in volunteering (Overgaard, 2019, p. 137).

2.2.3 Education

A noticeable finding regarding the profile of green volunteers, and especially biodiversity citizen scientists, is a significant overrepresentation of those with higher levels of education. While not all studies on green volunteering report levels of education, those that do often note that a significant percentage of their study participants have academic degrees or at least some form of college education. Examples of such findings include 74.7% of respondents having a college degree (Asah & Blahna, 2012), up to 78% (Van den Berg et al., 2009), and even 90% (Donald et al., 1997). As noted by Soleri et al. (2016, pp. 3-4), available information on citizen scientists' profile confirms significant biases in educational attainment (e.g. Johnson et al., 2018; Maund et al., 2020; Tiago et al., 2017; Wright et al., 2015). A meta-analysis of citizen science projects across disciplines ($N = 68$) found

²⁷ Though the author is also quick to add that these differences vary in their magnitude, and should be seen as one factor along with social influences. For a similar discussion related to charitable giving, see De Wit and Bekkers (2016).

participation to be 'slightly male-biased, overwhelmingly white, and well-educated', with 73% of participants having a college degree (National Academies of Sciences, Engineering, and Medicine, 2018, pp. 165-166). Some variation can also be found within studies on green volunteering, for instance linked to degree of involvement: Dresner et al. (2015, pp. 997-998) found that the predominance of older and more highly educated stewardship volunteers increased with frequency of participation. Overall, those studies that investigate it appear to confirm a relatively high level of education among green volunteers.

A high level of education among volunteers, and barriers related to this, are a common topic of discussion in the general volunteering literature. Gesthuizen and Scheepers (2012) provide one illustration: based on a survey among more than 42,000 respondents across 17 countries, they found that respondents with a higher level of education were around 2.5 times as likely to volunteer (p. 68).²⁸ The authors review several possible explanations, including socialisation and the sharing of group norms on the importance of volunteering, personal skills trained during education, and the development of a broader network. Indeed, familiarity with science through education might explain why the educational profile of citizen science participants is so skewed (Pandya, 2012). This development of a 'science habitus' (Jones et al., 2017, p. 429) can include not just education but also mentors and supportive social networks, and helps explain why existing interest in and familiarity with science is found to be an important factor in deciding to participate in citizen science (e.g. Martin, 2017).

In line with this observation, Hustinx and Lammertyn (2003, p. 183) note that the development described in section 1.3.3 to a more individualised mode of volunteering risks worsening barriers for vulnerable groups, as they could lack the knowledge or 'habitus' to pursue volunteering opportunities. These factors link up to the so-called 'dominant status model' of volunteering, which helps explain differing volunteering rates among teenagers (Sundeen & Raskoff, 2000). Hustinx et al. (2010) argue that while 'this mechanism by no means implies that volunteering is exclusively carried out by the rich, educated, and well situated in society', it does explain why rates of volunteering are often higher among those of higher social status (p. 422).

²⁸ The recent assessment of volunteering rates in the Netherlands (Arends & Schmeets, 2018) also finds a strong effect of education level, with around 58% of those with a higher education taking part in volunteer work, compared to 30.5% of those with only primary school education (pp. 8-9). However, the authors also note that respondents with lower levels of education spent more time on volunteer work on average compared to their highly educated counterparts.

2.2.4 Conclusions

As this brief discussion of the literature has illustrated, studies have found engagement in green volunteering (as well as citizen science and volunteering in general) to be unequal across demographic groups. Specifically looking at the three dimensions of age, gender and education, common patterns in the empirical literature suggest a generally high age and level of education among green volunteers, with more mixed findings regarding gender balance. Based on insights from the different consulted literatures I also discussed some explanations that have been suggested for these patterns, such as socialisation into volunteering and development of a volunteering or science 'habitus', and the possible influence of peer groups as well as group or gender norms. Based on the literature, the factors of age, gender and level of education are included as dimensions of demographic profile in the empirical chapters; this does not preclude other aspects from being important, such as ethnic or cultural background, but these remain suggestions for further research (see section 8.4). Finally, an important insight from this section is that the decision to start or continue volunteering may relate to a host of different factors (Haski-Leventhal et al., 2018), importantly one's motivations, but also different barriers one may experience. While reasons to stay and quit are the specific focus of Chapter 7, it is the motivations of green volunteers that I turn to in the next section.

2.3 The 'why' of biodiversity citizen science and green volunteering

As discussed in Chapter 1, an important component of understanding action for nature is gaining insight into people's motivations for taking action (Bennett et al., 2018; Enqvist et al., 2018). The literature has emphasised the importance of being sensitive to volunteers' motivations, for instance to understand how different motivations translate into action, or to help volunteer organisations maintain volunteers' enthusiasm and match them to activities they would most enjoy (e.g. Asah & Blahna, 2012; Stukas et al., 2016; Wright et al., 2015). At the same time, several scholars have argued that more insight into green volunteers' motivations is needed. Ryan et al. (2001) noted around 20 years ago that motivations of green volunteers were rarely a topic of discussion in the academic literature. This observation resurfaced several times in the work of later scholars such as Bruyere and Rappe (2007) and Liarakou et al. (2011) amongst others, and was recently highlighted again by Woosnam et al. (2019, p. 2). These different authors all call attention to how we cannot understand action for nature without insight into why

people are motivated to take action. As such, the ‘why’ of biodiversity citizen science and green volunteering is a key topic of inquiry in this thesis.

In this section, I first provide a concise overview of relevant motivations for biodiversity citizen science and green volunteering as reported in the literature (section 2.3.1). Based on this overview, in section 2.3.2 I reflect on two important choices I made regarding how I studied motivations in the empirical work reported in the next chapters: the focus on ‘deeper’ motivations for taking action for nature, and a broad selection of motivations covering both aspects of the self, others and nature.

2.3.1 What motivates biodiversity citizen scientists and green volunteers?

A concise review

This section takes a closer look at the existing literature on motivations for participating in biodiversity citizen science and green volunteering. I do so by drawing together findings from studies on both of these groups, supplemented where relevant with findings from the broader citizen science literature.

Wright et al.’s (2015) survey study among ornithological citizen science volunteers in South Africa ($N = 840$) showed diverse motivations to be at play, with two types standing out: one important group of motivations related to contributing to science and conservation, and another to exploring the outdoors and feeling connected with nature. Learning was also considered an important motivation, while social, organisational and career-related motivations were emphasised somewhat less (pp. 1019-1020). This echoes Kragh’s (2016) observation that biodiversity citizen scientists experience several motivations, but that those focussed on contributing to a good cause often end up emphasised more strongly than those focussed on personal development or social motivations. Since all these aspects are also shown to matter to green volunteers more broadly, I first discuss motivations related to contributing to science or conservation, followed by findings related to personal development and social motivations for green volunteering.

Contributing to a good cause: Science, conservation and place

Protecting species or natural environments is consistently identified as a key motivation in biodiversity citizen science (e.g. Frensley et al., 2017; Hvenegaard & Fraser, 2014). For instance, a mixed-methods study among coastal citizen scientists identified a desire to help and contribute to research and coastal protection as crucial motivations, both for beginning and experienced participants (He et al., 2019). In the survey study of Hobbs and White (2012) among citizen scientists in two biodiversity recording schemes in the United Kingdom, ‘to provide data for/

help the environment’ was ranked the second-most important motivation for taking part, after a personal interest in wildlife (p. 370). Among a sample of over 3000 participants in the Christmas Bird Count, Larson et al. (2020) found a diverse range of relevant motivations, but the desire to contribute to science and conservation was reported as most important for both initial and continued participation. These findings align well with those from studies of citizen science projects in other fields. For instance, a survey study among volunteers of the iSPEX aerosol monitoring project ($N = 1123$) found that contributing to research on, and improvement of, air quality was the strongest motivation, along with an interest in science (Land-Zandstra et al., 2016a). Similar results, emphasising contributing to research and health or environmental improvement, were found through surveys among participants of the Dutch Great Influenza Survey (Land-Zandstra et al., 2016b) and the British Gut Project (Del Savio et al., 2017) as well as water quality monitoring (Alender, 2016). Charesifard & Wehn (2016) used qualitative methods to study factors influencing data sharing in amateur weather networks; amongst other factors, they found that participants’ beliefs about contributing to knowledge about the weather, and trust in the ability of citizens to contribute to this aim, were oft-cited motivations for the sharing of weather data. Qualitative and quantitative studies on motivations of participants in gamified citizen science projects (Curtis, 2015, 2018; Tinati et al., 2017) have also shown that the desire to contribute to research and scientific progress are consistently identified by participants as key motivations for taking part. This desire to contribute to science is argued to be interwoven with an interest in science, which Curtis (2018, p. 9) notes may be what draws people to citizen science rather than other forms of volunteering.

Studies on green volunteering more generally have also highlighted the importance of contributing to a good cause as a motivation for volunteering, in this case nature protection or conservation more so than scientific research. Ryan et al. (2001) used a survey to identify five motivational factors among volunteers of three stewardship programmes ($N = 148$), with highest importance attributed to helping the environment and learning. Similarly, a survey study by Liarakou et al. (2011) found that the most important motivations for their respondents (48 Greek environmental volunteers between the ages of 18 and 40) related to learning about, being directly in contact with, and feeling responsible for nature and the environment (see also DiEnno & Thompson, 2013). Whether inspired by a connection to animals (Abell, 2013) or a general concern for nature, an ‘ethic of care for the environment’ (Measham & Barnett, 2008) consistently reappears as a key motivation for green volunteering. For some volunteers, the desire to contribute to science and conservation may be linked to specific landscapes or places to which people feel attached (Dunkley,

2019; Newman et al., 2017). Ryan et al. (2001, p. 642) found that green volunteers felt strongly attached to their specific volunteer site, and Pagès et al. (2019) similarly found through interviews ($N = 31$) that volunteers engaged in the management of invasive alien species were often strongly motivated by affinity for specific local species or attachment to local lands. Among volunteer oyster gardeners in New York City, environmental concern and a desire to contribute to stewardship were important motivations to do volunteer work, but the specific activities chosen were linked to a sense of place as well as social and ecological memories regarding the local estuary (Krasny et al., 2014a). In a series of interview and focus group studies of the Coastal Observation and Seabird Survey Team programme (COASST), Haywood (2016, 2019) found that collecting data within the programme contributed to volunteers' attachment to their specific monitoring location. Haywood (2019) argues that citizen science projects like COASST offer participants 'a reason to engage with place, adding weight and consequence to an otherwise leisurely stroll along the coastline' (p. 147). In other words, not only can attachment to place function as a motivation to take part in citizen science, participation then offers a way to alter relationships with place and stimulate feelings of attachment and protection, in turn motivating further participation. This changing relationship with place is illustrated by the following narrative offered by Martha, one of the participants in this programme:

We had never visited that beach before COASST. Now we call it our beach and are kind of a little protective of it. I mean, when they do coastal clean-ups, if we are around, we will go and sign up to do that beach. Because it is *our* beach. (...) It has become a part of our lives now, a really important place. (Cited in Haywood (2016, p. 253), emphasis in original)

Personal development: Enjoyment, learning, connection and identity

As shown above, key motivations for green volunteering often revolve around contributing to bigger causes like the advancement of scientific research or the protection of nature or treasured places. However, a second group of important motivations reported in the literature consists of those linked to personal development, which can include the enjoyment of the volunteering activities, building and expressing a personal connection with nature, and development in terms of knowledge or identity. These motivations are discussed next.

A desire to be outside and in nature can function as a motivation for green volunteering. In their analysis of open-ended survey responses from green volunteers,

Bruyere and Rappe (2007, p. 511) found the desire to be outside to be a prominent motivation, with volunteering providing an opportunity to experience and enjoy nature and the outdoors. Similarly, among the diverse motivations for nature volunteering reported in interviews by their Canadian participants (including learning, fun, social interaction and leaving a legacy), Caissie and Halpenny (2003) highlighted that the natural setting of the volunteer work, and people's connection with it, was of significant added value. They noted how 'the chance to interact with nature, to be integrated with nature is seen as an end rather than a means to something else' (p. 47). This desire to be outside and connect with nature is also expressed frequently in citizen scientists' motivations, sometimes linked to existing enjoyment of the outdoors or interest in wildlife (e.g. Hobbs & White, 2012). Regarding connection with nature as a motivation, Bell et al. (2008, p. 3449) illustrate how biodiversity citizen science offers an opportunity for participants to immerse themselves in nature, be alone with nature and intimately connect with it. Citizen science can even function as a justification for observing nature and connecting with it (Lawrence, 2006, p. 292): one of Hobbs and White's (2012) respondents expressed how they treasured 'to be able to stand idly watching... the birds without feeling guilty' (p. 370). This illustrates how biodiversity citizen scientists can be motivated by the opportunity to channel existing interests into contributing to a worthwhile cause. Seeing rare or special species may be especially enticing, as can seeing diverse species; an appreciation of species diversity has similarly been identified among broader groups of nature enthusiasts, such as people feeding wild birds (Martin & Greig, 2019).

This enjoyment of being in the outdoors links to the importance of fun, passion and enjoyment as motivating participation in green volunteering. One example is enjoyment of the physical nature of some green volunteer work and the benefits to physical and mental wellbeing it may offer (Miller, 2020; O'Brien et al., 2010; Takase et al., 2019). The role of passion and enjoyment has also been found in studies of citizen science; for instance, while participants in the online mapping project Tomnod overwhelmingly emphasised the importance they attributed to helping people and the environment through their contributions, some volunteers also emphasised their own learning and a sense of fun and recognition (Baruch et al., 2016). Similarly, studies of motivations for participating in Galaxy Zoo (Mankowski et al., 2011; Raddick et al., 2010) have illustrated how contributors place great importance on making a contribution to research and interacting with scientists, but also cherish the beauty of astronomical images, learning about the galaxy, and pursuing (sometimes life-long) interests in astronomy.

Learning about species, places and ecosystems is often identified as an important motivation for biodiversity citizen scientists (Johnson et al., 2018); in fact, Bell et al. (2008, p. 3450) note that ‘the will to learn is one of the hallmarks of a serious volunteer recorder’. In a survey study among both current and potential contributors to marine citizen science, Martin et al. (2016b) found that both groups believed strongly that participation would improve their knowledge of marine species, along with contributing to research and conservation. Interestingly, they also found that confidence in one’s own knowledge was significantly higher for current volunteers compared to potential ones (p. 514-515), illustrating how gaining, sharing and using knowledge can play a role in motivating participation in biodiversity citizen science. Others have found that learning could be an especially strong motivation for newer participants (e.g. Cox et al., 2018; He et al., 2019). Among broader groups of green volunteers, Guiney and Oberhauser (2009) found through a combination of surveys and interviews that learning about nature, having fun and enjoyment were important motivations alongside those related to stewardship. These findings match with Van den Berg et al.’s (2009) observation that volunteers in a conservation stewardship programme were driven especially by a desire to learn about nature.

Finally, in line with the developments discussed in section 1.3.3, participation in green volunteering and biodiversity citizen science may be one avenue through which participants build their personal identity. This motivation can be found in work on online citizen science; Jennett et al. (2016), for instance, found through interviews (N=39) that online volunteers may increasingly start to see their activities as shaping their identity, linked to increased feelings of belonging to a community, improved self-confidence, and a perception of making a contribution to scientific research (p. 15). Aspects of identity formation may also motivate biodiversity recording and green volunteering. He et al. (2019) note that especially seasoned COASST volunteers increasingly identified with the aims of the programme, seeing themselves as team members in a collective scientific effort, and experiencing greater self-esteem thanks to their participation. Gooch’s (2005) qualitative study of Australian catchment volunteers also reflects several dimensions of personal development; participants’ commitment to their volunteering work was connected to their personal and social identities, learning and exercising skills, and living a meaningful life. Such motivations can also be found in literature on community gardening (e.g. Quested et al., 2018); for instance, Sonti and Svendsen (2018) interviewed community gardeners in New York City, and their results highlight the importance of joy for motivating participation in community gardening. They found that this went beyond a simple sense of fun but linked inextricably to their participants’ identity and the role of community gardening in living a meaningful life.

Social motivations: Community and competition

Finally, the literature addresses social considerations that may motivate participation in green volunteering, especially in the context of motivating continued involvement. While Ryan et al. (2001) reported social and organisational factors to be less prominent motivations, they did show these factors to be positive predictors of continued commitment, whereas more highly ranked motivations (helping the environment and learning) were not. Similar findings were reported by Asah and Blahna (2012; 2013), whose survey studies demonstrated that social and community-related motivations were better predictors of commitment to conservation volunteering. Despite the relatively solitary nature of biodiversity recording, social dimensions may also be an important motivation there. For example, Bell et al. (2008) highlight how citizen scientists’ appreciation of being alone in nature and connecting with it existed in harmony with a desire to share this connection with likeminded others. This social aspect may include close family or fellow enthusiasts, and it may involve online or offline communities; examples of the latter include observing nature together with others, or the motivating effects on mentoring and social learning in groups (Ng et al., 2018). In an ethnographic study of bird-watchers, Wilkinson et al. (2014) illustrate how lists of bird observations are used as a way to share nature experiences with like-minded others. The authors argue that these nature observers ‘share a sense of collective identity, thus regardless of where they go there is a common bond between people who watch birds’ (p. 214).

Finally, these social motivations for volunteering may also include components of competition or status. Studies of online citizen science projects have analysed how competitive elements such as leaderboards may function as an incentive for participation (Ponti et al., 2018). Biodiversity citizen scientists may also be driven by challenge and the recognition of expertise and experience within a community of biodiversity recorders (Ellis, 2011; Lawrence & Turnhout, 2010). Competitive motivations may especially play a role when citizen science projects involve specific dedicated groups of nature enthusiasts, such as ‘twitchers’ in birding.²⁹ However, also among these groups, motivations to take part in recording programmes or events may be as much about contributing to conservation and social bonding than about competition (Scott et al., 1999).

2.3.2 Reflecting on motivations for green volunteering

The literature reviewed in section 2.3.1 demonstrates a diverse array of motivations

²⁹ Studies of birding (Cooper & Smith, 2010; Lee et al., 2015) have suggested that such competitive and status-oriented motivations may be relatively more prominent among male participants.

that play a role in motivating green volunteers. This literature in turn informed how I approached the study of motivations for green volunteering in my empirical work. Here, I reflect on two important choices made in this regard: the choice to focus on 'deeper' and more intrinsic motivations, and how inclusion of the three types of motivations referred to in the previous section (in brief: nature, self and social) means we cover both more altruistic and more self-oriented motivations.

Firstly, in the empirical work reported in this thesis I opted to focus my study of motivations on 'deeper' motivations for green volunteering. To understand what this implies, it is helpful to reflect on the difference between motivations and needs. If we take motivations to be expressions of why someone chooses a certain pursuit, the previous section illustrates that people may choose to do green volunteer work (as opposed to the myriad of other possible pursuits) for a variety of reasons. However, as touched upon in section 2.1 I recognise that volunteer work can also be a response to more fundamental needs, a context that may leave relatively little room for any active choice. Examples of how certain needs may drive volunteering include a strongly felt sense of obligation (e.g. to significant others, the community, or in return for charity of others), or institutional and legal obligations (e.g. when 'volunteering' is a required part of degree or benefit programmes³⁰). Classic frameworks such as Maslow's (1954) hierarchy of needs also recognise this: many of our choices may be driven by considerations of self-expression, self-improvement or living a meaningful life, but others may be informed by considerations of our basic needs (e.g. financial security or safety within a community).

Though I recognise this aspect of contextualising motivations, and their prominence in settings such as school- or sports-related volunteering where obligations may play a significant role, considering the context of my empirical work (green volunteering in the Netherlands) the choice was made to focus on a more detailed investigation of the 'deeper' motivations discussed in the previous section. We thus did not inquire into the degree to which some of our respondents may feel obligated to do green volunteer work, or felt little choice in the matter. For example, while some people may pursue volunteering opportunities in order to improve their resume and improve their odds on the competitive job market, we did not include an item tapping into this motivation in our surveys. This links to the distinction made in the literature between intrinsic and extrinsic motivations (Bennett et al., 2018, pp. 601-603; Lakomý et al., 2020; Ryan & Deci, 2000). Intrinsic motiva-

³⁰ Though see section 2.1 for debates on whether this then still falls under the banner of volunteering.

tions can be understood as those related to personal satisfaction and development, or the expression of one's values and moral beliefs; associated motivations include the enjoyment of doing the activity, a feeling of community with fellow volunteers, learning through doing or the feeling of making a meaningful contribution. Extrinsic motivations would then be those related to consequences separable to the individual, including financial rewards or degree requirements. The considerations described here make clear that our inquiry largely focusses on the more intrinsic motivations. Of course, that they are not the focus of our inquiry does not mean that these extrinsic motivations are never touched upon at all in this thesis; as Chapter 7 will demonstrate, in the everyday reality of green volunteering we do witness volunteers reflecting on pressures to volunteer. However, focussing on the 'deeper' or intrinsic motivations for green volunteering is an important choice in demarcating my object of study.³¹

Secondly, we drew on the literature discussed in the previous section to survey respondents on a wide range of motivations for green volunteering, both those emphasising contributing to science or conservation of nature and place, self-development in terms of learning or identity, and social motivations. In doing so I adopt a broad position regarding another dichotomy discussed in the literature on motivations: the one between altruistic and egocentric motivations. Simply put, altruistic motivations centre on taking action for the benefit of others (e.g. to help someone in need, or to support threatened species), while action taken for egocentric motivations focus on benefits for oneself (such as learning new knowledge or skills, making friends or personal enjoyment) (see e.g. Piferi et al., 2006, p. 172). The review in section 2.3.1 makes clear that both types of motivations appear to play an important role in motivating green volunteering, in line with the observations by Hustinx and Lammertyn (2003) regarding the pluralisation of motivations for volunteering as discussed in section 1.3.3.

The choice to include such a diverse range of motivations means I avoid either viewing volunteering as something arising purely out of self-interest, while also recognising that the personal benefits of volunteering may play an important motivational role. In regards to the latter, there is a long-standing debate over whether any action

³¹ It is important to emphasise that the way I categorise motivations as either intrinsic or extrinsic (e.g. by categorising learning as a more intrinsic motivation) is only one possible conceptualisation. As discussed in more detail by Stukas et al. (2016, p. 248), different scholars have categorised intrinsic and extrinsic motivations, and their relation to altruistic and self-oriented motivations, in a variety of ways. Furthermore, it should be recognized that extrinsic motivations differ in the degree to which they might become internalised (Ryan & Deci, 2000, p. 61).

is ever truly taken purely for altruistic reasons; Smith (1981) argued this point in relation to volunteering³², while Clary and Snyder (1999, p. 157) note that motivations for volunteering are complex and difficult to categorise exclusively as altruistic or egoistic (see also Yeung, 2004). An important implication of these perspectives is to not perceive more self-oriented motivations as somehow ‘lesser than’ more altruistic ones, a viewpoint which the context of volunteering may readily invite. Both types of motivations are important and may even reinforce each other; for instance, Snyder and Omoto (2008, p. 16) note that a combination of altruistic and self-oriented motivations for volunteering may in fact help strengthen volunteers’ perseverance in times of hardship, as compared to those volunteers driven purely by the desire to help others. The importance of both aspects called for including both in the empirical studies.

Indeed, an important takeaway from the literature discussed in the previous section is that a combination of motivations may drive green volunteering, which problematises a binary distinction between voluntary actions driven from either altruistic or egocentric motivations. For instance, Schild (2018) found through interviews and a survey ($N = 480$) among recreation-based volunteers that her respondents most commonly discussed environmental values and different commitments (towards the environment, the community, and future generations) as motivations for volunteering, but also highlighted how their volunteering contributed to their own learning process and identity formation.³³ Similarly, Torres et al. (2017) interviewed community gardeners in and around Paris and found that participants discussed both environmental (raising awareness about biodiversity, environmental stewardship), personal (happiness, breaking routines) and social motivations (meeting new people, building community).

Section 2.3.1 also demonstrates clearly how motivations related to nature and place are important for understanding green volunteering. This directly informed the choice to largely design our own measurement items, rather than using existing scales from the volunteering literature. This importantly includes the Volunteer Functions Inventory (VFI; Clary et al., 1996), which is commonly used in the volunteering literature. While fruitfully applied in a variety of volunteering contexts (e.g.

Eley & Kirk, 2002; Willems & Walk, 2013), several scholars studying green volunteering have questioned how suitable the VFI is to understand action for nature (e.g. Guiney & Oberhauser, 2009; Krasny et al., 2014a, p. 24; Pagès et al., 2018, p. 919; Schild, 2018, p. 926). These authors suggest that its decontextualised design (intended to be applied in many different volunteering contexts) may be less suitable when the volunteering cause is nature rather than other people. As such, we combined self-designed items (aligned with the different motivations reviewed in section 2.3.1) with some existing items from the empirical work in BIOMOT, which studied motivations for action for nature by highly committed individuals across Europe (Admiraal et al., 2017). By bringing these different literatures together, our survey instrument was designed to be appropriate for studying the specific context of green volunteering.

³² In line with this sentiment, Wilson (2012, p. 182) notes that ‘although it goes against the grain of thinking of volunteer work as altruistic, it is undeniable that in many cases people volunteer for an activity only if it is in their best interest to do so’.

³³ Scholars have used several terms to refer to this unison of more altruistic and more self-oriented motivations; for instance, Schild (2018) herself uses the term ‘enlightened self-interest’, while Rehberg (2005) speaks of ‘altruistic individualism’.

3

Sharing biodiversity data

Citizen scientists' concerns and motivations

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Abstract

Citizen scientists play a pivotal role in providing necessary biodiversity data. To ensure the continued involvement of a strong volunteer base, insight into the concerns and motivations of voluntary recorders is crucial. This paper presents the findings of a large-scale survey ($N = 2193$) among Dutch volunteer biodiversity recorders of diverse taxa, and focuses on three questions: what are the characteristics of these citizen scientists regarding their activities and socio-demographic background, what are their motivations for recording biodiversity, and what are their views on data sharing and ownership?

Our findings show that a connection to, interest in and concern for nature are the most important motivations for biodiversity recorders. Volunteer recorders have high expectations regarding the impact of their data, both for their own learning as well as for science and management. Almost half the volunteers consider their data to be public goods, but this does not mean they support unconditional data sharing. Instead, the acceptability of data sharing with third parties seems strongly linked to the goals of the user.

We discuss the implications of our findings for practitioners, such as the role of biology curricula and the importance of learning opportunities to redress the lack of younger volunteers. We argue that conceptualising volunteer recorders as data *custodians* rather than *owners* helps to understand their perspective on data sharing, and emphasize the importance of clear and transparent data policy that respects volunteers' views on their data.

3.1 Introduction: A different perspective on citizen scientists

Citizen science is on the rise. More and more research projects involve volunteers who collect biodiversity data, interpret astronomic images, fold proteins, or even help solve mathematical problems (Conrad & Hilchey, 2011; Dickinson et al., 2010; Franzoni & Sauermann, 2014; Kullenberg & Kasperowski, 2016). Scientists are discovering the enormous potential of non-professional citizen scientists, mobilizing their volunteer commitment to undertake research projects that would otherwise be unachievable or unaffordable. In the wake of such endeavours, there is a modest but growing body of social scientific research studying this phenomenon of citizen science. These studies report and discuss experiences with citizen science projects, analyse tensions and limitations, and provide management recommendations (e.g. Bone et al., 2012; Newman et al., 2003; Van Vliet et al., 2014; Whitelaw et al., 2003). Biodiversity researchers too have been debating the potential of citizen science, especially in the form of volunteer biodiversity recorders who produce atlases, periodic surveys, or targeted monitoring projects, sometimes combined with conservation efforts (Catlin-Groves, 2012). There is an ongoing debate in the literature on whether citizen science as a method provides data of sufficient quality to merit the costs (Schmeller et al., 2009), or whether investments in citizen science yield sufficient numbers of research papers and citations to be cost-effective (Tulloch et al., 2013b).

Compelled by both urgent conservation problems and the publication pressure typical of current research careers, it might seem logical for biodiversity researchers to weigh the advantages of citizen science in the cold logic of a potential resource. Hence we find phrases such as citizen scientists representing 'a free source of labour, skills, computational power and even finance' (Silvertown, 2009, p. 467), or how much 'bang for your buck' in terms of scientific outputs' different types of citizen science projects provide (Tulloch et al., 2013b, p. 135).

However, involving volunteers is much more complex than such an instrumental view may suggest. Social scientists studying biodiversity recorders have signalled that this portrayal as 'research instruments' can be a potential source of conflict. These volunteers object to being cast as what Ellis and Waterton (2004) refer to as 'automated data-drones' (p. 98) – just like most scientists would not want to be considered publication-producing 'research drones'. Volunteers have their own ideas about what constitutes appropriate and respectful use of their data, and might decline to share them if their trust is breached (Lawrence & Turnhout, 2010); they are clearly not the docile data collectors they are sometimes made out to be (Resnik et al., 2015).

This observation raises important questions, such as how biodiversity recorders feel about the data they collect, and what motivates them to collect and share these data. Maintaining the engagement and enthusiasm of volunteer recorders around the world is crucial: not only do national and international initiatives like the Global Biodiversity Information Facility (GBIF) fuel a demand for biodiversity data, but (as noted in the next section) involvement of volunteers in biodiversity-related citizen science is linked to a diverse range of benefits for participants. These may include cognitive and experiential learning outcomes and a strengthened connection with nature (Groulx et al., 2017) and mental and physiological health benefits associated with nature engagement (Russell et al., 2013). Biodiversity-related citizen science may thus not only contribute to biodiversity conservation through direct provision of data, but also indirectly through strengthening participants' awareness of and connection with biodiversity and the natural world.

Using the Dutch national biodiversity recorder as an example, our aim is to gain insight into the interrelated factors of volunteer biodiversity recorders' background, motivations, and views on sharing data, in order to learn more about what drives citizen scientists to record biodiversity, and to assist practitioners in connecting with their volunteers' concerns and motivations.

3.1.1 Who is the citizen scientist?

Citizen science is a broad form of cooperation between professional scientists and the public (Bonney et al., 2016), which is in theory open to anyone willing to participate. However, experience has shown that different segments of the population are more prone to participate than others (Soleri et al., 2016). Both Hobbs and White (2012) and Pandya (2012) note that citizen scientists currently tend to be whiter, older and more middle-class than broader society; a similar pattern is found in volunteering in general (Measham & Barnett, 2008). For instance, in their study of the Second Southern African Bird Atlas Project, Wright et al. (2015, pp. 1017-1018) found that volunteers in both their sample and the entire programme were overwhelmingly older white males with high levels of education and income. In addition, in a survey among potential marine citizen scientists, Martin et al. (2016a) found that interest in participation was positively correlated with both education in science and previous participation in scientific research. This indicates that this will continue to influence future volunteer recruitment, and will not likely resolve itself without purposeful effort.

This is a missed opportunity, as participation is presumed to lead to several benefits for the citizen scientist, such as increased understanding and appreciation of

science (Brossard et al., 2005; Cronje et al., 2011; Trumbull et al., 2000), stronger bonds with nature (Ellis & Waterton, 2005; Lawrence, 2006) and social bonding (Bell et al., 2008). In addition, citizen science as an experience in nature could raise an interest in and support for nature conservation, especially at a younger age; Brewer (2006) notes that 'many conservation biologists reminisce about having their interest kindled through early experiences in nature in the company of friends and mentors' (p. 691). In order to extend these potential benefits to a more diverse public, insight into the profile and motivations of the volunteer base is important.

3.1.2 Citizen scientists' motivations

If scientists are to see citizen scientists as colleagues rather than 'data-drones', they must gain an understanding of volunteers' motivations for participating. Meeting the expectations of volunteers and engaging their knowledge and expertise helps to maintain their motivation to contribute and prevents 'poor recruitment or high exit rates from research programs' (Wright et al., 2015, p. 1015).

Several authors have found that connecting with and learning about local nature and biodiversity is a key motivation for participation in nature volunteering (e.g. Hobbs and White, 2012). For instance, Guiney and Oberhauser (2010) found that their conservation volunteers gave higher scores to nature-related motivations than to social or career-related motivations (p. 189), and Bruyere and Rappe (2007) found that to 'help the environment' was by far the highest-scoring motivation in their factor analysis of environmental volunteer motivations (p. 509). Lawrence (2006) even suggests that biodiversity recording can function as an excuse for spending quality time outdoors and 'indulging in nature, or fleeing from family and social demands' (p. 292). As noted by Bell et al. (2008), learning about nature through citizen science is an important aspect of this bonding with nature:

[V]olunteers narrated to us their enjoyment in being outdoors and feeling close to nature, but such pleasures are neither exclusive nor specific to volunteer monitoring. Rather, the particular intimacy with the natural world developed through such activities is closely associated with a growing understanding of how the natural world works. (p. 3450)

In addition to learning about and connecting with nature and biodiversity in general, some authors have called attention to the importance of specific places in motivating nature-based citizen science. Lawrence (2009) notes that citizen science data often arise out, and are given personal meaning through, long-term interac-

tion with a specific place. In addition, Haywood (2014, 2016) has drawn attention to the importance of sense of place, i.e. the meaning of and attachment to specific sites, as both a possible motivation for and result of participation in citizen science. Specifically, Haywood et al. (2016) found that knowledge and familiarity developed through repeated sampling visits was connected to stronger attachment to place, such as a sense of ownership.

Bonding with like-minded people can also play an important role in nature volunteering. Asah and Blahna (2013) showed that social and community motivations were crucial for the commitment of urban conservation volunteers. Another possible motivation is a sense of personal achievement and pride in biodiversity recording (Lawrence & Turnhout, 2010, p. 356). In addition, participation can be inspired by the desire to contribute to conservation science or management. With the literature discussing many examples of the contribution of citizen science to research and management (Dickinson et al., 2010; Lovell et al., 2009; Shirk et al., 2012), many authors also stress the importance of communicating with volunteers about the impact of their work, as the awareness of making a concrete contribution is an important motivator for investing time and effort (e.g. Bonney et al., 2009; Gouveia et al., 2004).

3.1.3 Data sharing in citizen science

Access to and sharing of citizen science data is of crucial importance: Open data and data sharing with both project participants and outside parties can improve the data's relevance and trustworthiness for science, policy and management (Freitag et al., 2016; Soranno et al., 2015). Several practical issues regarding data sharing and use are debated in the literature, especially how to organise, validate, integrate and analyse these data (Gouveia et al., 2004; Newman et al., 2012; Resnik et al., 2015). Citizen science still deals with a (perceived) 'image problem' regarding data quality (Riesch & Potter, 2014, p. 113), though steps can be taken to assuage this concern (e.g. Bone et al., 2012; Sullivan et al., 2014; Theobald et al., 2015). Other practical issues in data sharing include legal questions (e.g. who owns database records), concerns about the disturbance of rare species, and volunteer privacy (Newman et al., 2012), the latter two being especially relevant when data are geo-referenced.

However, sociology of science cautions us regarding a more fundamental concern related to the difference between data and knowledge. In order for records to be 'usable' as biodiversity data, they must be submitted in a structured and standardised format, objectively validated, and then transmitted to and stored in data-

bases (Turnhout & Boonman-Berson, 2011). However, Ellis and Waterton (2005, p. 688) note that tensions may arise when volunteer data become 'disembedded from their original source and the human-nature contractual relationships which are implied in their production'. The standardisation and decontextualisation implicit in centralised biodiversity databases provides opportunities for conservation, yet we must be wary of the contextual richness we lose in the process and the effects this has on both data utilisation and volunteer motivation (Turnhout & Boonman-Berson, 2011; Turnhout et al., 2016). This requires project managers to consider the views of citizen scientists regarding ownership and appropriate use of their data.

3.1.4 The aims of this study

Since volunteer or enthusiast natural history research is actually older than its professionalised counterpart (Bois et al., 2011; Miller-Rushing et al., 2012), we argue that *cooperation between* biodiversity researchers and citizen scientists is a more productive perspective than researchers *making use of* volunteers. Cooperation may cover the entire spectrum between relatively passive data collection and independent research by citizens (Haklay, 2013; Shirk et al., 2012), but leaves more room for collegial approaches where the views, knowledge and skills of both professional and citizen scientists are mutually acknowledged.

This conception of citizen science implies that both scholars and policymakers in the field of biodiversity conservation will benefit from a better understanding of the citizen scientists themselves. Cooperation requires a thorough understanding of their background, motivations and goals. Understanding why citizen scientists make the commitment they do, and ensuring responsiveness to their concerns and motivations, is necessary if we are to take their engagement seriously (Land-Zandstra et al., 2016a). This includes citizen scientists' views on data sharing, which are rarely studied empirically. Lawrence and Turnhout (2010) note that while contributing to science is an important motivation for volunteer biodiversity recorders, they also value the context of their sightings and need to trust that their data will be used respectfully and for the right purposes, 'not ... simply as a commodity that can be bought and sold' (p. 359).

In order to reach new audiences or increase engagement of existing volunteers, scholars and practitioners can use methods such as surveys and interviews to gain a deeper understanding of a project's participants. For instance, using a combination of surveys, focus groups and interviews, Merenlender et al. (2016) found an overrepresentation of older and wealthier participants in California and Virginia Naturalist programmes, and used their findings to enact changes to engage a more

diverse audience, e.g. through providing scholarships and course credit. Regarding existing participants, Haywood (2016) notes that programme evaluation is often done from the perspective of scientists rather than volunteers. Based on interviews and focus groups, he recommended several ways to improve engagement, e.g. by fostering social networking among volunteers, asking volunteers to recommend new variables to monitor, or allowing motivated individuals to take up more complex tasks.

This section has illustrated the importance for scholars and practitioners to understand their citizen scientist colleagues in order to stimulate engagement, diversify the volunteer base, and establish a cooperative base to improve the project itself. To gain insight into these matters and assist practitioners in biodiversity-oriented citizen science, we present the results of a large-scale survey ($N = 2193$) among Dutch volunteers recording diverse taxa, and explore three main research questions:

1. What are the characteristics of these citizen scientists regarding their activities and socio-demographic background?
2. What are their motivations for monitoring biodiversity?
3. What are their views on data sharing and ownership?

3.2 Materials and methods

A questionnaire was designed in the online survey platform LimeSurvey (www.limesurvey.org) to gain insight into the background, motivations and views on data sharing of volunteer biodiversity recorders, specifically those that submit their data to an online portal. To ensure the relevance of the results to practitioners in the field of biodiversity conservation, the questionnaire was designed in close cooperation with representatives of NLBIF, the funder of the research, as well as many Dutch nature organisations and biodiversity monitoring platforms.³⁴ The final questionnaire was also piloted among a few of their representatives and several scientists not involved in the project.

³⁴ The organisations that commented on the draft survey are Waarneming.nl; The Dutch National Database Flora and Fauna (NDDF); Nature's Calendar (part of Nature Today); Sovon Dutch Centre for Field Ornithology; Reptile, Amphibian & Fish Conservation Netherlands (RAVON); Dutch Foundation for Botanical Research (FLORON); European Invertebrate Survey (EIS); Dutch Butterfly Conservation; The Dutch Mammal Society; and Naturalis Biodiversity Center.

The survey covered four topics: the activities of the volunteers (e.g. submitted taxa and frequency of submission, years active, locations), their motivations (including their validation and learning strategies and their views on the significance of their efforts), their views on data sharing (e.g. data ownership, acceptable use and conditions on sharing) and socio-demographic questions (age, gender, education, sectoral employment and postcode). Most questions were either multiple-choice (e.g. 'what do you do when you doubt a sighting?') or took the form of a group of items or statements with a response scale. The full questionnaire contained a total of 35 questions, with an estimated completion time of around 15 min.

Regarding motivations for biodiversity recording, respondents were given a list of 12 motivations (ordered randomly for each respondent) based on our literature review reported above and the EU-FP7 project BIOMOT, an empirical study into the motivations of committed actors for nature (Admiraal et al., 2017). Respondents were asked to arrange these motivations in descending order of importance and were free to leave out any motivations deemed unimportant. Although this method may force respondents to create an imposed hierarchy among motivations considered equally important, it avoids the more serious problem of careless equivalent scoring on a response scale (i.e. the problem of straight-lining (Maronick, 2009)). Since our goal was to reach a specific population that is diffused and difficult-to-reach (Dutch volunteer biodiversity recorders who submit data), we employed purposive sampling to reach as many respondents as possible fitting these criteria, using a variety of channels (Neuman, 2014). The online survey was active for a month (September-October 2015). The organisations consulted in the survey design (see footnote 34) distributed the survey link throughout their volunteer networks using a mixture of direct emails to volunteers, online newsletters, and social media posts. Our sampling approach involved an initial introductory brief with the link to the survey, and two reminders sent to all organisations over the next few weeks. The involvement of these diverse organisations ensured both a significant number of respondents as well as a wide geographical scope and breadth of taxonomical focus, though the chosen sampling method limits the representativeness of the sample (see section 3.4.1). The final sample consisted of 2193 completed questionnaires, a completion rate of 66.7%. Respondents were spread throughout the country (Appendix A).

Data were analysed in SPSS version 21. Aside from descriptive statistics, we used Pearson's chi-squared tests to analyse associations between categorical variables, Mann-Whitney tests to compare means, and Spearman's rank correlation coefficient for checking bivariate correlations between ordinal and/or discrete variables

(Field, 2013). Non-parametric tests were chosen because normality tests (Kolmogorov-Smirnov and Shapiro-Wilk) indicated significant deviations from the normal distribution. In all cases $p < .05$ was taken as a minimum value for statistical significance. To allow chi-squared tests to include age or years active as volunteer recorder, we recoded these continuous variables into categories (<35, 35-49, 50-64, and 65+ for age; <2, 2-5, 6-10, 11-15, and 16+ for years active).

The motivation ranking scale was analysed by scoring each motivation based on the rank given to it by each respondent (e.g. 12 points for 1st rank, 11 points for 2nd rank, all the way to 1 point for 12th rank, with 0 points given if the motivation was not included at all) and then summing these scores across all respondents to arrive at a final score for that motivation. This allowed us to create a final ranking of the 12 motivations. Scores were not weighted based on how many motivations respondents had included in their personal ranking. To compare relative popularity of motivations across demographic categories using chi-squared tests, we created binary variables for each motivation based on whether a respondent had included that motivation in their top three motivations.

3.3 Results

3.3.1 Volunteer profile

Table 3.1 summarises the socio-demographic profile of our sample. Regarding age, it is notable that the age groups 80+, 0-19 and 20-39 are underrepresented among the volunteer recorders compared to the general population, while those between 40 and 79 years old are overrepresented. Table 3.1 also shows that the Dutch volunteer naturalists in our sample are overwhelmingly male and much more highly educated than the general population. Volunteers have been volunteer recorders for an average of 10.4 years; a Mann-Whitney test showed that the average years active was significantly higher for male ($M = 11.3$, $SD = 10.7$) than for female ($M = 7.6$, $SD = 8.3$) respondents ($U = 330.73$, $p < .001$). This was not related to male respondents being older than females, as mean age did not significantly differ between male ($M = 53.6$, $SD = 14.0$) and female ($M = 54.2$, $SD = 12.1$) respondents ($U = 440.04$, $p = .950$). Finally, Table 3.1 shows that almost one in five respondents are employed in the nature/environment sector.

Figure 3.1 shows the frequency of record submission for each taxon, split among frequent (daily, weekly or monthly), occasional (few times a year or less) and never. Category labels were based on the way monitoring societies are organised in the

		Sample	Dutch population
Age ^a	Mean (SD)	53.7 (13.6)	41.5(-)
	0-19	1.1%	22.5%
	20-39	15.0%	24.5%
	40-64	60.5%	34.8%
	65-79	22.7%	13.8%
	80+	0.6%	4.4%
Gender	Male	75.4%	49.6%
	Female	24.6%	50.4%
Higher education completed		61.7%	29.4%
Mean years active (SD)		10.4 (10.3)	-
Paid position in nature/ environment sector		18.2%	-

^a $n = 2175$.

Table 3.1 | Socio-demographics.
Dutch general population data based on census data for 2016 (age and gender (Statistics Netherlands, 2019)) and 2014 (higher education (Statistics Netherlands, 2018)).

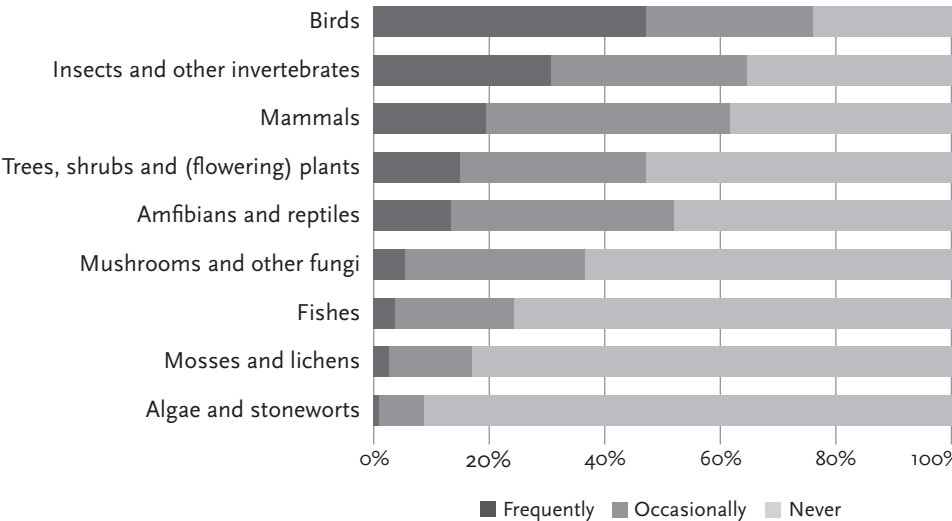


Figure 3.1 | Self-reported frequency of submission per taxa ($n = 1923$).
Respondents could pick multiple taxa. Frequently = daily, weekly, or monthly; Occasionally = a few times a year, or yearly or less. Category labels (y-axis) were based on the way monitoring societies are organised in the Netherlands.

Netherlands; i.e. 'Mushrooms and fungi' refer to mushrooms and non-lichenized fungi, and 'mosses and lichens' include hepatics. The data show that birds are the most widely submitted taxon (75.9% of respondents), followed by insects and other invertebrates (64.9%), and mammals (61.6%). Birds also stand out as the category submitted most frequently, with birds being the only taxon where the frequent submitters (47.2%) outnumber the occasional submitters (28.7%).

Several questions explored volunteers' observation practices. Regarding location, the overwhelming majority of respondents (85.5%) record species wherever they see them, and more than half (57.7%) record sightings from their garden. It is also notable that almost a third (30.2%) of respondents record observations abroad. Biodiversity recording is overwhelmingly a solitary activity; 90.4% of respondents indicated they are (usually) alone when recording. Finally, biodiversity recording seems to be part of a broader engagement with nature conservation for many participants: a vast majority of respondents (84.9%) has made a financial contribution to nature development or conservation, 57.9% has actively contributed to nature management (e.g. pruning shrubs or pollarding trees), and 50.9% has reported offences in natural areas. For each of these additional actions, chi-squared tests revealed that volunteers with a longer history of recording are more likely to have carried out these actions ($p < .01$ for each test).

3.3.2 Motivations

The results of the motivation ranking exercise are shown in Figure 3.2. It is immediately noticeable that nature plays a central role in the top motivations: a connection to, interest in, and concern for nature make up the top three as ranked by the volunteers themselves. Time spent outdoors also ranks highly, likely reflecting both its value as exercise as well as its role in building a connection to nature. Motivations such as contributing to science and place attachment are given moderate importance, while social motivations (working together with people) and more abstract motivations such as meaningful life and identity formation end up with lower scores.

Chi-squared tests also showed some influences of background characteristics on which motivations were ranked in the top three: for instance, connection to nature was ranked in the top three more frequently by older respondents, while learning about nature and seeing as many different species as possible were more popular motivations among younger respondents and those who have been recording for fewer years. Contributing to science or nature conservation and management was ranked in the top three more often by more experienced volunteers and by those

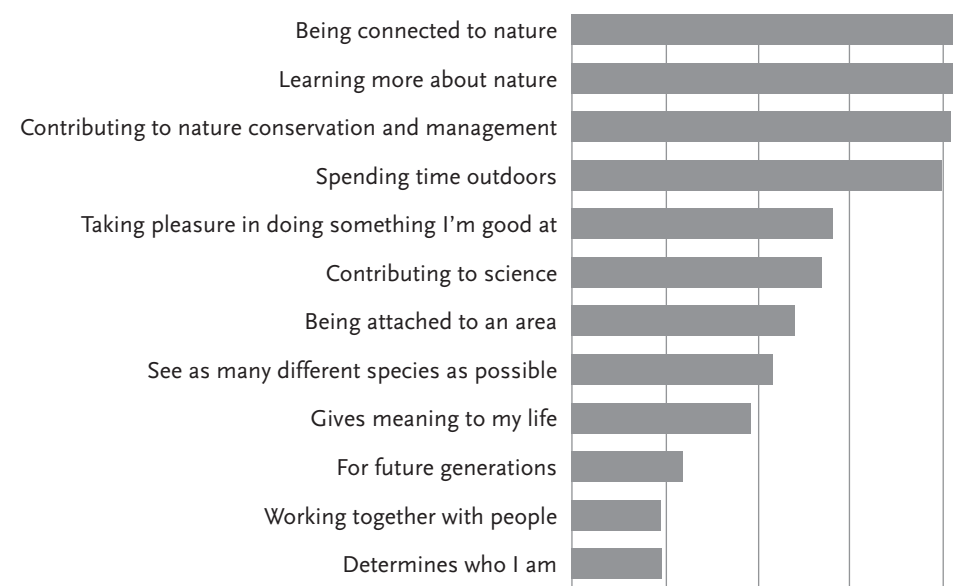


Figure 3.2 | Motivation ranking scale.

Scores calculated by scoring each motivation based on the rank given to it by a respondent (e.g. 12 points for 1st rank, 11 points for 2nd rank) and then summing these scores across all respondents.

with a paid position in the nature/environment sector. All these tests were significant at $p < .001$.

These findings are corroborated by several other questions. The drive for learning among volunteers was shown clearly in a question on how volunteers deal with doubt. When asked to select the strategies used to dispel doubt about the accuracy of an observation (multiple answers possible), 72.5% reported consulting field guides, 66% use the internet to double-check (e.g. through identification groups on Facebook), 34.3% and 33.7% consulted other recorders or experts respectively, while only 24.8% of respondents said they submitted a doubtful record without checking. Another question tapped into the different methods of learning used, including self-study (88.4%) and discussions with other volunteers (48.6%) or experts (38.3%). Finally, 90.9% considered their collected data to be important or very important for their own learning about nature.

Respondents also expected their data to be highly relevant for research and conservation, with a majority considering the data to be important or very important for nature conservation on a local (70.2%) and national scale (68.7%), and for scientific research (63.1%) and (spatial) policy (56.3%). These findings, together with

the fact that almost half the respondents would like more information on relevant nature policy and scientific research (47.5% and 46.6% respectively), indicate that the desire and expectation to contribute to conservation science and practice is an important driver for these biodiversity recorders.

3.3.3 Sharing data

When it comes to sharing data, an important initial question is how citizen scientists feel about data ownership. When asked who owns submitted records, almost half the respondents (48.7%) chose the option ‘the data are nobody’s property (public good)’, 27.4% consider data to be owned by the organisation they were submitted to, while only 18.2% consider these data as personal property. Respondents clearly did have an opinion on this question, as only 5.7% chose the option ‘I really don’t know’.

Despite their support for data as a public good, only 12.3% of respondents supported completely unconditional use of their data. One group of respondents (25.6%) felt that this issue should be left to whoever manages the data; however, the majority chose concrete demands. Specifically, 16% indicated that either the volunteer or the organisation to which they entrust their data should be attributed whenever the data is used, and 36.7% felt that, in addition to attribution, their data should also not be used for financial gain. Only 2.2% of respondents chose ‘no opinion’. Related questions showed that a majority of respondents (69.1%) would like insight into how others use their data, and 41.2% would like to be cited by name when their data is used.

Respondents were invited to expand on these issues in several open questions, which gave us more in-depth indications of volunteers’ concerns regarding data sharing. Most importantly, although many relevant concerns were brought up (including the use of volunteer data by private consultancies, volunteer privacy, exposure of rare species, and the possibilities for tracking data use), the central tenet of the responses involved the use of biodiversity data for the ‘right’ purpose, specifically nature protection and conservation.

3.4 Discussion: What drives biodiversity recorders?

3.4.1 Reflections on generalizability

Before discussing our findings, two issues regarding generalizability demand attention. Firstly, there are no definitive statistics on the number of volunteer biodiversity recorders in the Netherlands, and as such it is impossible to determine how our

sample size relates to population size. This community ranges from very active to occasional participants, with no self-evident cut-off point. Both Lawrence and Turnhout (2010, p. 355) and Mabelis and Maksymiuk (2009, p. 71) estimate the nationally-organised volunteer base to consist of around 15,000 recorders, which gives us some confidence in having reached a substantial sample, yet the lack of data on the total population does hamper our ability to generalise.

In addition, our desire for a large national sample of a dispersed group practically necessitated a non-representative sampling strategy. As such, there is a possibility for some sampling bias. Since we have no socio-demographic data on the entire population, we cannot check for representativeness using statistical tests. Overall, however, we feel our considerable sample size and cooperation with a diverse group of partners while sampling does allow us to generate insights on volunteer views and motivations that are relevant for engagement of volunteer biodiversity recorders in other settings.

3.4.2 Who participates in citizen science?

The socio-demographic profile of our respondents highlights two important points for reflection. Firstly, participant diversity merits closer inspection. Though issues of sampling bias need to be taken into account, like in other studies (see section 3.1.1) the Dutch biodiversity recorder appears to be biased towards older males with a high level of education. Considering the oft-discussed link between environmental citizen science and further conservation actions (e.g. Johnson et al., 2014), conservation biology has a clear stake in engaging a broader subset of the population. Hobbs and White (2012) note that financial and time restrictions may play a role in hampering participation of a more diverse group (see also Merenlender et al., 2016), but they also stress that communication plays an important role. Promotion of nature-based citizen science projects often takes place through websites of environmental groups and other nature-related media, and as such is less likely to reach those not already interested in nature conservation.

The second point of discussion is the distinction between citizens and scientists in citizen science. The literature tends to make a strong (implicit) distinction between ‘amateurs’ or ‘lay people’ on the one hand, and ‘experts’ or ‘professionals’ on the other. However, our empirical data support the claim by Ellis and Waterton (2004, p. 98) that this boundary is more blurred in practice than those terms imply. Almost 20% of our respondents are employed in the nature/environment sector, some of them likely with a background in biology or related disciplines, which is knowledge they also bring to their volunteer recording efforts. In addition, citizen

scientists bring along local knowledge of biodiversity in their surroundings, and the passion for learning among our respondents indicates that they aim to build up this knowledge base; Bell et al. (2008, p. 3446) note that ‘dedicated amateurs who pursue their knowledge acquisition and activities systematically ... can achieve higher standards of expertise than their professional counterparts’. This expertise is important to consider when balancing different dimensions of data quality (Lukyanenko et al., 2016).

3.4.3 What motivates the citizen scientist?

Our literature review highlighted several important motivations for participating in nature-related citizen science, including social bonding, learning about nature and science, personal achievement, helping the environment, and connecting with nature and place. Our motivation-ranking exercise showed that especially nature and learning were central motivations for our respondents, more so than social and achievement-related motivations. The lower significance given to cooperation with other people is likely tied to the solitary nature of biodiversity recording; while the idea of working with like-minded people is appreciated, biological recorders seem akin to a ‘community of individualists’ for whom social bonding is not a prime motivation.

The most important conclusion is that biodiversity recorders are driven by a combination of personal motivations (connecting with and learning about nature, being outdoors, pleasure) and the desire to do something for the world around them (contributing to nature conservation and science). At the personal level, learning stands out as both an important motivation for, as well as a significant result of, biodiversity recording (see also Johnson et al., 2014). This central role for learning, especially for younger and less experienced volunteers, reinforces the crucial importance of meeting this motivation. Significant attention to learning would potentially lead to a ‘virtuous cycle’ in which learning motivates further participation, in turn stimulating further learning and continued interest and engagement (Ryan et al., 2001, p. 637).

As for motivations based on ‘making a difference’, the results show that there is an interest among the volunteers for more information on nature policy and scientific research. In order to respect these citizen scientists as colleagues, it is important to respond to this interest by providing more information about scientific progress and nature conservation policy, and the role citizen science data plays in this. This helps maintain their motivation by acknowledging them as partners in the knowledge creation process (Cornwell & Campbell, 2012). At the same time, it helps to

prevent ‘crowding out’ of their intrinsic motivations (Rode et al., 2015) due to an overly instrumental approach as just data collectors.

3.4.4 How do citizen scientists feel about sharing data?

At first glance, our results on data sharing appear to present a paradox. On the one hand, almost half the respondents consider biodiversity data to be a public good, rather than property of a specific person or organisation. On the other hand, only a small minority (12.3%) supports completely unconditional use of this data, with a majority specifying rules around attribution and financial gain, and a majority of the volunteers also professed an interest in tracking the use of ‘their’ biodiversity data. How can these findings be explained? We argue that talking about *ownership* might not be the most productive way to think about the relationship between volunteer recorders and the data they collect. Biodiversity data are collected in a rich natural, local and personal context; in a way, these data are recorded nature experiences. This explains why the use of biodiversity data for the ‘right’ reasons (i.e. conservation and protection of nature) was so often emphasised in our open questions. Discussions on who has legal ownership of collected biodiversity data are far removed from the ‘lifeworld’ of biodiversity recorders; they are more productively conceptualised as *custodians* of their collected data rather than *owners*. Data might be considered public property by many volunteers, but if these recorded nature experiences are used for the ‘wrong’ reasons their custodians might ultimately decide to withhold them, to guard them against improper use. This argument bears similarities to that of Ellis and Waterton (2005) regarding the ‘imagined contract’ between volunteer naturalists and nature, based on respect and wonderment as well as an expectation that ‘data extracted from nature should properly be used towards its preservation’ (p. 685).

Our results suggest that violation of this expectation could have grave consequences for both volunteer motivation and their willingness to submit their collected biodiversity data; as noted by Martin et al. (2016a), trust is an important factor in citizen scientists’ decision to share data. This in turn implies a responsibility for project organisers to both conduct themselves in accordance with volunteers’ values and motivations regarding data sharing, and to keep them updated on the how and why of use of their data (Groom et al., 2017). This implies several practical challenges (e.g. how to communicate consideration about responsible use of data, how to track and monitor this responsible use, how to maintain volunteer privacy), yet our findings confirm that the goals for which data are used are important to citizen scientists. For project managers, this means that engaging biodiversity recorders in these deliberations is key to maintaining their trust and commitment.

3.5 Implications: Another way of thinking about citizen scientists

This paper empirically explored the Dutch volunteer biodiversity recorder: their profile and activities, their motivations for collecting and sharing biodiversity data, and their views on data sharing and ownership. We discuss some implications of our findings for project managers in biodiversity citizen science, partly based on two feedback sessions we organised with our project partners.

3.5.1 Volunteers and their motivations

One particular bias in the volunteer base, the relative lack of young biodiversity recorders, was identified as a prime concern, as it may signal a lack of attachment between young (potential) recorders and nature organisations. If this group is to be reached and enthused, which is vital for ensuring continuation of biodiversity recording, specific attention must be paid to two elements. Firstly, reaching this group could be facilitated by utilising educational institutions to engage them with nature at a young age. By including biodiversity recording in biology lessons in primary and secondary schools, and fieldwork in ecology-related curricula in higher education, the younger generation can be engaged in both biodiversity recording and nature in general. Secondly, to motivate them to continue this practice (even casually) outside of their education, taking consideration of their motivations is vital to pique and maintain their interest. Our results show that learning is a crucial motivation, and especially for young citizen scientists it is important to facilitate and guide their learning process in order to initiate the aforementioned virtuous cycle of participation and learning.

Our motivational data show that nature is a central motivation for biodiversity recording, which reaffirms the importance of acknowledging this connection to and love for nature in interacting with volunteers. In addition, we found that almost half the respondents would like more information on relevant policy and research; these topics ought to be given more attention on organisational websites and in their newsletters. Doing so helps volunteers see the impact of their work, which is an important motivation to continue their efforts.

3.5.2 Data sharing

This marked interest among volunteers about what is done with the data they collect brings us to the topic of sharing data. Organisations such as GBIF aim to make as much biodiversity data as possible publicly available, and the idea of data as a public good clearly resonated with our respondents. However, a significant finding

of this study is that support for open data does not mean that volunteers agree with completely unconditional use. We have argued that seeing volunteer recorders as *custodians* rather than as *owners* of their collected biodiversity data helps to understand this perspective. Volunteers record their personal nature experiences, and many feel that in return these ought to be used exclusively to protect nature. Several of the practitioners we discussed our findings with recognised this view, and noted the difficulties this poses for nature organisations, considering they face ethical and practical limitations in the degree to which they can track data use.

However, two important recommendations can be made. Firstly, it is important to have a clear and transparent data policy that respects volunteers' views about their data, but also makes clear how organisations decide on third-party use of these data. It must also be clear to volunteers what is and is not possible regarding the attributing individual recorders. This data policy is preferably actively communicated to volunteers when they first decide to share data, in an easily digestible form. One approach actively promoted by GBIF is the use of Creative Commons or Open Data Commons licences, which can be used to communicate data sharing conditions to volunteer recorders (Groom et al., 2017). However, while these licenses can provide clarity on how data are shared with third parties (e.g. the use of attribution), they provide volunteer recorders little insight into what the data are used for, only whether commercial use is permitted. As noted in section 3.4.4, discussing the goals of data use with the volunteers themselves is an important responsibility for project organizers regardless of whether standardized licenses are used, as volunteer recorders need to know that their data are used respectfully if they are to continue providing them.

Secondly, and especially in a country which, like the Netherlands, has many active organisations and platforms dealing with biodiversity data, it is important that their respective data policies do not conflict. This makes information sharing and cooperation between different nature organisations vital to spread good practices in data policy. Since their efforts are of crucial importance for nature protection and biodiversity conservation, it is essential that the concerns and motivations of volunteer biodiversity recorders are elicited and respected.

Acknowledgements

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and their invaluable help in spreading the survey. We also wish to thank two anonymous reviewers for their constructive feedback on an earlier version of this manuscript.

Appendix A

A total of 1954 respondents (89.1% of the total sample) agreed to provide the four numbers of their postcode, which was used to create this figure in ArcGIS. Dots indicate the relative number of respondents, several large cities are also indicated. Our thanks go to Stefan Vriend (Radboud University) for his assistance in making this figure.



Figure 3.3 | Residential location of respondents.

Adapted from Ganzevoort and van den Born (2016, p. 45). Source files: © Kadaster / Centraal Bureau voor de Statistiek, 2015.

4

The thrill of discovery

*Significant nature experiences among
biodiversity citizen scientists*

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Abstract

The important role of direct experience in nature has sparked an interest in studying people's significant experiences in nature, yet few studies have addressed the nature experiences of biodiversity citizen scientists. For organisations involved in organising biodiversity citizen science projects, or interested in improving recruitment and retention in existing projects, insight into which experiences in nature are especially memorable and impactful for participants can be used for effective communication or project design. To address this lacuna, this paper reports a thematic analysis of 1450 significant nature experiences reported by Dutch biodiversity citizen scientists.

Respondents narrate a wide variety of experiences, ranging from the general to the particular and from the extraordinary to the everyday appreciation of nature. Discovery, that is, encountering plants and animals the respondent has not seen before, appears to be a critical factor in shaping significant experiences of biodiversity citizen scientists. This thrill of discovery is experienced both in remote locations and close to home. This, along with the relative prominence of rare or unique species and a sense of surprise in reported experiences, indicates that many respondents are deeply impressed when nature managed to catch them off guard. In addition, we discuss the importance of learning both as a motivator for and result of nature engagement among biodiversity citizen scientists. Based on our findings, we formulate several points of attention for organisations aiming to recruit and retain committed citizen scientists for monitoring biodiversity, and discuss fruitful steps for further research.

4.1 Introduction

Direct experience in nature is considered vital for building an affinity toward and emotional connection with nature, which in turn are linked to pro-environmental attitudes and behaviour (Nisbet et al., 2009). However, this important role of direct experience in nature has sparked concern over an increasing deficit of such experiences (Louv, 2005; Miller, 2005). As this deficit worsens, nature organisations search for new ways to get people outside and engage them with nature.

Nature-based citizen science is increasingly identified as a promising way to invite people to (re-)engage with nature. The involvement of citizen scientists, volunteers from outside the walls of academia, in monitoring plants and animals is increasingly recognized as vital for biodiversity conservation (Cooper et al., 2007; Dickinson et al., 2010). However, citizen science is about more than data; biodiversity citizen scientists voluntarily engage with nature, and this engagement is meaningful and impactful for participants beyond their scientific contributions (Lawrence, 2006). Schuttler et al. (2018) argue that nature-based citizen science may be one way to offer the nature experiences needed for an increasingly urbanised populace to build a connection and commitment to nature.

Considering the value of biodiversity citizen science for research, conservation and nature engagement, it is important to gain more insight into biodiversity citizen scientists' nature experiences. Not only will this contribute to our understanding of these experiences, but it is also important information for project organisers. Insight into which experiences in nature are especially memorable and impactful for participants can be used for effective communication or facilitation of specific experiences, and to improve recruitment and retention in new or existing projects. This paper uses a large dataset ($N = 1450$) of significant nature experiences reported by Dutch biodiversity citizen scientists to thematically analyse the character of these experiences. We first discuss previous studies on the meanings tied to significant nature experiences, and the specific experiences of biodiversity citizen scientists.

4.1.1 Meanings of nature engagement

Exposure to and engagement with nature has been linked to increased connectedness to nature, learning, inspiration, and several physical and psychological dimensions of wellbeing (Capaldi et al., 2015; MacKerron & Mourato, 2013; Russell et al., 2013). Scholarly attention has thus turned to studying people's everyday (Bell et al., 2018; Skår, 2010) transformative (Chawla, 2009), transcendent (Fredrickson &

Anderson, 1999; Williams & Harvey, 2001) or peak (McDonald et al., 2009; Naor & Mayselless, 2017) nature experiences.

Richardson et al. (2015) specifically focussed on the significant experiences people have in everyday nature. When asked to report ‘three good things in nature’ every day for five consecutive days, their respondents noted many aspects of nearby mundane nature, including its sensations, growth and change, beauty, and active wildlife. Andrews (2018) found that her respondents reported a stronger sense of connectedness when directly present in nature, and that they used language related to particular plants, animals or natural phenomena when discussing a close relationship with nature. Several authors have focussed on attachment to specific places, and argued that direct presence and activities in, and experience with, a place contribute to a sense of attachment to it (Eisenhauer et al., 2000; Ryan, 2005; Schroeder, 2007). Specifically focussing on significant wildlife encounters, Bell et al. (2018) found that these are characterised by qualities such as their unexpected or (conversely) their cyclical nature, or by a feeling of immersion. Curtin (2009, 2010) pointed at similar characteristics in her ethnographic analyses of wildlife tourists’ nature experiences, although she also highlighted the significance of encountering new, rare or large numbers of species.

4.1.2 The perspective of biodiversity citizen scientists

Previous studies have addressed biodiversity citizen scientists’ key motivations, which may include protection of and connection with nature (Ganzevoort et al., 2017), learning about wildlife and nature (Domroese & Johnson, 2017), and sharing information and experiences with other people (Wright et al., 2015). However, while studying motivations for taking part in citizen science can aid in understanding which experiences are significant for participants, it is important for volunteer enthusiasm and retention that motivations are matched by actual experiences (Clary & Snyder, 1999; Wright et al., 2015).

A few studies have thus inquired into biodiversity citizen scientists’ significant experiences. Bell et al. (2008), for instance, found that their respondents cherished the opportunity to learn about and be alone in nature, but also the opportunity to share their experiences with others. Cosquer et al. (2012) concluded from their study of garden butterfly recorders that participation became the starting point of an enduring habit of observing nature, in turn inspiring learning and reflection. Using an in-depth study of corncrake monitoring in Scotland, Lorimer (2008) highlighted several key experiences of participating field scientists (including volunteers), such as emotional highs and lows and honing the senses (p. 391).

4.2 Methodology

4.2.1 Participants

The data presented in this paper were collected as part of a larger online survey study ($N = 2193$) into Dutch volunteer biodiversity recorders (Ganzevoort et al., 2017). The goals of this study were to understand who is currently involved in biodiversity recording in the Netherlands (in terms of socio-demographics), the types of activities they undertake (including where, with whom, and taxonomic groups of interest), their motivations for monitoring, and their views on open data and data sharing. Data collection took place from September to October 2015. Biodiversity citizen scientists from across the Netherlands were recruited using online newsletters, email lists and social media of various Dutch nature and biodiversity organisations.³⁵ Respondents all submitted biodiversity data into online repositories, yet were otherwise highly diverse in terms of frequency of data submission, preferred taxa, and whether they acted independently or in consultation with a biodiversity organisation.

The question on significant nature experiences was optional, and we received 1450 valid responses (66.1%). Mean respondent age of this group was 54.8 years ($n = 1438$), men outnumbered women (71.9% to 28.1%), and respondents had been active as volunteer recorders for an average of 10.2 years. Respondents were highly educated, with 59.2% having completed higher education compared to 29.4% of the general population (Statistics Netherlands, 2018). These demographic characteristics were very similar to those of the larger survey sample³⁶, indicating that the decision to report a significant nature experience was not linked to these demographic characteristics.

4.2.2 Materials and analysis

After answering several questions about their monitoring activities, respondents were asked a few questions about their motivations and visions of nature. The first of these was an optional open question, asking respondents ‘What has been your most wonderful experience while monitoring?’ We chose not to provide examples or suggested answer formats to our respondents (cf. Richardson et al., 2015) so as

³⁵ These organizations included Sovon Dutch Centre for Field Ornithology; Reptile, Amphibian & Fish Conservation Netherlands (RAVON); Dutch Foundation for Botanical Research (FLORON); European Invertebrate Survey (EIS); Dutch Butterfly Conservation; The Dutch Mammal Society; Naturalis Biodiversity Center; and Waarneming.nl.

³⁶ Demographics of the full survey sample: mean age 53.7 years, 75.4% male, active for 10.4 years, 61.7% completed higher education.

not to steer them towards specific types of experiences. Other questions on visions of nature and motivations came after this open question, also to prevent those answer categories from influencing the open responses.

The 1450 reported experiences were bundled and uploaded into the Atlas.ti software package for coding and analysis. While the literature reviewed in this papers suggest a broad array of significant experiences in nature, we did not develop a typology based on this literature for deductively coding the dataset. Instead, the dataset was coded inductively based on the experiences described, and the words used, by the respondents. Since categorising each reported experience into only one category would not do justice to the richness of the data, we chose to allow multiple codes to each response when needed, although identical codes were not repeated within one response. As such, the total number of codes applied is greater than 1450 (see Figure 4.1).

To mitigate the issue of subjectivity, development of the code list and coding of the dataset was carried out through constant collaboration in a team of three researchers. The second author started the coding process and developed an initial living document of codes developed bottom-up from the data. At several points during this process all three researchers met to discuss these initial codes, their content (what did and did not fall under that code) and whether certain codes might be sub-codes that could be subsumed under a larger concept. After several of such group discussions and refinements to the document, at which point the first half of the dataset had been coded, the third team member took over the coding process to further ensure that code identification and application were not strongly influenced by the perspective of one researcher. Like in the initial stages, during this second stage of the coding process the three-person team met up regularly to discuss any newly emergent codes and fine-tune the way codes had been applied in the first stage in light of new information.

When the entire dataset had been coded, the first author and the third team member independently coded a random set of 50 responses, followed by all three researchers coding another random set of 50 responses to see where remaining disagreements or differences in interpretation occurred. These occurrences were discussed and resolved, and used to complete the final code list of 35 codes. Finally, at the end of this process it was decided to not repeat identical codes within one response, as noted above; the first author thus finalised the coding process by removing duplicate codes from the same response.

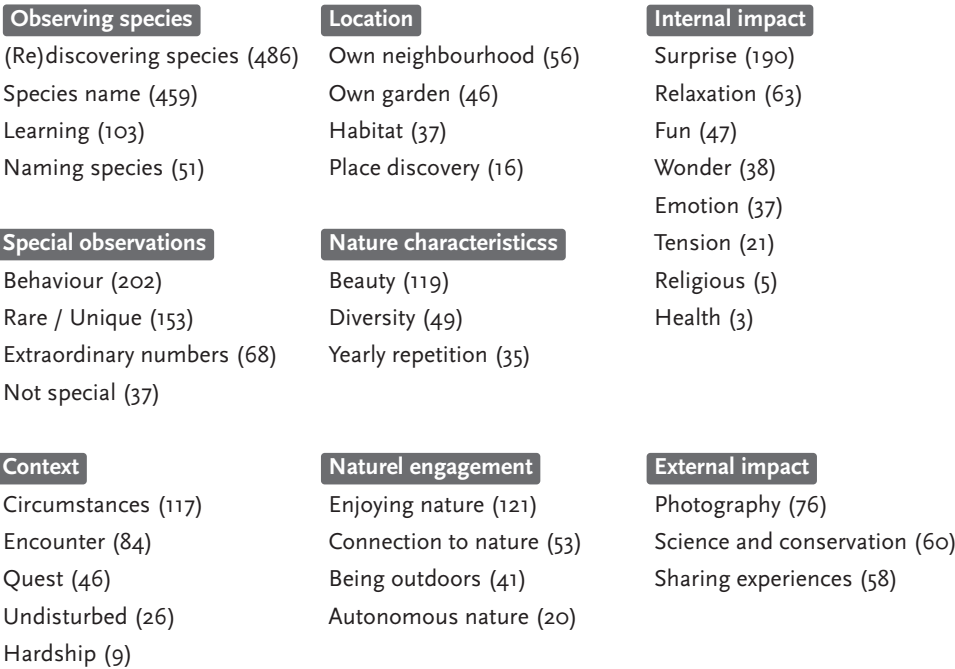


Figure 4.1 | Eight thematic categories of wonderful experiences while monitoring biodiversity.
Numbers between brackets refer to the number of responses coded with that code.

4.3 Results

Because respondents were free to determine for themselves what constitutes a significant experience, reported experiences ran the gamut between a single specific moment and a type of experience, species or environment. In addition, 59 respondents (4.1%) reported more than one significant experience (these counted as one response), and 37 responses (2.6%) could not be assigned any code. After coding was concluded, the 35 codes were grouped into eight thematic categories as shown in Figure 1. These thematic categories are briefly discussed below; for an overview of each code’s definition and example quotes, see Table 4.1. In the text below, the percentages in brackets indicate how often each code was applied.

	Count	%	Description	Example quotes
Observing species				
(Re)discovering species	486	33.5%	The observation is special because the respondent discovers a species, or has never seen it before. This concerns a personal sense of discovery. Instances of rediscovery (not yearly repetition) are also included	<i>'It's exciting to find a species that's new to me'</i>
Species name	459	31.7%	The respondent names a specific species. This has to be more specific than classes (e.g. 'bird')	<i>'Seeing a beautiful kingfisher, or an osprey'</i>
Learning	103	7.1%	The respondent makes clear he/she learns things, e.g. species names, behaviour, ecology, etc.	<i>'Nature is about learning how to observe'</i>
Naming species	51	3.5%	The respondent notes that he/she can now recognise and/or name a specific species	<i>'Naming species makes it even more fun, because then you understand better what exactly you're looking at'</i>
Special observations				
Behaviour	202	13.9%	The respondent notes or describes animal behaviour; this behaviour does not have to be explicitly referred to as extraordinary or special	<i>'A fox walking through a flock of geese, and the geese barely responding, as in 'we can see you!''</i>
Rare / Unique	153	10.6%	The observation was special because it concerned a rare or unique species	<i>'Discovering an extremely rare vagrant emperor'</i>
Extraordinary numbers	68	4.7%	The observation was special due to the number of individual animals or plants witnessed at once. What counts as extraordinary depends on the circumstances and the respondent	<i>'Discovering several hundred marsh valerians just at the edge of a ditch'</i>
Not special	37	2.6%	The respondent explicitly notes that an observation or species does not have to be 'special' to leave an impressions, or that everything that lives is 'special'	<i>'Simple sightings' of everyday species give me a rich feeling as well'</i>
Context				
Circumstances	117	8.1%	The respondent makes clear that the circumstances (weather, time, temperature, etc.) contributed to making the observation special	<i>'Singing nightingales on a beautiful summer evening at dusk on an otherwise empty heath'</i>
Encounter	84	5.8%	The respondent experienced an encounter with an animal, either through proximity or the experience of an interaction	<i>'Standing face to face with a roe deer, 5 meters between us'</i>
Quest	46	3.2%	The respondent was expecting to find the plant or animal they observed, or was explicitly looking for it	<i>'When you find what you've been searching for (for so long)'</i>
Undisturbed	26	1.8%	During the observation nature was not disturbed by the respondent's presence	<i>'That I'm secluded so well that birds just go about their business without noticing that I'm there'</i>
Hardship	9	0.6%	The respondent describes some form of hardship (cold, discomfort) they endured while in the field	<i>'All my most wonderful experiences are under extreme circumstances, like long hikes in the pouring rain or extreme cold of -15°C'</i>
Location				
Own neighbourhood	56	3.9%	The respondent made an observation either close to home or at their regular monitoring location	<i>'The unexpected discovery of a neighbourhood chock-full of common swifts, a short distance from my home'</i>
Own garden	46	3.2%	The observation was made in the respondent's own garden or at their own home	<i>'The immense variety in your own garden continues to fascinate and amaze me'</i>
Habitat	37	2.6%	The observation was made in the natural habitat of the plant or animal	<i>'Realising you found a good indicator species, so you know the biotope is of a good quality'</i>
Place discovery	16	1.1%	The respondent discovered/explored a new area while monitoring	<i>'Entering a nature area at the crack of dawn, one where other people are not allowed to come'</i>

Nature characteristics				
Beauty	119	8.2%	Species, habitats, landscapes or settings are described as beautiful (or with related terms)	<i>'The beauty of the early hours of the morning'</i>
Diversity	49	3.4%	The respondent refers to diversity in species, behaviour, colours or natural features	<i>'The immense diversity of plants and animals, even in the city centre'</i>
Yearly repetition	35	2.4%	The respondent notes yearly repetition or cycles in nature, such as the passing of the seasons	<i>'The peacock butterfly who's waiting for me at the start of each monitoring season'</i>
Nature engagement				
Enjoying nature	121	8.3%	The respondent refers to being in nature, or enjoying nature or the landscape	<i>'Enjoying all the little things in nature'</i>
Connection to nature	53	3.7%	The respondent describes a deeper sense of connecting with nature, e.g. a sense of awe or oneness with nature	<i>'Being completely immersed in nature time and time again'</i>
Being outdoors	41	2.8%	The respondents refers to (the joy of) being outside, without explicitly linking this to nature	<i>'Enjoying being outdoors during the different seasons'</i>
Autonomous nature	20	1.4%	Nature is described in terms of being free, pristine or autonomous	<i>'Experiencing nature's parallel reality, which is not concerned with issues of the day'</i>
Internal impact				
Surprise	190	13.1%	The observation, species or situation came as a surprise, or was unexpected	<i>'It's the unexpected observations I enjoy most'</i>
Relaxation	63	4.3%	The respondent experienced a sense of rest or relaxation while monitoring	<i>'Being alone in nature, silence and peace'</i>
Fun	47	3.2%	The observation, or the process leading to it, is described as fun or entertaining	<i>'It's just fun to do'</i>
Wonder	38	2.6%	The respondent reports a sense of wonder regarding species, behaviour, nature, etc.	<i>'Sometimes I'm amazed at what you come across'</i>
Emotion	37	2.6%	The respondent explicitly describes an emotional state, such as happiness, sadness, feeling strongly moved or excited, or a sense of freedom	<i>'The feeling of happiness when you see something special'</i>
Tension	21	1.4%	An observation, situation or experience was memorable because of a sense of tension involved	<i>'It's often exciting, what you could run into'</i>
Religious	5	0.3%	Experiences in nature are linked to a sense of religious or spiritual wonder, e.g. God or creation	<i>'A sense of wonder about creation'</i>
Health	3	0.2%	The respondent notes the health benefits of their monitoring activities	<i>'Peace of mind combined with physical activity'</i>
External impact				
Photography	76	5.2%	The respondent explicitly describes being able to take pictures of an observation or situation	<i>'Taking a picture of a species that only briefly shows itself and moves quickly'</i>
Science and conservation	60	4.1%	The respondent discusses contributing to science or nature conservation by submitting records	<i>'These are protected animals who need help'</i>
Sharing experiences	58	4.0%	Either the respondent was in the field with others, or they later shared their experience with others. This social aspect goes beyond sharing data	<i>'Our daughter enthusiastically telling other people about the beautiful things one can see'</i>

Table 4.1 | Code titles, number and percentage of responses the code was applied to, code descriptions, and example quotes for all 35 codes.

4.3.1 Observing species

Since our respondents are all active as biodiversity recorders, and our question referred to experiences while monitoring, it is not surprising that the two most common codes by far concern aspects of species observation. Specifically, the most common type of significant experience reported (by 33.5% of respondents) is the discovery of a plant or animal new to the observer, or rediscovering one not seen for a long time. Discovery could refer to both rare and everyday species; it was the sense of personal discovery that makes the experience memorable. In addition, almost as many respondents (31.7%) refer to specific species in their reported experiences; these could be anything from kingfishers to leeches. Another significant dimension of species observation appears to be learning about biodiversity: respondents mention learning about ecology and animal behaviour amongst others (7.1%), as well as recognising and correctly naming species (3.5%).

4.3.2 Special observations

We identified several recurring elements that make observations special. The most common of these is a description of specific behaviour of the animal in question (13.9%); the behaviour itself did not have to be special or rare, but it is the behaviour that makes the observation significant to the respondent (e.g. witnessing a bird chase its prey). Unsurprisingly, rare or unique observations are frequently identified as memorable experiences (10.6%). Another dimension of wonderful experiences while monitoring concerns extraordinary numbers of a species at one point in time (4.7%). Finally, quite a few respondents (2.6%) specifically note that they consider all living beings wonderful and special, or that their significant experiences do not concern 'special' species or circumstances.

4.3.3 Context

The next theme centres on the context of the observation; how the observation could be characterised. Most frequently, respondents refer to circumstances that made the moment special, such as the time of day or the weather (8.1%). A few respondents (0.6%) also link this specifically to a sense of hardship that had to be endured to make the observation. Wonderful experiences while monitoring also include moments where observers experienced a direct encounter with wildlife, inspired by proximity or some form of interaction (5.8%). While interactions are considered special, so are moments where animals did not notice the observer, and continued their behaviour undisturbed (1.8%). Finally, some respondents liken their most significant experience to a quest (3.2%): the observation is special because the observer was specially looking for, or expecting, a certain plant or animal.

4.3.4 Location

For some respondents the location of an observation, or their monitoring in general, is just as significant (or even more so) than the plants or animals encountered. Observations in respondents' own gardens (3.2%) and in their own neighbourhood or usual monitoring location (3.9%) stand out for some respondents. Another group of memorable observations, however, are those made when species were witnessed in their own habitat (2.6%). Finally, while a sense of discovery was most commonly linked to specific plants or animals, a few respondents (1.1%) also discuss the discovery of a new place: monitoring wildlife sometimes brought a respondent to areas either new to them or with restricted access.

4.3.5 Nature characteristics

Several characteristics of nature, both of specific species and/or natural landscapes in general, appear to make nature experiences significant. Over a hundred respondents (8.2%) refer to beauty, specifically to the beauty of plants or animals, the natural environment, or the circumstances (e.g. sunlight). In addition, diversity in nature appears to be highly valued; our respondents describe diversity in colours, species, behaviour or in nature more generally (3.4%). Another quality that several respondents (2.4%) point out is a sense of yearly repetition in nature, such as the passing of the seasons or how spring signals the return of many species.

4.3.6 Nature engagement

Biodiversity monitoring is one form of nature engagement, and in describing their significant experiences our respondents refer to different ways of appreciating and engaging with nature. Some simply mention the joy of being outside, without specifically referring to nature (2.8%), while others (8.3%) mention being in nature, or enjoyment of the landscape or the natural surroundings. Several respondents explicitly mention experiencing a deeper feeling of connectedness to nature through a sense of awe or immersion (3.7%). Finally, a few respondents (1.4%) express an appreciation of nature being free or autonomous, not subject to human interference.

4.3.7 Internal impact

The seventh theme brings together ways in which monitoring biodiversity shapes respondents' emotional, spiritual, psychological or physiological well-being. These include a sense of rest and relaxation while monitoring (4.3%), a sense of wonder regarding species, behaviour or natural phenomena (2.6%), or being caught in a moment of tension (1.4%). A few respondents also touch upon nature stimulating a sense of religious or spiritual awe (0.3%) or the contribution of monitoring biodiversity to their physical health (0.2%). While specific experiences are sometimes

wonderful simply because of the sense of fun or joy involved (3.2%), respondents also narrate a wide diversity of emotional responses, including happiness and excitement but also sadness or feeling moved (2.6%). By far the most common of these, however, is a sense of surprise (13.1%): when species or phenomena caught the observer off-guard, the resultant sense of surprise appears an important factor in making the experience significant.

4.3.8 External impact

The final three codes concern sharing the results of biodiversity monitoring. Nature photography is one way of doing so, and 76 respondents (5.2%) specifically mention taking pictures during their most significant experience. Secondly, several respondents (4.1%) refer to submitting their observational data and in doing so contributing to biodiversity research and/or nature conservation. Finally, beyond sharing data, some (4.0%) narrate how their most wonderful moments involved sharing their monitoring experiences with other people. This social component could involve biodiversity monitoring with other people, but also sharing experiences through conversations or social media.

4.4 Methodological reflection

While our results provide important insights into the significant nature experiences of biodiversity citizen scientists, some methodological notes are in order. For instance, while our coding process of constant collaboration between three researchers may lessen the issue of subjectivity compared to coding by one researcher, numerical data on consistency were not calculated. Despite the many steps taken to strengthen consistency, it is thus important to keep this issue in mind. Care must also be taken when making generalisations. Our large dataset, embedded in a national study among biodiversity citizen scientists with diverse engagement patterns, may provide more opportunities for identifying broader trends than a study at a much smaller scale. However, with no population statistics to compare our sample with, we must be cautious with generalising our findings to the larger volunteer base of the Netherlands or other countries.

In addition, Curtin (2009) cautions that ‘words can fall very short when talking about wildlife experiences’ (p. 458), especially regarding spiritually significant experiences in nature (p. 468). This raises the methodological question of whether significant nature experiences can even be elicited using written or verbal methods. Since Curtin (2009) noted this difficulty in ethnographic interviews, it is likely that

an open survey question present further difficulties for respondents. As such, our results may underrepresent deeply moving experiences in favour of experiences that are easier to put into words, such as discovery and fun. However, one significant advantage of our approach is the opportunity to study experiences of a much wider group of respondents than would be possible using more ethnographic approaches.

4.5 Conclusions

Our study aimed to elicit significant nature experiences of biodiversity citizen scientists. Respondents narrated a wide variety of experiences, ranging from the general to the particular and from the extraordinary to the everyday appreciation of nature. These include witnessing rare species or undisturbed animals, or large numbers of plants or animals; noticing animal behaviour; enjoying beauty and diversity in nature; feelings of fun, surprise or relaxation; and feeling a sense of wonderment in, or deep connection to, nature. This paper addresses a lacuna in the literature, as few studies have specifically addressed the nature experiences of biodiversity citizen scientists.

While some authors have noted the significance of first-time sightings for wildlife enthusiasts (Curtin, 2010; Folmer et al., 2013b), the dominance of discovery in our respondents’ most wonderful experiences was notable. The ability to discover new plants and animals, whether in remote locations or close to home, appears to be a critical factor in shaping significant experiences of biodiversity citizen scientists. This, along with the relative prominence of rare or unique species and a sense of surprise, indicates that many respondents are deeply impressed when nature managed to catch them off guard.

However, while the thrill of discovery and surprise clearly resonate strongly, the importance of everyday nature and ‘unremarkable’ sightings must also be emphasised (Richardson et al., 2015). Our respondents mentioned not only rare species but also common plants and animals, and several respondents cited familiar areas such as their own gardens or regular monitoring trajectories. Even the most common garden bird or flower can be an exciting discovery, and terms like ‘mundane’ and ‘unique’ will be interpreted differently from person to person.

Another dimension that seems to be of specific importance to biodiversity citizen scientists is learning. Learning is frequently noted to be an important motivation

for citizen science participation, including biodiversity monitoring (Bell et al., 2008; Domroese & Johnson, 2017; Ganzevoort et al., 2017) and was found to play an important role in motivating people to act for nature (Van den Born et al., 2018). Quite a few of our respondents specifically discussed their learning process, both regarding species names as well as behaviour, biodiversity and ecosystems. Cosquer et al. (2012, p. 4) argue that a positive feedback loop exists between knowledge about and attentiveness to nature: paying attention to nature increases knowledge, increased knowledge inspires more attentiveness, and so on. Learning thus appears to be both a key motivator for, and an important experience in, biodiversity monitoring.

In addition, quite a few respondents specifically referred to their contribution to science and conservation through submitting collected records. While the significant nature experiences of biodiversity citizen scientists might to some degree be comparable to those of other groups of nature enthusiasts (such as wildlife tourists), contributing to science and conservation may be one of the dimensions more unique to citizen science. The act of recording wildlife and submitting these records can be highly meaningful beyond the wildlife encounters themselves.

4.5.1 Implications and future research

While our results illustrate the diversity of what makes nature experiences wonderful, our analysis has identified some overarching patterns and points of attention for organisations aiming to recruit and retain committed biodiversity citizen scientists. Most striking is the experience of discovery, which was reported by a third of all respondents. As such, nature organisations that work with volunteer recorders could facilitate discovery by providing information about species occurrence in different regions, as well as different methods of how to discover their presence. Notably, this should not be limited only to rare or flagship species, or special locations; everyday biodiversity close to people's homes may be just as significant in many cases, as long as a sense of discovery and surprise is nurtured.

This ties into the importance of learning as both a motivation for and benefit of participation in biodiversity citizen science. Learning was often mentioned as contributing to significant experiences, which indicates that stimulating volunteers' learning trajectories (e.g. through educational materials or fieldwork courses) may contribute to motivation fulfilment (Wright et al., 2015) by heightening the sense of significance in citizen scientists' nature experiences.

This interplay between experiences and motivations is not just of interest for practitioners, but is also of scholarly interest. It should be noted, however, that we did not ask respondents whether their most wonderful experience was something they had specifically hoped for. Because the significance of an experience could be influenced by one's initial motivations or goals, incorporating this question would be an interesting next step.

Indeed, while the aim of this study was to elicit citizen scientists' experiences rather than motivations, previous studies on motivations of green volunteers provide some insights into how our experiential themes could be linked to different interests or behaviours (West & Pateman, 2016). For instance, among environmental volunteers both Ryan et al. (2001) and Asah and Blahna (2013) found that social and community-related motivations were important to ensure commitment. Biodiversity citizen scientists who emphasised social experiences in this study may be more committed to opportunities to connect with like-minded others (in person or online). These volunteers may consider other nature-based activities if it would offer social opportunities. This could contrast with those citizen scientists emphasising diverse or specific species (Cole & Scott, 1999), undetected observation or contributing to science and policy with their collected data.

As discussed above, we may also expect volunteers oriented towards a specific type of experience to value different modes of biodiversity citizen science (Measham & Barnett, 2008), such as invasive species programmes for those interested in discovering new species or fulfilling a quest, or phenomenological projects for those valuing yearly repetitions in nature. Finally, one's most cherished experiences may influence how one deals with unpleasant circumstances (such as bad weather or harsh terrain). Those who simply want to be outside (Bruyere & Rappe, 2007, p. 513), relax, stay active (O'Brien et al., 2010), have fun, or cherish everyday plants and animals may be more likely to avoid such challenging circumstances, whereas those whose key experiences are characterised by hardship, awe or a deep connection to nature may enjoy the extra challenge (Lorimer, 2008). It should be restated, however, that using treasured experiences to predict behaviour was not the aim of this study, and as such these potential implications should be considered invitations for future research.

Finally, we emphasise how the language used to communicate to volunteers should align with how they experience nature. Our findings match the observation by Buijs and Elands (2013) that lay representations of nature are oriented more towards individual animals or plants, rather than more abstract concepts such as 'habitat'

or 'ecosystem'. Especially with the current dominance of more instrumental and economic approaches to nature, e.g. the discourse on ecosystem services, it is important not to lose sight of how people actually reflect on their engagement with nature (Chan et al., 2016). Project organisers or involved scientists ought to be careful with more abstract and detached terminology and favour more emotional and evocative descriptions of nature, as these may invite stronger connectedness and relationships with nature (Andrews, 2018).

Our findings, while an important first step, also serve as an invitation for further research on this topic. Future studies could extend a similar methodological approach to citizen scientists in different parts of the world, or to green volunteers more generally (e.g. nature restoration or educational activities in nature). Interviews or focus groups with biodiversity citizen scientists could also complement our results, and would provide an opportunity to study some of the dimensions we identified in greater depth. Our work hopefully inspires further research into the significant nature experiences of biodiversity citizen scientists, and the deeper meanings they attribute to their engagement with nature.

Acknowledgements

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5

Counting bees

*Learning outcomes from participation
in the Dutch National Bee Survey*

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Abstract

Citizen science approaches to data collection are growing in popularity, in part because of their potential for achieving both scientific and educational objectives. Evaluating the impacts of participation on citizen scientists is important, yet such evaluations are still relatively rare. In addition, recent literature reviews indicate several lacuna's, including a focus on content learning, a limited use of existing scales, and a lack of reported null results.

This paper reports an evaluation of the demographic profile, motivations and learning outcomes of participants in the Dutch National Bee Survey, a national-scale citizen science project involving citizens in collecting observational data of wild bees. We conducted a repeated measures survey study into participants' background, motivations and experiences, and we assessed the impact of participation on respondents' attitudes and behavioural intentions regarding bees, and their attitudes towards nature, citizenship and citizen science.

Analysis of the data from our baseline ($N = 373$) and follow-up ($N = 208$) surveys indicates that our respondents are of a relative high age and education level, have a pre-existing affinity with nature, and are strongly motivated by conservation concerns and learning about bees. Assessment of learning outcomes indicated a significant difference between two types of self-report questions: respondents reported significant gains in knowledge and appreciation of wild bees, yet attitudinal scales indicated no significant shifts in attitudes towards bees, nature, citizen science or citizenship. In our discussion, we suggest several explanations for this finding, and advance suggestions for future research into citizen science learning outcomes.

5.1 Introduction

As we take steps around the world to combat biodiversity loss and species extinction, the importance of protecting our planet's insect population is increasingly recognised. Recent studies paint a worrying picture, with a German study using data spanning 63 German nature areas over 27 years indicating a 76%-82% decline in flying insect biomass (Hallmann et al., 2017). Considering the crucial role insects play in processes such as pollination and food webs, the need to take action is abundantly clear. Bees in particular play an important role in pollination (Potts et al., 2010), and halting their decline thus receives increasing attention.

Data on the distribution of different types of bees, and understanding the factors that affect their decline or recovery, are crucial for formulating effective strategies for action. Citizen science approaches to monitoring bees hold great potential for improving our understanding of bee populations, while also engaging society in supporting this crucial species. In fact, the aforementioned study by Hallmann et al. (2017) drew on a dataset collected over 27 years by dedicated citizen scientists of the Entomological Society Krefeld. Other authors also assessed pollinator data collected by citizen scientists or through crowdsourcing (e.g. Kremen et al., 2011; Mason & Arathi, 2019; Stafford et al., 2010; Van der Wal et al., 2015).

5.1.1 The Netherlands Buzzes

It is within this context of increasing attention to pollinators and citizen science that the Dutch National Bee Survey (DNBS), our case study, was initiated. The DNBS is organised within the context of The Netherlands Buzzes (tNB), a multifaceted national project launched in 2018 by four partners: Naturalis Biodiversity Center, Natuur & Milieu, IVN Nature Education and LandschappenNL. The goal of tNB is to improve nesting opportunities and access to food for wild bees across the country (Nederland Zoemt, 2020). These goals align well with those of the Dutch National Bee Strategy, signed in January 2018 by 43 partners to contribute to nesting areas and food ('bed and breakfast') for pollinators, especially wild bees (Ministry of Agriculture, Nature and Food Quality, 2018). To realise these aims, tNB encompasses a wide variety of projects, including education programmes for both professionals and schools, a national 'bee working day', museum exhibitions, and an opportunity for municipalities to become recognised as a 'bee-friendly municipality'.

One of the projects organised within tNB is the DNBS, aimed at involving the public in counting wild bees. During a single weekend in April, Dutch citizens are asked to spend half an hour in their garden to count and classify wild bees. Participants

receive a checklist to help identify and count the bees, and submit their collected data using the project website. The DNBS celebrated its first edition on the 21st and 22nd of April 2018, and has become a yearly event. During its first edition, more than 4000 participants submitted over 40,000 bee observations (IVN, 2018).

The main aim of the DNBS is to support wild bee populations in the Netherlands, e.g. by contributing to large-scale data collection on their occurrence. However, it also specifically opts for a citizen science approach with the aim to improve knowledge about bees, stimulate positive attitudes and adoption of bee-friendly behaviours, and increase participants' broader scientific literacy and concerns about biodiversity (Knoben et al., 2017, pp. 3-4). As such, the DNBS aims for both scientific and educational outcomes.

The authors of this manuscript were tasked with evaluating the first edition of the DNBS. We designed a repeated measures survey study to gain insight into the profile, motivations and experiences of the DNBS participants. In addition, based on the project aims we assessed to what degree we could identify an impact of participation on respondents' attitudes and behavioural intentions. In the next section, we place our study in the context of previous work on citizen science learning outcomes and evaluation.

5.1.2 Evaluation of citizen science learning outcomes

For the DNBS, as for many similar projects, the choice to involve citizen scientists revolves around the potential to achieve both scientific outcomes and learning outcomes for participants; in other words, a win-win scenario. However, such dual-aim programmes may also face significant barriers in achieving both objectives, and in some cases they may be conflicting or in competition for limited resources (Lakeman-Fraser et al., 2016). In a recent report, Edelson et al. (2018) emphasise that achieving both outcomes is possible, but does require careful design and planning to anticipate and handle tensions. The authors also describe several design strategies that may aid in achieving both outcomes, such as clear data collection protocols and opportunities for social interaction between participants and scientific staff. However, in order to assess to what degree these outcomes are achieved, evaluation is crucial. Evaluation of project outcomes is important for a project itself (Jordan et al., 2012), but for the emergent field of citizen science such evaluations can also be highly instructive in terms of sharing experiences and lessons learned for future projects.

Before being able to evaluate learning outcomes, it is important to be clear about the kinds of learning in which a project is interested. While the word 'learning' might evoke the memorization of information (e.g. recognising types of bees), this is only one type of learning outcome that may be of interest. For instance, Phillips et al. (2014, p. 10) distinguish between six different categories of individual learning outcomes of citizen science: interest, self-efficacy, motivation, behaviour and stewardship, skills of science inquiry, and knowledge of the nature of science. Edelson et al. (2018) group these under the larger categories of cognitive, affective and behavioural learning outcomes.

Many potential citizen science learning outcomes are claimed or hypothesised (for an overview see Haywood, 2014, p. 67), and evaluations of different outcomes can be found in the literature. For instance, in terms of content knowledge Masters et al. (2016) demonstrate how participation in online projects may contribute to better performance in a project-specific science quiz. Dem et al. (2018) identified improved awareness of the importance of butterflies and dragonflies among Filipino citizen science participants. In addition, Everett and Geoghegan (2016) show how natural history can boost participants' confidence through contributing to scientific data collection.

However, it may be just as (if not more) important to consider more transformative forms of learning, which Bela et al. (2016, p. 992) define as 'a deep, structural shift in awareness that alters one's way of being in the world and how one views interconnectedness among the universe, the natural environment, one's personal world, and the human community'. In other words, these learning outcomes include perspective shifts and changing relationships between participants and their social or natural environments, and may include deeper reflection and behaviour change (Bela et al., 2016; Chao, 2017; Groulx et al., 2017; for a similar distinction between 'narrow' and 'broad' learning outcomes see Edwards et al., 2018). Cosquer et al. (2012) studied the impacts of a French butterfly project on participants, and argued that beyond knowledge gains, citizen science participation inspired some participants to exchange their knowledge with others and could lead to strengthened feelings of community (see also Johnson et al., 2014). In terms of promoting behaviour change, Toomey and Domroese (2013) found that participants in two projects on bees and coyotes reported more positive attitudes towards these species, as well as increased interest in conservation actions, while Lewandowski and Oberhauser (2017) found that 95% of surveyed butterfly citizen scientists reported increased engagement in one of several conservation actions. Other authors have emphasised the potential of citizen science participation to encourage scientific

modes of thinking, improve an understanding of the scientific process, or alter perceptions of science or scientists (Price & Lee, 2013; Wynn, 2017, p. 169).

Some evaluations indicate gains in one type of learning, but few to none in others. For instance, Jordan et al. (2011) identified gains in content knowledge and some behavioural intentions related to invasive plants, but not in understanding of the nature of science. Similarly, participants in the study of Brossard et al. (2005) demonstrated a significant increase in content knowledge regarding bird biology, but no significant shifts in broader environmental attitudes, understanding of the nature of science, or attitudes towards science. An assessment by Forrester et al. (2017) also found increased content knowledge regarding mammals, and increased intention to discuss local mammals with other people, but no improved attitudes towards conservation. In a study of pollinators, Druschke and Seltzer (2012) found reduced fear of bees after participation, but few other shifts in knowledge of bees, attitudes towards bees, or attitudes towards citizen science.

Rather than providing a comprehensive overview of previous studies evaluating citizen science learning outcomes, here we instead build on insights from several recent reviews of the current state of the evaluation literature (Bonney et al., 2016; Peter et al., 2019; Phillips et al., 2018; Stepenuck & Green, 2015). Important insights drawn from these reviews include the following:

- Being a relatively nascent field, citizen science evaluation would gain much from increased clarity regarding the types of learning outcomes projects may aim for (Phillips et al., 2018, p. 1), informed by the literature. Phillips et al. (2018) note that one important current limitation may be a lack of insight into relevant dimensions of learning or appropriate measurement instruments (see also Bonney et al., 2016, p. 5), as well as a lack of resources (staff, time, money) for conducting social science evaluations.
- Linked to this issue, the nascent nature of the published evaluation literature has also raised the concern that existing scales are rarely re-used (Phillips et al., 2018, p. 12). Drawing on items used in previous studies would provide more opportunities for synthesis and cross-project comparability of findings.
- Current evaluations often emphasise measuring content knowledge gains, despite other learning outcomes (e.g. skill development or behavioural change) being of more interest for the stated goals of the project (Phillips et al., 2018; Stepenuck & Green, 2015). Peter et al. (2019, p. 13) note that this could be explained by several factors, amongst which might be funders emphasising content learning, or a higher familiarity among project leaders with assessing content learning compared to other learning outcomes.

- In terms of question formats Phillips et al. (2018, p. 13) note that there should not be a complete reliance on self-report questions. Peter et al. (2019, p. 13) suggest the enrichment of evaluation studies with other assessment approaches, which might include those that measure actual rather than perceived impacts.
- Few evaluation studies publish null or negative results regarding project outcomes for participants (Peter et al., 2019). Stepenuck and Green (2015) argue that this may be caused both by biases against such results in the scientific publication process, as well as potential risks of losing project support if project aims are not achieved. However, such results can be highly instructive to scholars and staff of other projects (Robinson et al., 2018, p. 39).

Our aim with this evaluation study was to incorporate several of these recommendations into our research design. As noted in the previous section, the DNBS team had formulated diverse project goals, which informed our selection of learning outcomes to include in our study. When available and possible, we made use of existing scales from previous studies. If scales that fit our design were not available, we made sure to include items based on previous studies, or we developed items ourselves informed by previous studies (see section 5.2). Finally, in terms of null or negative results we made the explicit commitment before initiating the evaluation to report the results regardless of outcomes.

5.1.3 Research goals and questions

An important aim of our study was to evaluate the learning outcomes of participation in the first edition of the DNBS. In addition, other key points of interest were participants' profile (in terms of demographics), their motivations for participating, and their evaluation of the DNBS. Aside from the general importance of knowing the background and motivations of participating citizen scientists (e.g. Johnson et al., 2018), profile, motivations and project experiences may also affect learning in citizen science (Jennett et al., 2016). For instance, Dem et al. (2018) demonstrate how e.g. gender and motivations were related to differing learning outcomes, and Druschke and Seltzer (2012) discuss the impact of project experiences on learning. A recent report by the National Academies of Sciences, Engineering, and Medicine (2018) also argues the importance of citizen science projects providing insights into their participants' demographics (p. 44) and one of its key conclusions regarding learning opportunities is that 'science learning outcomes are strongly related to the motivations, interests, and identities of learners' (p. 148). Profile, motivations and project evaluation were thus included as research questions in this study.

Based on these key dimensions of our study, and the insights from the literature described above, our repeated-measures inquiry was guided by the following research questions:

1. What is the profile of the DNBS participants in terms of demographics, motivations and further engagement with green volunteering?
2. How did they evaluate their participation in the DNBS?
3. What impacts of participating in the DNBS do respondents report in terms of changes in knowledge on, attitudes towards and behavioural intentions to support bees?
4. What impacts of participating in the DNBS can be measured in terms of attitudes towards bees, nature, citizenship and citizen science?

5.2 Methods

For our assessment of learning outcomes from participating in the DNBS, we opted for a repeated measures survey study, with a baseline measurement before participation and a second survey completed after participation. While not a true experimental setting (thus caution must be exercised in attributing any changes in responses to participating in the DNBS), a repeated measures design does provide for more structured insights compared to a single survey.

5.2.1 Questionnaire development

An online questionnaire was developed for both the baseline and post-DNBS surveys, using the online survey platform Limesurvey. The questionnaires contained 17 (baseline) and 10-16 (post-DNBS, depending on survey routing) questions, each survey having an estimated completion time of 5-10 min. Most questions utilised multiple-choice, 'check all that apply' or five-point response scale formats (e.g. 'completely disagree' to 'completely agree'), while a few questions used other formats such as ranking (motivations) and semantic differentials (e.g. attitudes towards bees).

The baseline survey included sections on motivations for participating, demographics (age, gender, education level, employment and province of residence), and respondents' 'green profile' (information channels, involvement with the organisers of tNB, and further involvement in biodiversity monitoring and broader green volunteer work). Questions on motivations and 'green profile' drew from previous studies on Dutch biodiversity citizen scientists (Ganzevoort et al., 2017) and green volunteers (Ganzevoort & van den Born, 2020).

The post-DNBS questionnaire covered participation in the DNBS (e.g. location and company), evaluation of the project, and self-reported impacts of participation. Since our questions on learning outcomes were limited to self-reports, we included two different types of self-report questions to achieve a degree of triangulation. These included scale-based attitudinal measures, repeated before and after participation (an implicit way to assess change based on self-report), and questions where respondents were themselves asked explicitly to assess the level of change in their attitudes, knowledge and behavioural intentions. For the latter, we partly drew on items used by Toomey and Domroese (2013) and Lewandowski and Oberhauser (2017). Regarding attitudinal measures, we drew on existing literature to include five matching sets of statements in both surveys, in order to compare responses between both measurement moments. These five sets of statements covered the following constructs (for full item lists, see Appendix B):

- **Attitudes towards bees**

We developed seven semantic differential items on attitudes towards bees, with poles such as 'dangerous – not dangerous' or 'rare – common'. Use of this response format was inspired by the work of Fischer and van der Wal (2007) on perceptions of puffins and tree mallow. Respondents could indicate their answer on a seven-point scale between each set of poles, with the middle option representing 'neutral'.

- **Nature bonding**

Linked to the project goals regarding attitudes towards bees and biodiversity, this set of six statements aimed to measure a sense of attachment to local bees and nature. We selected three items from Raymond et al. (2010) and included each statement twice, referring to either local nature or bees (e.g. 'I would be saddened if there would be a loss of *nature/bees* in my environment'). Like the next three sets of items, responses were measured using a five-point Likert scale running from 'completely disagree' to 'completely agree'.

- **Nature relatedness**

In addition to the more specific construct of attachment to nature, we also included a measure of general nature relatedness (Nisbet et al., 2009). We opted for the shortened NR-6 scale (Nisbet & Zelenski, 2013) which consists of six items on awareness of, connection to and interest in nature (e.g. 'I always think about how my actions affect the environment').

- **Attitudes towards citizen science**

Since the DNBS aimed to improve scientific literacy and stimulate active engagement in science, we included statements tapping into respondents' attitudes towards citizen participation in scientific research. We developed seven

items (e.g. ‘scientists don’t trust the skills of citizens to do research’), some based on Druschke and Seltzer (2012).

- **Attitudes towards citizenship**

Finally, since citizen science is a form of active engagement in volunteering, we included six items measuring components of active citizenship attitudes (e.g. ‘It is important for me to contribute to my community’). We largely used the same scale as included in a previous survey of green volunteers in the Netherlands (Ganzevoort & van den Born, 2018), which in turn drew on the work of Bobek et al. (2009) and Zaff et al. (2010) and was adapted to the research context.

5.2.2 Data collection

Anyone interested to participate in the DNBS was able to enrol on the tNB website, although this was not a requirement. Two weeks before the DNBS, all enrolled DNBS participants up to that point who had also indicated an interest in project emails ($N = 739$) received an email invitation explaining the goal of the baseline study and the survey link. In addition, an invitation with the link was placed in the project newsletter sent to the same group and to other interested individuals who had subscribed to it. Finally, survey invitations were placed on social media channels such as the Facebook page of tNB. A week later, the tNB team emailed a reminder to the same 739 enrolled participants and once again included it in the newsletter. When we closed the baseline survey just before commencement of the DNBS, 373 respondents had completed it.

Following institutional proceedings at the time of carrying out the empirical work, considering the design of the research and the target population no formal ethical approval was required. In terms of informed consent, as noted above the initial survey was distributed by the DNBS project team; the authors thus never had access to respondents’ contact information. To obtain informed consent for the follow-up survey, at the end of the initial survey we informed respondents about the follow-up study and asked them to share their email address if they were interested in participating; 327 respondents (87.7%) opted to do so. We sent them an invitation for the follow-up survey three weeks after the DNBS, with a reminder for non-respondents ten days later. When the data collection phase ended, 208 respondents (63.6%) had completed the second survey.

5.2.3 Analysis

Data were uploaded into SPSS Statistics version 21 for cleaning and analysis. For four of the five sets of attitudinal statements we used reliability analysis (Cronbach’s α) to check whether they formed coherent and reliable combined scales.

We carried out this analysis on the items regarding nature bonding, nature relatedness, attitudes towards citizenship and attitudes towards citizen science; the items on attitudes towards bees were not intended to form a combined scale. We thus conducted eight reliability analyses, for each of the four sets of items at both measurement moments.

Results of these reliability analysis showed that nature bonding (pre-DNBS $\alpha = .663$, post-DNBS $\alpha = .833$) and nature relatedness (pre-DNBS $\alpha = .735$, post-DNBS $\alpha = .784$) formed reliable scales at both measurement moments, and the citizenship scale did so after dropping one item (pre-DNBS $\alpha = .716$, post-DNBS $\alpha = .709$). The items on attitudes towards citizen science, however, did not form a reliable scale at either measurement moment (pre-DNBS $\alpha = .351$, post-DNBS $\alpha = .370$). We thus calculated mean scores for nature bonding (six items), nature relatedness (six items) and attitudes towards citizenship (five items) for both measurement moments. We then checked these variables for normality using histograms, boxplots, Q-Q plots and descriptive statistics on skewness and kurtosis. These analyses indicated that scores on nature bonding were strongly negatively skewed. As such, to check for demographic differences in scale scores and assess differences between the two measurement moments, we utilized parametric tests for nature relatedness and attitudes towards citizenship (paired-samples t-test, independent-samples t-test, Pearson’s correlation), while for nature bonding non-parametric alternatives were used (Wilcoxon signed-rank test, Mann-Whitney U test, Spearman’s correlation).

Finally, we elicited data on motivations using a ranking scale. We scored each of the eight motivation items (presented to each respondent in a randomly ordered list) based on how high they were ranked by the respondents; motivations not selected by the respondents were given the score of zero. This then allowed the calculation of combined rank scores for each motivation across all respondents.

5.3 Results

Section 5.3.1 will present findings related to the first research question, respondents’ demographic and ‘green’ profile and their motivations. Section 5.3.2 focusses on the second research question: DNBS participation and evaluation. In section 5.3.3, we present our findings on the learning outcomes from DNBS participation.

5.3.1 Baseline study

In contrast to earlier studies on biodiversity citizen scientists and green volunteers in the Netherlands (Ganzevoort et al., 2017; Ganzevoort & van den Born, 2020), a majority of the respondents is female (Table 5.1). Respondents are of a relatively high age, with ages ranging between 15 and 83 years and the largest age group being those between 56 and 60 years of age (comprising 16.1% of all respondents). An independent-samples t-test also shows that the mean age of male respondents (57.0 years) is significantly higher than that of female respondents (51.4 years) ($t(303) = -3.96$, $p < .01$). In terms of education level, Table 5.1 shows that more than half of the respondents have obtained a higher vocational or academic degree; this rate is more than twice the Dutch average (29.4% in 2014; Statistics Netherlands, 2018).

Age ^a	Mean (SD)	53.2 (12.6)
Gender ^b	Female	60.6%
	Male	39.4%
Higher education completed		65.2%
Paid position in nature/environment sector ^c	Yes	24.7%
	No	45.5%
	Unemployed/Retired	29.8%

^a $n = 348$, ^b $n = 355$, ^c $n = 356$

Table 5.1 | Socio-demographics of the baseline study respondents.

Several questions tapped into respondents 'green profile', the degree to which they are engaged with nature and the environment in their professional and personal lives. Table 5.1 indicates that almost one in four respondents work in the nature or environmental sector. In addition, 57.4% report that they donate to, are active in, or are member of at least one of the organising partners of tNB. These four organisations were also the main channel through which people got engaged with the DNBS (61.1%).

Furthermore, we asked participants if they participate in other national monitoring days or green volunteering. More than half (56.0%) have participated in the yearly national garden bird count, and 28.2% in the yearly national butterfly survey. In fact, 12.3% of respondents submit biodiversity data they collect to an (online) repository at least once a month. Data on respondents' involvement in other forms of green volunteering (Figure 5.1) further confirm a broader engagement with nature: many

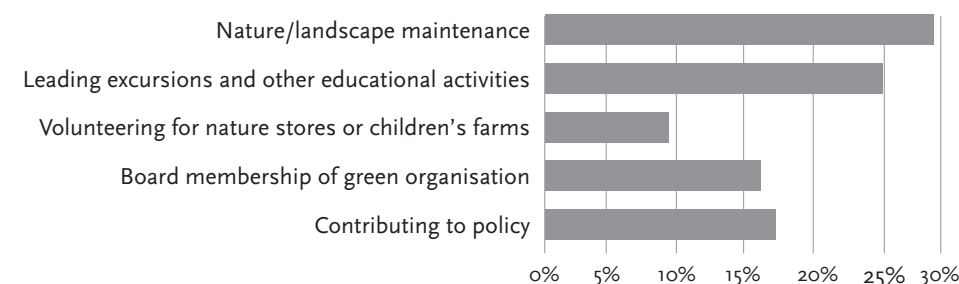


Figure 5.1 | Involvement in other forms of green volunteering.

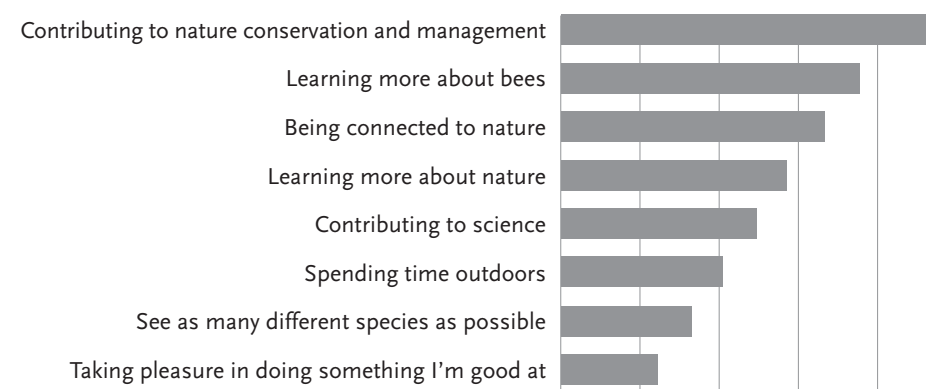


Figure 5.2 | Motivations for participating in the DNBS.

respondents take part in other forms of green volunteering, including greenspace restoration or maintenance (28.7%) and organising or leading excursions or education (24.7%).

Results of the motivation ranking (Figure 5.2) demonstrate that conservation concerns arise as most important for the respondents, which corresponds with the emphasis of tNB on halting the decline of wild bees. Respondents also prominently rank their connection to nature and learning about bees as motivating factors. Scientific contributions, spending time outdoors and learning about nature more generally are emphasised somewhat less, while the pursuit of a diversity of species, or the pleasure of doing something you are good at, are given least emphasis.

5.3.2 Follow-up study

As described in section 5.2, 208 respondents of the initial survey also completed

the follow-up survey. To check whether the decision to participate in this second survey was related to demographic characteristics (which might introduce biases in the comparison), we compared age, gender and educational composition of both study samples. The respondents of the follow-up survey displayed a highly similar profile on these characteristics (mean age 54.2 years, 60.9% female, 65.8% completed higher education) compared to the baseline sample as discussed previously; as such, we felt confident in ruling out demographic response biases in responding to the second survey.

	n =	%
Participants (n = 155)		
Counted and submitted observation data	135	64.9%
Counted, did not submit observation data	20	9.6%
Non-participants (n = 53)		
Started counting, but did not finish	12	5.8%
Enrolled, but did not participate in the DNBS	41	19.7%

Table 5.2 | DNBS participation categories.

As illustrated in Table 5.2, the 208 respondents of the follow-up survey were categorised as DNBS participants or non-participants. The participants comprised all respondents who completed the full 30 minutes of counting bees, with most also submitting their collected data. The non-participants either ended up not participating at all (with commonly reported reasons being other commitments or lack of time) or started counting but quit prematurely (difficulties in recognising bees, or no bees to observe, were reported as the most common causes).

We made use of a branching survey structure; non-participants were only presented with the attitude scales (discussed in the next section) and two evaluation questions, while the participants were also presented with questions on the way they participated, two questions on perceived impacts of participation, and further evaluation questions. Here we focus on the latter set of questions among the 155 participants of the DNBS.

In terms of location and company, the vast majority (86.5%) counted bees in their own garden, with some others opting for communal gardens or public green spac-

es. Participation was largely a solitary activity (72.3%), although 23.9% of participants did so together with family members.

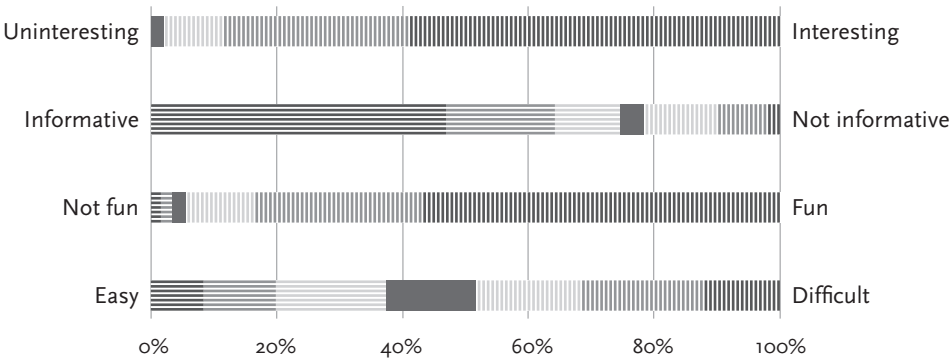


Figure 5.3 | Evaluation of participating in the DNBS. Horizontal stripes indicate responses on the left of the scale, vertical stripes responses on the right of the scale, and solid the 'neutral' middle option.

Participants were generally highly positive about the project. Using a set of four seven-point semantic differential scales (Figure 5.3), we found that almost all participants found the DNBS interesting (98.1%) and fun (94.2%), with the majority even choosing the far end of the scale. Similar results were found for the informative nature of participating, although results were more mixed. The question whether participating in the DNBS was difficult or easy led to the most divided response: there was a relative large group who found it neither easy nor difficult (14.8%), and the group who felt more inclined to consider it difficult is larger (47.7%) than the group who found it easier (37.4%).

Our final question, in which we asked both participants and non-participants whether they would like to take part in next year's edition of the DNBS, also reflect this positive evaluation. The overwhelming majority (91.7%) indicated they aimed to participate next year; this included 97.4% of the participants (the rest of whom said 'maybe'), and 75.5% of non-participants.

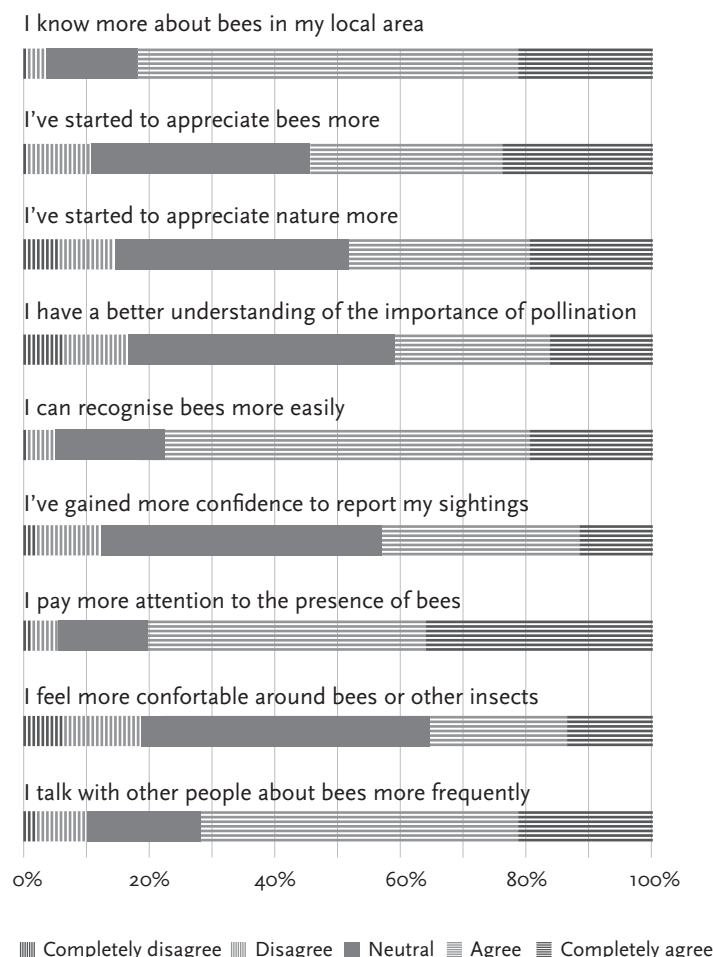


Figure 5.4 | Self-reported impacts of participating in the DNBS.

5.3.3 Impacts of participation

As shown by Figures 5.4 and 5.5, the 155 participants in the DNBS reported impressive learning outcomes as a result of their participation. Figure 5.4 shows that between 71.0% and 81.3% of respondents agreed or completely agreed with the three statements on increased knowledge and awareness of bees, as well as frequency of talking about bees with others. More than half (53.5%) also reported development of a stronger appreciation of bees. We found lower scores for gains in general appreciation of nature, understanding of pollination, and confidence in reporting observations, and we received the most mixed response regarding an increased feeling of comfort around bees or other insects: while 34.2% agreed or completely agreed, 20.0% disagreed and almost half (45.8%) gave a neutral response. Over-

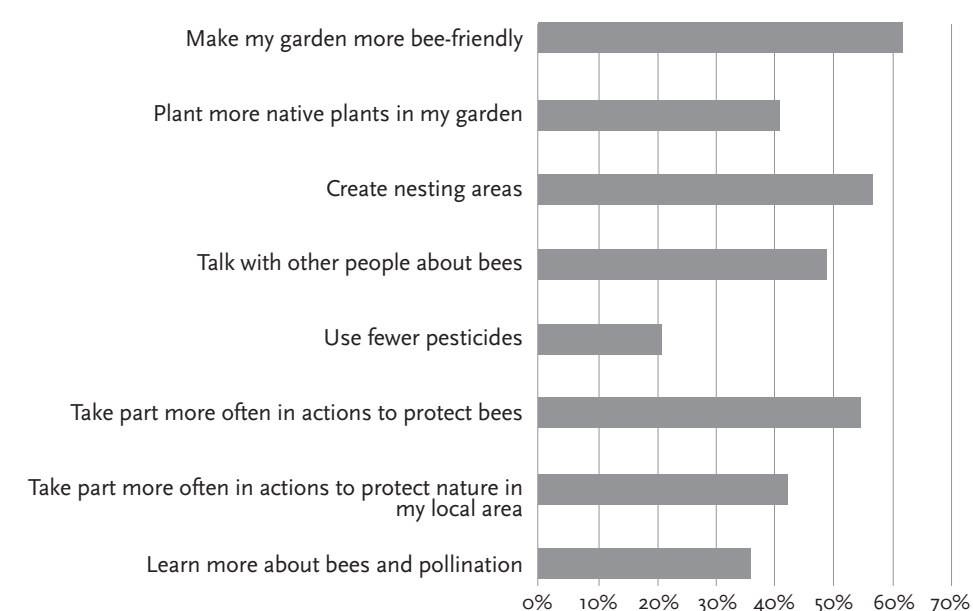


Figure 5.5 | Self-reported behavioural intentions as a result of participating in the DNBS.

Question prompt was: 'Because of my participation in the DNBS, I am (even) more interested to...'. Respondents were asked to only pick those behaviours that they felt an increased interest towards, with the aim to control for pre-existing intentions.

all, based on the self-reported perceived changes as a result of the DNBS, it appears that participation was highly impactful for participants, especially in terms of knowledge about and awareness of bees.

Figure 5.5 shows that participation in the DNBS also had a significant impact in terms of behavioural intentions. The majority of participants indicate an increased interest in making their garden more bee-friendly (e.g. diversifying plants; 61.9%), creating nesting areas (56.8%) and taking part in other actions to protect bees (54.8%). In addition, more than a third reported a stronger intention to talk with other people about bees (49.0%), take part in actions to protect local nature (42.6%), plant more native plants in their garden (41.3%) and learn more about bees and pollination (36.1%). Only the intention to reduce pesticide use was reported by a much smaller group (21.3%).

Taking the findings of Figures 5.4 and 5.5 together, it appears that the DNBS accomplished its goals of increasing knowledge about bees, stimulating positive attitudes

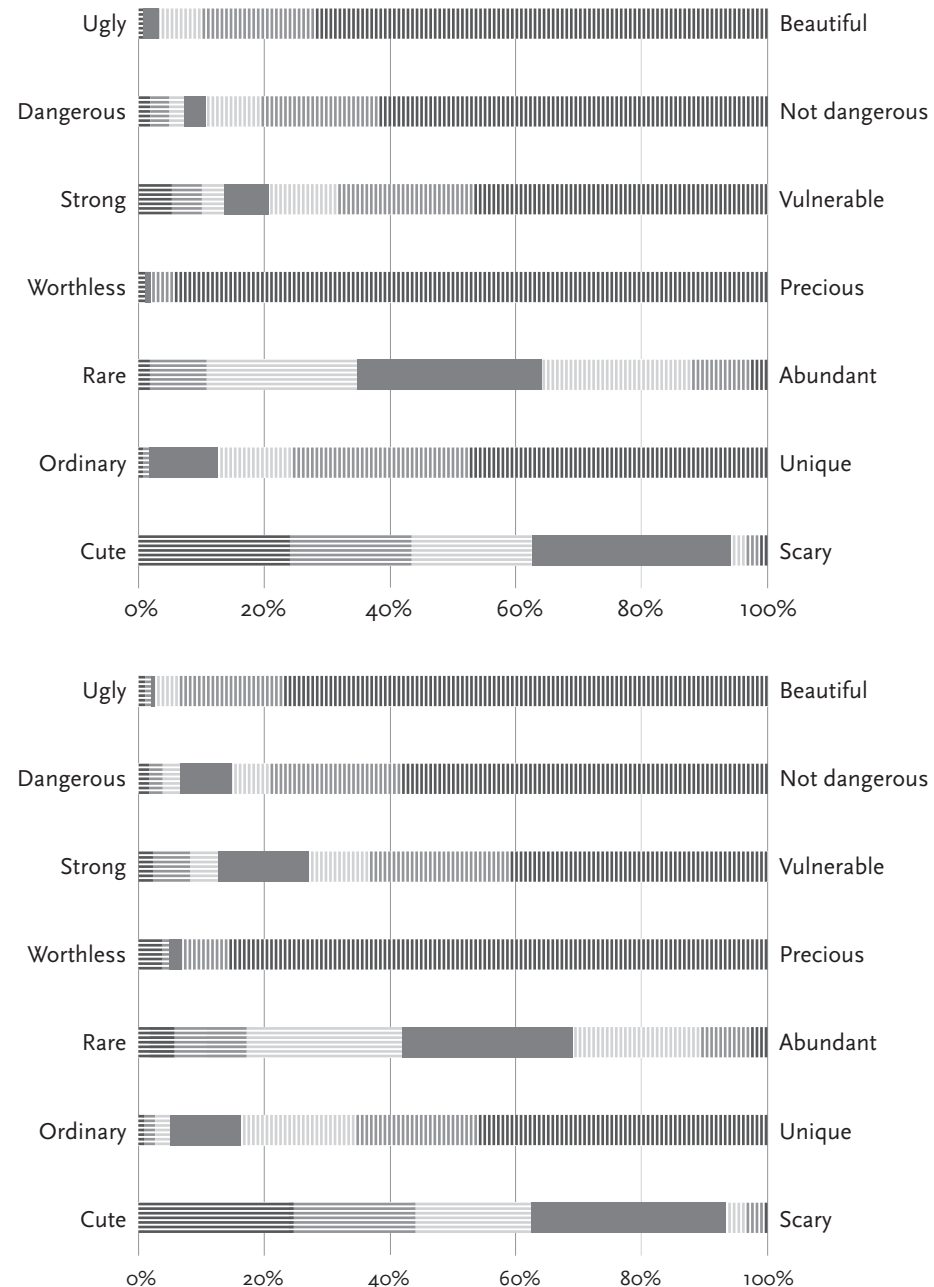


Figure 5.6 | Attitudes towards bees before (top) and after (bottom) participating in the DNBS.

Horizontal stripes indicate responses on the left of the scale, vertical stripes responses on the right of the scale, and solid the 'neutral' middle option.

towards bees, and increasing intentions to engage in bee-friendly behaviours. However, we also presented our respondents in both surveys with five sets of statements on attitudes towards bees, nature, citizen science and citizenship. These results are presented next.

Figure 5.6 shows the results of the semantic differential items on attitudes towards bees among all 155 participants in the DNBS, both before (top) and after (bottom) participation. A large majority of participants perceives bees as beautiful, precious, not dangerous, unique and vulnerable to some degree, a majority considers them cute rather than scary (though with a considerably larger number of neutral responses), and the most mixed responses could be found on the perception of bees as either rare or abundant. As quickly becomes clear from Figure 5.6, these response patterns are highly similar between both measurement moments. In fact, if we group all horizontally striped, solid, and vertically striped responses in Figure 5.6 and compare the results between before and after the DNBS, the greatest shift is only 7.1% (the percentage of respondents who perceive bees as rare to some degree increased from 34.8% to 41.9%). Overall, however, Figure 5.6 provides little basis on which to claim that a significant shift in attitudes towards bees took place because of participation in the DNBS.

We found similar patterns when analysing the results of the scales on nature bonding, nature relatedness, attitudes towards citizen science and attitudes towards citizenship (Appendix B). At both measurement moments, respondents' scores on the nature bonding scale were overwhelmingly distributed towards (complete) agreement with the items. Responses to the nature relatedness scale were somewhat less skewed, though few respondents disagreed with any of the items; the major exception was the item 'I feel spiritually connected to nature', which evoked a larger percentage of neutral responses and disagreement.

The scale on attitudes towards citizenship showed a similar pattern of high levels of agreement with the items. Finally, the data on attitudes towards citizen science indicate somewhat more varied responses. While a large majority (fully) agrees that it is important that citizens are more actively involved in scientific studies and that results need to be shared with participants, there was a bit less agreement on whether scientists trust the ability of citizens to take part in science. Questions on data quality also evokes varied responses; for instance, while almost half our respondents (fully) agreed that scientists make fewer mistakes than citizens in conducting research, fewer respondents felt that data collected by citizens is thus also less reliable.

Demographic analyses revealed no significant relationships between nature relatedness, nature bonding and attitudes towards citizenship scale scores and respondents' age, gender or education. In addition, we found no significant changes post-DNBS in levels of nature bonding ($T = 1409$, $p = .392$), or in mean scores for nature relatedness ($t(154) = 1.39$, $p = .166$) or attitudes towards citizenship ($t(154) = 0.42$, $p = .67$).

5.4 Discussion

Our results show that survey participants positively evaluated their participation in the first DNBS, and overwhelmingly intend to take part again (91.7%). However, in terms of learning outcomes a rather ambiguous picture emerges. Participants themselves directly perceived significant impacts of DNBS participation on their awareness of and knowledge about bees, appreciation of bees, and behavioural intentions such as adapting their garden and talking about bees with other people. However, few impacts of participation could be detected in responses to scale-based measurements of attitudes towards bees, nature, citizen science and citizenship. In this section, we discuss three factors that may help explain these results: the nature of the project, the profile of the participants, and methodological aspects of our study.

Firstly, the DNBS is a yearly event consisting of participants counting wild bees for 30 minutes and submitting the data. More transformative learning outcomes, such as shifts in underlying attitudes towards nature, science or citizenship, would likely arise more slowly than increased knowledge and awareness of bees, and a one-off event lasting 30 minutes might not realistically be able to bring about this sort of impact (Crall et al., 2013, p. 759). In addition, participants' contribution was limited to collecting and reporting observational data; the DNBS did not involve citizens in formulating research questions or analysing the data. Several authors have argued that deeper attitudinal shifts, especially in terms of attitudes towards science, would require involvement in more phases of the research process (e.g. Haywood, 2014, p. 68; Turrini et al., 2018, p. 183). However, Lawrence (2006) cautions not to be too quick to discount more transformative learning in contributory projects, as the very act of data collection in nature can also be deeply moving for participants. Bonney et al. (2016, p. 11) add that 'learning does not just 'happen'', and that deeper learning especially would require incorporating explicit reflection or learning aids into citizen science participation (e.g. Roetman et al., 2018; Sharma et al., 2019). Secondly, we need to take the profile of our participants into account. Our results on

profile and motivations indicate that respondents were generally of a relatively high age and education level, that many had pre-existing affinity with nature through work or volunteering, and that conservation concerns were the most important motivation for participating. Survey response biases and the representativeness of our sample should also be taken into account, yet our data on respondents' profile and motivations seem to indicate that participants entered the project with pre-existing positive attitudes towards nature, science, citizen science and citizenship. Our scale results reinforce this suggestion, especially regarding attitudes towards nature and citizenship. As noted by several other authors (e.g. Bonney et al., 2016, p. 6; Turrini et al., 2018, p. 177), such pre-existing positive attitudes also help explain why shifts in these attitudes are difficult to measure. This phenomenon leads to a so-called ceiling effect: changes in a response scale become difficult to measure if respondents already start out at an extreme end of a scale.

One methodological approach to mitigate this effect could be to use a more refined response scale: our study generally employed five-point response scales, so using six-point or seven-point scales could allow for more differentiated responses. However, Crall et al. (2013, p. 759) note that more nuanced and specific statements might also be necessary. Several scales used in this study, including the NR-6 and nature bonding scales, are intended for surveying the general population; for participants in nature-oriented volunteering projects, statements probing more specific attitudes or viewpoints could aid in more successfully differentiating respondents.

Finally, our results invite reflection on the exclusive use of self-report questions for evaluation studies (see e.g. Phillips et al., 2018, p. 13). Our first type of self-report measure, self-reported changes in perspective, may be especially vulnerable to issues of social desirability as respondents may feel pressure to report those outcomes they expect the researcher to be looking for. However, several other authors note that scale-based self-report questions may not accurately detect certain learning outcomes either. Chase and Levine (2018, p. 7) argue that, even if existing attitudes or behaviours do not significantly shift as a result of citizen science participation, reinforcement of existing attitudes through supportive exchanges with fellow volunteers or project staff is also of great value. Similarly, the quantitative study by Lynch et al. (2018) found no statistically significant learning outcomes of participation in entomological research, yet in interviews their respondents did report more positive attitudes towards nature and insects and an increased sense of self-efficacy.

These examples and our own findings highlight that, while triangulation between different types of self-report questions can tease out interesting differences, the use of different question formats or mixed methods designs in evaluation studies holds great potential for understanding important nuances. Adding a qualitative component (e.g. interviews or focus groups with participants) to quantitative evaluations would be one way to improve our understanding of the diverse learning outcomes in citizen science, and to gain insight into both magnitude and meaning of change (Seymour et al., 2018, p. 84). Other qualitative methods may also shed new insights, such as the use of narrative approaches like research diaries or narrative interviews (Constant & Roberts, 2017). In addition, while we did use a repeated measures design, a truly longitudinal approach that assesses the sustainability of learning impacts after a longer period would also be an interesting avenue for further research where possible.

5.5 Conclusion

Our evaluation of the first edition of the DNBS indicated that our respondents were highly positive about the project. We also found they were strongly motivated by conservation concerns and learning about bees, and many were more broadly involved in green volunteering, suggesting a pre-existing affinity for and engagement with nature. In terms of learning outcomes, our respondents reported significant gains in knowledge and appreciation of, attitudes towards, and intention to support wild bees. However, scale-based measures indicated no significant shifts in attitudes towards bees, nature, citizen science or citizenship. We suggested several explanations for this finding, including the brief and contributory nature of the DNBS, and the pre-existing positive attitudes of our respondents.

Our research design incorporated several recommendations made in recent reviews in the citizen science evaluation literature: linking project aims and evaluation, focussing on more than content knowledge, reusing existing scale items where possible and available, and committing to reporting possible null results. We recommend the further application of scale items used in previous studies (including from this study), their fine-tuning in terms of content and response scales towards use among highly engaged groups of participants, and the adoption of diverse methods in evaluation studies (including mixed-methods designs). We thus hope this study inspires further research on the evaluation of learning outcomes in citizen science.

Citizen science projects with both scientific and outreach objectives are certainly capable of doing both, but will likely face tensions in terms of priorities or resources. As this study has demonstrated, any citizen science project that aims to achieve both objectives ought to invest in a detailed evaluation of its learning outcomes, both to check whether it is achieving its ambitions, and to improve our understanding of the potential for citizen science to stimulate new insights and inspiration among its participants.

Acknowledgements

We are grateful to our partners in tNB for the opportunity to conduct this evaluation study. We especially wish to thank Nieke Knoben (Naturalis) and Marchien de Ruiter (IVN) for their support in designing and distributing the surveys. We are also grateful to all our respondents for their time and effort.

Appendix B

Table 5.3 displays the scale items, item scores and mean scores for nature bonding, nature relatedness, attitude towards citizen science and attitude towards citizenship, at both measurement moments. Data are for all DNSB participants ($N = 155$). For scale items and results regarding attitude towards bees, see Figure 5.6.

	Baseline	Post-DNBS
Nature bonding	4.79 (0.277)	4.77 (0.336)
The natural features in my environment are very important to me	4.95 (0.222)	4.87 (0.336)
The bees in my environment are very important to me	4.94 (0.246)	4.85 (0.357)
I am very attached to the natural features in my environment	4.61 (0.587)	4.65 (0.589)
I am very attached to the bees in my environment	4.41 (0.701)	4.48 (0.658)
I would be saddened if there would be a loss of natural features in my environment	4.92 (0.360)	4.87 (0.336)
I would be saddened if there would be a loss of bees in my environment	4.89 (0.404)	4.87 (0.373)
Nature relatedness	4.02 (0.546)	3.98 (0.570)
My ideal vacation spot would be in a wild nature area	3.87 (0.978)	3.72 (0.997)
I always think about how my actions affect the environment	4.05 (0.696)	3.99 (0.743)
I feel spiritually connected to nature	3.15 (1.112)	3.21 (1.032)
I take notice of wildlife wherever I am	4.45 (0.647)	4.41 (0.653)
My relationship to nature is an important part of who I am	4.32 (0.738)	4.26 (0.701)
I feel very connected to the earth and all living things	4.28 (0.728)	4.25 (0.744)
Attitude towards citizen science^a		
It is important that citizens are more actively involved in scientific research	3.99 (0.725)	4.06 (0.676)
I think scientists are interested in actively involving citizens in scientific research	3.61 (0.894)	3.66 (0.725)

	Baseline	Post-DNBS
Scientists should more frequently ask citizens which issues should be researched	3.70 (0.846)	3.74 (0.805)
Scientists make fewer mistakes than citizens in doing research	3.34 (0.864)	3.43 (0.905)
Data collected by citizens are less reliable	2.80 (0.833)	2.90 (0.917)
Scientists don't trust the skills of citizens to do research (RC)	2.94 (0.741)	3.04 (0.663)
If citizens participate in research, scientists should share the results with them	4.34 (0.649)	4.34 (0.659)
Attitude towards citizenship^b	4.07 (0.451)	4.06 (0.478)
I believe I can make a difference in my community	3.88 (0.696)	3.86 (0.751)
If my neighbours need help, It's not my problem (RC)	1.72 (0.640)	1.75 (0.677)
It is important for me to contribute to my community	4.08 (0.689)	4.07 (0.704)
When I see someone being treated unfairly, I want to help them	4.14 (0.523)	4.09 (0.585)
I often think about doing things so that future generations have things better	3.99 (0.725)	4.04 (0.780)
I have little trust in my fellow man (RC)	2.40 (0.984)	2.42 (0.973)

^a No mean scale score computed; ^b Mean scale score computed across the first five items.

Table 5.3 | Scale items & mean scores at both measurement moments
Numbers provided are mean scores on a five-point scale ('completely disagree' – 'completely agree'), with standard deviations in brackets. RC = reverse coded.

6

Understanding citizens' action for nature

The profile, motivations and experiences of Dutch nature volunteers

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Abstract

Active citizens are a crucial foundation of nature conservation, with a long history of commitment to natural history, conservation work, education and outreach. There is a strong need for greater understanding of these volunteers and their motivations, both to match volunteer management to the individual, but also more broadly to understand citizens' action for nature.

This study adds to the literature by surveying a broad sample of Dutch nature volunteers ($N = 3775$), including both formal volunteers and participants in nature-oriented citizen initiatives, providing insight into their profile, motivations, and attitudes regarding their volunteer work now and in the future. In addition to providing a broad overview, we also distinguish four types of nature volunteering (recorders, restorers, educators and administrators) to investigate differences in background and perspective.

Our results highlight a generally high age and level of education among nature volunteers, and we find that two motivations are crucial regardless of activity type: contributing to nature conservation, and personal connection to nature. Aside from these, restorers appear to have a somewhat divergent pattern of motivations. While nature volunteers generally experience freedom and appreciation, they share great concerns over the perceived lack of younger volunteers.

We argue that, while recognising nuanced differences is important, contemporary developments in the field of volunteering require nature organisations to recognise volunteers' diverse activities and strengthen collaboration in current and new initiatives. Taking on the joint responsibility to appreciate and voice nature volunteers' efforts and motivations is a promising route to stimulate current and future action for nature.

6.1 Introduction

The care for and protection of nature is inextricably tied to the efforts of volunteers, whom Sloane and Pröbstl-Haider (2019, p. 158) refer to as 'the foundation of nature conservation'. Volunteer contributions include hands-on conservation work, education and public outreach, coordinating activities, and monitoring presence and distribution of species. Ryan et al. (2001) noted that 'many of the improvements in environmental quality over the past three decades have been made by volunteers' (p. 630) and their importance has not waned since then. Volunteering is also linked to improved physical and emotional well-being for its participants (Kragh et al., 2016) and considered one way to combat the growing disconnect between people and nature, with 'hands-on involvement in ecological restoration' and nature-based citizen science especially promising avenues (Zylstra et al., 2014, p. 131).

Despite these identified benefits and promises of nature-oriented volunteer work for both conservation and the people involved, our knowledge of who these volunteers are and what motivates them is more limited (Woosnam et al., 2019, p. 2). This is cause for concern, because actors' background and motivations are important components of understanding environmental stewardship (Bennett et al., 2018; Enqvist et al., 2018). This understanding is crucial because successful nature conservation depends both on citizens' support for conservation measures and on their actions for nature, making understanding why citizens take action and how this can be fostered a key priority for nature conservation (Van den Born et al., 2018). In order to understand citizens' action for nature, strengthen its visibility and appreciation in society, and ensure optimal support and acknowledgement of volunteers, we require greater insight into their profile, motivations and experiences.

Existing studies on nature volunteers often either focus on a specific type of activity (e.g. Kidd & Kidd, 1997), or cover diverse activities without investigating differences between them (e.g. Guiney & Oberhauser, 2009). As will be detailed below, we use a broad conception of nature volunteering, distinguishing activities ranging from biodiversity monitoring and green space maintenance to education and coordination. In addition, there is little published research focussing on the profile and motivations of nature volunteers in the Netherlands, especially not quantitative studies with a national reach. This despite an active tradition of nature volunteer work and concerns about its sustainability (see Section 6.1.4). Finally, we complement existing work that focusses on either formal volunteering through an organisation (Johnson et al., 2018) or bottom-up initiatives of citizens (Mattijssen et al., 2018a), by including both.

This study thus aims to contribute to our understanding of citizens' action for nature. In order to do so, we carried out a large-scale national survey ($N = 3775$) among diverse types of Dutch nature volunteers. We specifically aim to provide quantitative insight into their profile, motivations, and attitudes, leading to the following research questions (RQs):

1. What is the profile of Dutch nature volunteers (in terms of demography & type of involvement)?
2. What are their motivations for volunteering?
3. What are their attitudes towards their current involvement?
4. What are their expectations for future involvement?
5. Do we find differences in profile, motivations, attitudes and expectations depending on the type of nature volunteering?

6.1.1 Nature volunteers' profile

Survey studies on nature volunteers' profile have indicated some recurring patterns shared across Western countries, including the United States (e.g. Asah & Blahna, 2013; Guiney & Oberhauser, 2009; Ryan et al., 2001) Canada (Donald, 1997), Great Britain (O'Brien et al., 2010), Greece (Liarakou et al., 2011), the Netherlands (Ganzevoort et al., 2017) and Austria and the United Kingdom (Sloane & Pröbstl-Haider, 2019). Some of these patterns mirror insights from the general volunteering literature (Wilson, 2012). Firstly, this includes a significant percentage of middle-aged volunteers. Especially the relatively low number of younger respondents is notable: for example, Asah and Blahna's (2013) sample of 322 conservation volunteers only had 5.3% of respondents aged <20, and this age group covered only 1.1% of a sample of 2193 volunteer biodiversity recorders in the Netherlands (Ganzevoort et al., 2017).

Secondly, while gender patterns differ in these studies, most find an overrepresentation of female volunteers in nature-oriented volunteer work: for instance, 62% of conservation volunteers in Van den Berg et al. (2009) were female, as were 70% of the 111 animal conservation volunteers surveyed by Abell (2013). However, some studies report relatively even distributions of male and female respondents (e.g. Dresner et al., 2015), and some others (Ganzevoort et al., 2017; O'Brien et al., 2010) found an overrepresentation of men.

Finally, one consistent pattern in the volunteering literature in terms of profile is a high level of education (Wilson, 2012), and those studies that report nature volunteers' educational background tend to confirm this. While there are some exceptions, such as 'only' 44% of Sloane and Pröbstl-Haider's (2019) Austrian re-

spondents having an academic background, most studies indicate these numbers to be much higher. Examples include 74% of British volunteers in Sloane and Pröbstl-Haider (2019), 77% in Guiney and Oberhauser (2009), and Bruyere and Rappe (2007) even found that 90% of their surveyed nature volunteers had a college degree. Thus, some recurring demographic patterns emerge from the literature on nature volunteering.

6.1.2 Nature volunteers' motivations

For our inquiry into motivations for nature volunteering, we draw on the BIOMOT project (Admiraal et al., 2017), a research project on the motivations of highly committed actors for nature in seven European countries.³⁷ While these committed individuals were not necessarily volunteers, they dedicate 'much more energy, thought and persistence to nature than would be necessary for reasons of job, income, tradition or reputation' (Van den Born et al., 2018, p. 845). Based on a review of motivations for actions for nature in different disciplines, narrowed down into a list of 20, empirical work by Admiraal et al. (2017) found that a range of motivations were of importance to committed actors for nature. These included a connection with nature, cooperation with other people, curiosity and learning, concerns for future generations, and the desire to live a meaningful life. Motivations such as personal benefits or spirituality appeared to be less important.

The diverse motivations assessed in the BIOMOT project align well with those found in the literature on nature volunteering (e.g. Bruyere & Rappe, 2007; Caissie & Halpenny, 2003; Ryan et al., 2001). Important motivations for different types of nature volunteering include those oriented towards nature and place (contributing to nature conservation, a personal connection with nature or specific places, learning about nature), as well as social motivations (working together with others) and personal development (fun and enjoyment in using skills, or learning new ones). We can also expect the relative importance of some motivations to differ depending on the type of activity: for instance, among educators in wildlife programmes the sharing of environmental knowledge and concern features prominently (Kidd & Kidd, 1997). Few studies focus on the motivations of volunteer board members or other administrative staff; Inglis and Cleave's (2006) survey study on non-profit board members' motivations in diverse fields (including the environment) found that 'helping the community' was the most highly rated motivation, though learning and expressing unique skills were also important.

³⁷ Belgium, Finland, Germany, Italy, Slovenia, the Netherlands and the United Kingdom.

6.1.3 Nature volunteers' experiences and retention

In addition, we surveyed nature volunteers' attitudes towards their current volunteer work, and their expectations for future engagement. Volunteer experiences and retention are an important field of research in the volunteering literature (Penner, 2002; Studer & Von Schnurbein, 2013), since a perceived lack of volunteers or volunteer commitment may well be rooted 'not in a lack of interest, but in the management practices used by agencies that work with volunteers' (Barnes & Sharpe, 2009, p. 171). The success and continuity of citizen initiatives is also strongly influenced by experiences in their volunteer work and their interaction with other parties (e.g. municipalities) (Hassink et al., 2016).

West and Pateman (2016) discuss several factors that improve volunteers' experiences, including support, appreciation, feedback and the opportunity to widen or change their volunteer activities to match changing skills or motivations. Pitt (2014) found that having control over the choice in volunteer activities is an important source of enjoyment for volunteers. Frequency of participation is relevant to take into account as well; Dresner et al. (2015) found that experiences differed between starting, occasional and frequent nature volunteers. Active citizens often depend on organisational support (Mattijssen et al., 2018b), and navigating the tension between engaging nature volunteers and volunteer burnout requires a better understanding of their motivations (Measham & Barnett, 2008, p. 548).

6.1.4 Nature volunteering in the Netherlands

Dutch nature conservation also highly depends on the efforts of volunteers, and has featured active citizen involvement for over a hundred years (De Kracht van de Groene Vrijwilliger, 2016). A recent national assessment of societal initiatives for nature (Sanders et al., 2018) demonstrates their great diversity, including many citizen actions for nature; the authors note that volunteer numbers fluctuate but show an increase for at least some organisations and initiatives. While precise numbers are not available, a recent estimate of the current population of Dutch nature volunteers reports around 130,000 individuals (Actieplan Groene Vrijwilligers, 2018); this includes both highly engaged and occasional volunteers, but excludes those only involved through informal citizen initiatives.

While a large and diverse group of citizens is thus actively continuing a tradition of nature volunteering in the Netherlands, there are increasing concerns regarding prospects for the future. These concerns include population change (e.g. an ageing population), a lack of participant diversity, and lagging organisational support that requires better fit with volunteers' motivations and needs. As a response to

these concerns, the sector itself launched an intervention and research programme in 2017 to build knowledge, improve cooperation and develop new strategies (De Kracht van de Groene Vrijwilliger, 2016). Our study was part of this research programme. The programme is still ongoing, but already resulted in the recent national 'Action Plan Green Volunteers' (Actieplan Groene Vrijwilligers, 2018), signed in 2019 by several prominent Dutch nature organisations and governmental partners.³⁸

To frame its discussion of nature volunteering, the programme distinguishes between three main types: monitoring, restoration, and education. We adopted this framework for our inquiry, while adding a fourth important type: management and policy. Our conception of nature volunteering thus covers the following types:

- **Recorders** – either structured (e.g. regular plots) or unstructured data collection on flora and fauna.
- **Restorers** – restoration and maintenance of nature and landscapes, both at a large or small scale.
- **Educators** – the education of young & old through activities such as guided walks, workshops, stands and stores.
- **Administrators** – voluntary management or board positions in nature-oriented organisations or initiatives, or voluntary participation in policy or planning discussions.

While the programme focusses on formal volunteering through nature organisations, it also notes a rise of nature-oriented citizen initiatives, fitting within a broader international trend towards increased active citizenship (Buijs et al., 2016). This led to our decision to include both formal nature volunteers and participants in nature-oriented citizen initiatives in our study.

6.2 Methods

6.2.1 Questionnaire development

This study made use of an online survey, covering four main topics: activities (e.g. types and frequency of nature volunteering, forms of organisation), motivations

³⁸ Signatories are IVN Nature Education, LandschappenNL (Dutch Landscapes), SoortenNL, (the Dutch network of biodiversity monitoring societies), BoerenNatuur (Farmer & Nature), Staatsbosbeheer (State Forest Service), Natuurmonumenten (Dutch Society for Nature Conservation), IPO (Association of Provinces of the Netherlands) and the Ministry of Agriculture, Nature and Food Quality.

(including motivations, perceived importance, other volunteering), opportunities and barriers (volunteering experiences, desired support, future volunteering) and demographics (age, gender, level of education, place of residence). The questionnaire was constructed using Limesurvey (<https://www.limesurvey.org/>) and consisted of 30 questions, with an estimated completion time of 15 min. Question types mostly included five- or six-point rating scales and multiple-choice questions. We discussed our nature volunteering typology in the previous section; we assessed this using a list of activities, with the wording of each item developed in consultation with representatives of four different Dutch nature organisations (see acknowledgements) to accurately capture the diversity in activities. In addition, we piloted the final questionnaire among some of these individuals and several others to confirm technical functioning and ease of understanding.

For our motivations scale, we made use of a ranking format. Since voluntary action can be driven by a multitude of motivations (West & Pateman, 2016), this approach allowed respondents to choose for themselves how many motivations are of personal relevance, while also ensuring insight into relative importance. Respondents were shown a list of 15 motivations in random order, and asked to select all that were of relevance; these could then be ranked in descending order of importance. Respondents could simply leave any irrelevant motivation out of their ranking. This approach was inspired by that of Admiraal et al. (2017) in the aforementioned BIOMOT project. Based on their work, Ganzevoort et al. (2017) had developed a similar list of motivations for use among volunteer biodiversity recorders, which we in turn took as our starting point. However, since we were targeting a more diverse group of nature volunteers than only recorders, we drew on the literature discussed in Section 6.1.2 to remove one item ('see as many different species as possible') and add four others ('Contributing to a sustainable world'; 'Improving other people's nature connectedness'; 'Doing something for the neighbourhood'; 'Working with my hands').

6.2.2 Data collection

We launched the survey in October 2017. Since our aim was to gain as many responses as possible from a large, diffuse and highly diverse group of volunteers, engaged through a great number of formal and informal initiatives, we opted for a self-selecting sampling approach utilising as many communication channels as possible. Calls to participate in the study were placed on the websites and social media pages (Facebook, LinkedIn, Twitter) of a great number of nature organisations working with volunteers, with several also utilising their newsletters and magazines. Examples include the programme's website (<http://www.degroenevri->

jwilliger.nl/), different communication channels of the Dutch regional landscapes and their umbrella organisation LandschappenNL, an extensive communication campaign by IVN nature education, the Dutch State Forest Service Staatsbosbeheer, and the communication channels of several Dutch biodiversity monitoring societies. Several of these organisations also sent reminders after initial postings.

While these efforts ensured great visibility and reach among formal nature volunteers, they may be less effective in reaching citizen initiatives. Anticipating this, we also sent an invitation to representatives of 171 Dutch nature-oriented citizen initiatives and the boards of 25 botanical gardens, gathered through our professional network. In addition, we published a call to participate on the news website Nature Today (<https://www.naturetoday.com>). Finally, we requested all participants to forward the survey to fellow nature volunteers, in order to tap into their social networks.

When we closed our survey after five weeks, our efforts had resulted in 3786 responses. Initial analysis of activities and place of residence, however, revealed that 11 respondents were not yet, or no longer, active as a volunteer, or did not live in the Netherlands; their responses were removed. As such, our final sample consisted of $N = 3775$. In Appendix C, we include a distribution map of our respondents across the Netherlands.

6.2.3 Data analysis

In the next section, we present descriptive analyses of our results linked to our RQs. In addition, considering our interest in how patterns in responses may differ depending on the type of nature volunteering (RQ5), we use Pearson's chi-squared tests to detect significant differences. Further details on our approach for these tests are reported in section 6.3.1. Throughout section 6.3, we discuss notable patterns from these analyses and illustrate the statistical significance of these tests using the following notation system: * $p < .05$, ** $p < .01$, *** $p < .001$. For a full overview of each individual comparison and their statistical significance, see Appendix D.

In order to construct a motivation ranking across all respondents, we scored each motivation based on its place in each individual ranking (running from 15 points for first rank to 1 point for the lowest rank, and 0 points if that motivation was not included in a ranking). By summing up these scores per motivation and ranking those summated scores, we arrived at a final motivation ranking.

While our large dataset allows us to incorporate the perspective of a substantial number of volunteers, in analytical terms it does have some consequences (Gazley, 2013, p. 1258). Chi-squared tests are sensitive to sample size, which means tests may reach statistical significance even for relatively small differences in distribution (Field, 2013, p. 736). Since our design involves a large number of chi-squared analyses, in our analysis of motivational data we use Cramer's V statistics to distinguish between weaker and more moderate effect sizes.

6.3 Results

6.3.1 Four types of nature volunteering

Our respondents report a broad engagement in different nature volunteering activities, whether through a formal organisation or as part of a citizen initiative. Following our typology, we created four main categories for further analysis: recorders, restorers, educators and administrators. Figure 6.1 shows the percentage of involved respondents: 55.2% of respondents are classified as recorder, 65.0% as restorer, 60.5% as educator, and 42.5% as administrator. We also distinguish between those involved frequently (weekly or monthly), infrequently (yearly or less than yearly), or not at all.

As these percentages indicate, the four groups are not mutually exclusive: in fact, 66.2% of respondents is involved in at least two of the four types. This has implication for our analyses of differences based on the type of activity. Since chi-squared tests directly compare mutually exclusive categories, we did not directly compare all four types within the same tests. Instead, we carried out separate analyses for

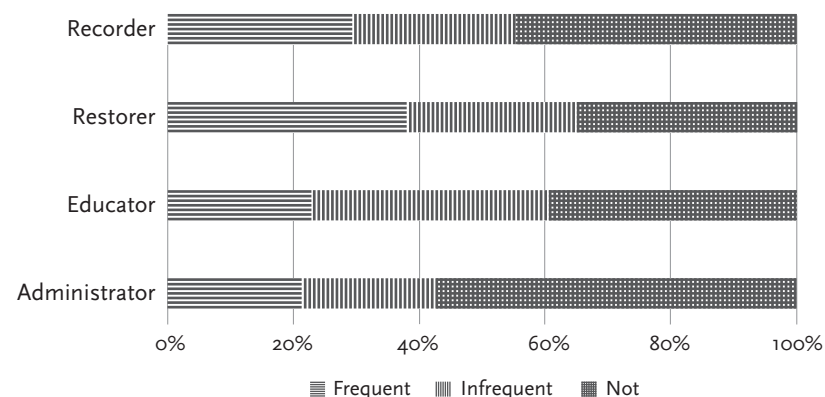


Figure 6.1 | Respondents' involvement in each type of nature volunteering (not mutually exclusive).

each type of volunteering, split into frequent, infrequent or non-involvement. This way, we systematically compared each type of nature volunteer with the rest of our sample, thus still allowing insight into statistically significant patterns in responses among the groups.

6.3.2 Profile

With a mean age of 61.8 and almost half of our respondents being 65 or older (47.9%), our demographic data confirm the picture of nature volunteers as being of a relatively high age (Figure 6.2). The low number of respondents aged ≤ 30 (2.3%) further supports this. Levels of education are also high, with 64.9% having completed an academic or higher vocational degree.³⁹ In addition, we find an overrepresentation of men (62.8%), with chi-squared tests also indicating that male respondents are generally older than women*** and have a relatively lower level of education***.

In terms of demographic differences between the four types of nature volunteers, chi-squared tests point to a slight overrepresentation of younger respondents among recorders*, while frequent volunteers among the other types tend to be somewhat older (all at least **). Focussing on gender patterns, we saw a higher percentage of women among the educators***, with the opposite pattern for re-

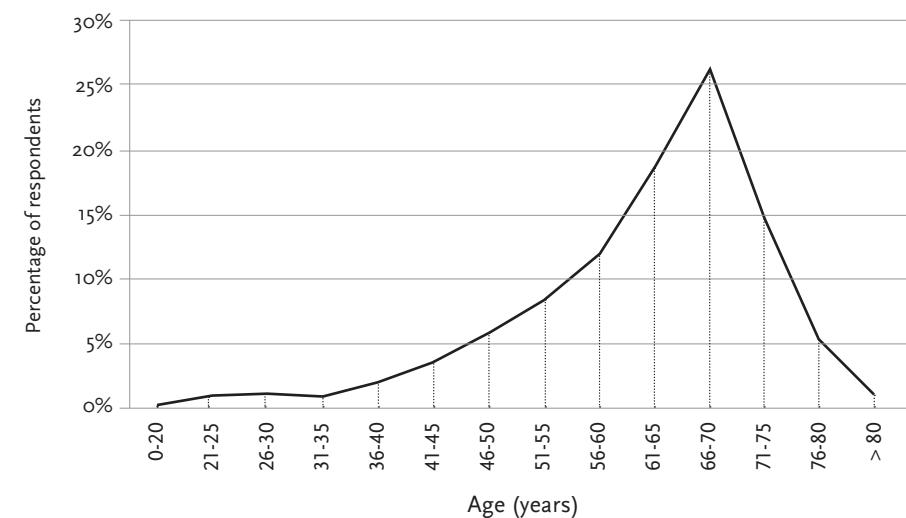


Figure 6.2 | Respondents' age (n = 3613).

As shown on the x-axis, data are collated into 5-year intervals.

³⁹ Compared to 29.4% of the general Dutch population (Statistics Netherlands, 2018).

storers***, administrators*** and frequent recorders***. Finally, taking the generally high level of education of our respondents into consideration, it was comparatively even higher among the administrators*** and educators***, and slightly lower among recorders** and frequent restorers*.

Using a multiple-choice question (options were not mutually exclusive), we found that most respondents do formal volunteering in projects organised by local (57.2%) or national (39.0%) nature organisations; governmental organisations were less common (5.9%). At the same time, 30.9% indicate that they take part in a citizen initiative, and 15.1% report organising their own activities. Interestingly, while formal volunteering and citizen initiatives for nature are sometimes considered distinct phenomena, we thus found that a significant number of respondents (23.9%) takes part in both formal volunteering and individual or group-based citizen initiatives. Just over half our respondents (55.2%) only volunteer for organisational initiatives, while 15.6% only take part in citizen initiatives.⁴⁰

Upon analysing differences in these organisational forms among the four types of nature volunteers, we find that restorers (especially frequent ones) are relatively likely to stick to citizen initiatives, while the others are more likely to combine both (all ***).

6.3.3 Motivations

Figure 6.3 shows the results of our ranking question on 15 motivations for nature volunteering. The most consistently high-ranking motivations are the opportunity to contribute to nature conservation, and respondents' personal connection with nature. The opportunity to spend time outdoors, and to learn more about nature, are also highly ranked. At a slightly more moderate ranking we find social motivations such as working together with other people and the chance to improve the connection with nature of others, as well as place attachment, a general pursuit of sustainability, and a personal sense of pleasure in using personal skills. Somewhat less prominent motivations include a concern for future generations, the enjoyment of physical work and the pursuit of a good life (eudaimonia; Van den Born et al., 2018). Finally, fewer respondents indicated being motivated by contributing to science or to their neighbourhood, or by nature volunteering as a core component of their personal identity.

⁴⁰ 5.2% of respondents could not be classified and were not included in these analyses.

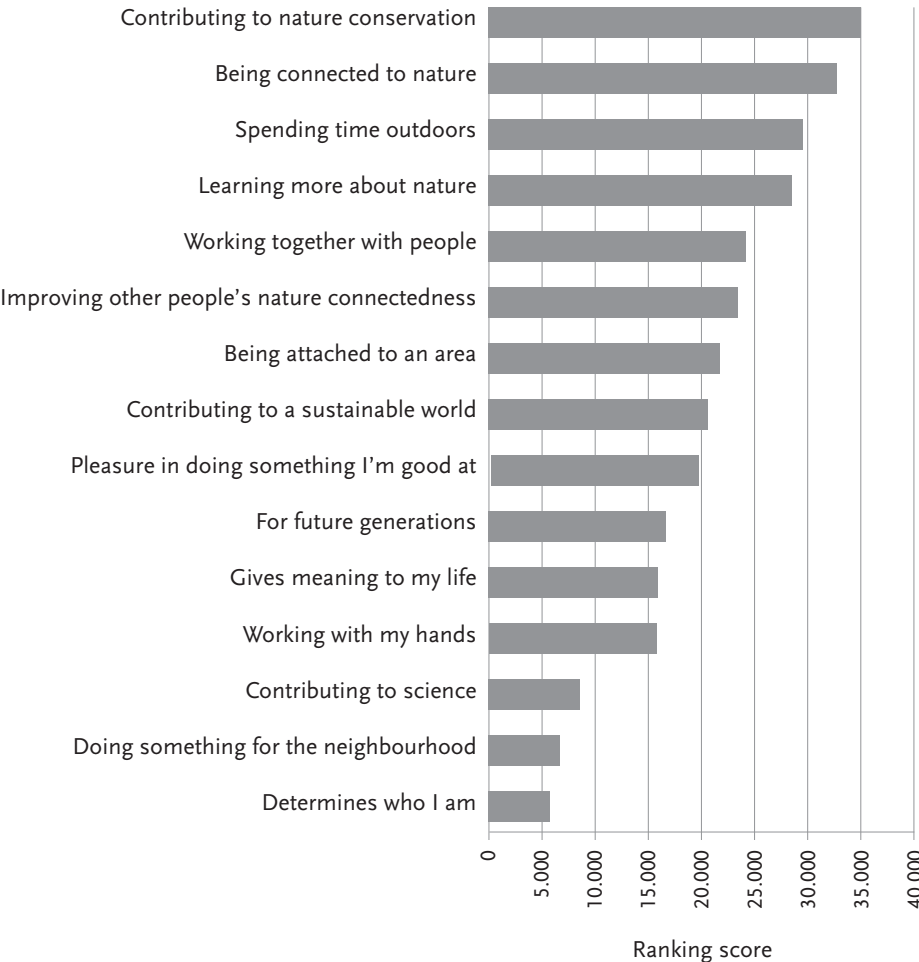


Figure 6.3 | Motivations for nature volunteering.
Ranking calculated by attributing scores to each item based on a respondent's ranking (e.g. 15 points for first rank, 1 point for 15th rank, 0 points if left out) and then summing these scores across all respondents.

Just as interesting as the overall picture of what drives nature volunteers, however, is to construct a differentiated picture for the different types of activities. To do so, we created dichotomous variables for whether or not a respondent ranked each motivation in their top three. Table 6.1 and Figure 6.4 show the results of these analyses; recall that the volunteering categories are not mutually exclusive. Notably, Table 6.1 highlights how the two highest-ranking motivations in general (Figure 6.3) are also consistently the two most prominent motivations across the different types of nature volunteering. As the third rank in Table 6.1 already hints at, once these two core motivations are taken into account we start to witness differences.

Figure 6.4 maps out the differences in relative prominence of each motivations for different types of volunteers. While many such differences were identified, the overall picture that emerges seems to hint at a somewhat different pattern of motivations for restoration volunteers. Some motivations appear relatively more important for this group (such as being outside, doing something for the neighbourhood and working with your hands), and others comparatively less so: these include learning about nature, the plight of future generations and improving other people's nature connectedness. In addition, Figure 6.4 indicates that both educators and administrators are driven relatively strongly by sustainability concerns and a desire to improve other people's connectedness with nature, while it also comes as no surprise that making a scientific contribution is a relatively strong motivation for biodiversity recording.

	All respondents	Recorders	Restorers	Educators	Administrators
Rank 1	Contributing to nature conservation (43.0%)	Contributing to nature conservation (44.9%)	Contributing to nature conservation (46.5%)	Being connected to nature (40.0%)	Contributing to nature conservation (44.0%)
Rank 2	Being connected to nature (40.1%)	Being connected to nature (43.2%)	Being connected to nature (40.2%)	Contributing to nature conservation (38.9%)	Being connected to nature (38.1%)
Rank 3	Spending time outdoors (29.0%)	Learning more about nature (29.2%)	Spending time outdoors (30.5%)	Improving other people's nature connectedness (34.5%)	Improving other people's nature connectedness (28.3%)

Table 6.1 | Top three motivations, for entire study population and each of the four types of nature volunteers.

Percentages indicate the proportion including that motivation in their top three.

In terms of motivations, we also assessed to what degree respondents expect their volunteering to contribute to different goals. As shown in Figure 6.5, a large majority expects their activities to be (very) important for local nature conservation in their own environment (85.7%), followed by their own knowledge about nature (78.6%) and nature conservation at a national scale (70.6%). Respondents expected less relevance for policymaking (42.7%) and scientific research (35.4%); it is also notable that for these two items a significant minority is unsure (7.6% for policy, 7.8% for research), whereas for the other options this ranged between only 0.8% and 2.3% of responses.

	Recorders	Restorers	Educators	Administrators
Contributing to nature conservation	↑**	↑***	↓***	-
Being connected to nature	↑***	-	-	↓*
Spending time outdoors	↓***	↑***	↓***	↓***
Learning more about nature	↑***	↓***	↑**	-
Working together with people	↓***	↑***	↓***	↓**
Improving other people's nature connectedness	↔***	↓↓***	↑↑***	↑***
Being attached to an area	-	↑**	↓**	-
Contributing to a sustainable world	-	↔*	↑***	↑***
Pleasure in doing something I'm good at	-	↓***	↑***	-
For future generations	-	↓*	↑***	↑**
Gives meaning to my life	-	-	↑**	↑**
Working with my hands	↓***	↑↑***	↓↓***	↓***
Contributing to science	↑↑***	↓***	↔***	↑***
Doing something for the neighbourhood	↓***	↑**	↓***	-
Determines who I am	↑**	↔***	↑**	↑***

Figure 6.4 | Differences in relative prominence of motivations for four types of nature volunteering.

An upwards arrow indicates that this is a 'top three' motivation relatively often for this type of nature volunteer, compared to the entire sample (a downwards arrow means the opposite). Double arrows indicate a relatively strong relationship (Cramer's $V \geq 0.2$). The symbol '↔' is used for four analyses where the direction of the relationship differed for frequent and infrequent volunteers of that type (i.e. the overall relationship had an ambiguous direction). Dash symbols indicate a lack of significant relationship. * $p < .05$, ** $p < .01$, *** $p < .001$.

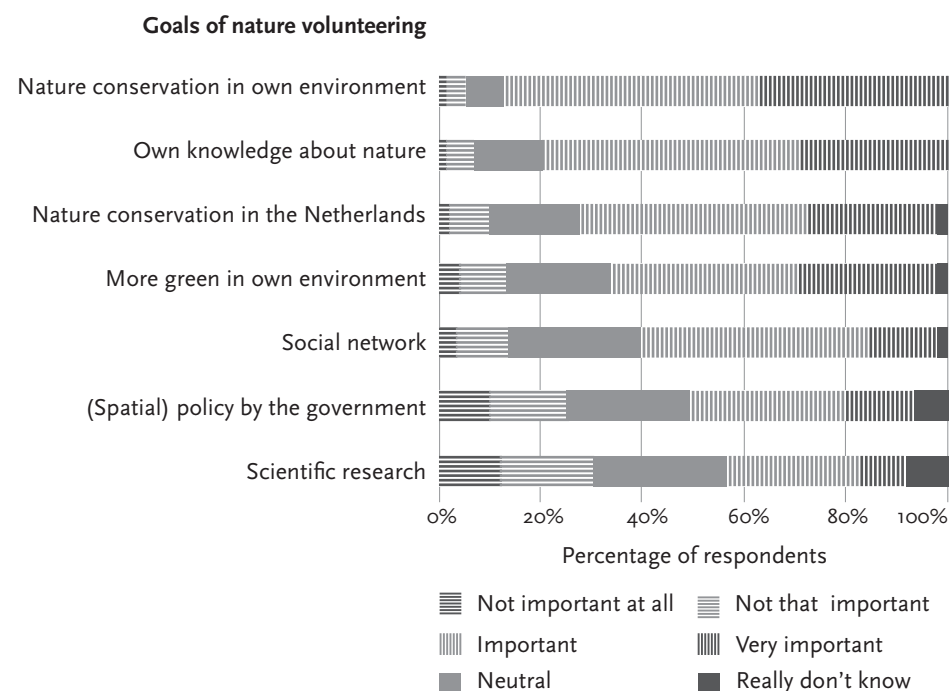


Figure 6.5 | Respondents' expectations of the importance of their volunteer work for different goals.

Ranked by descending order of combined 'Very important' and 'Important' responses.

We also found some significant relationships between types of nature volunteering and expected importance. For example, educators are relatively likely to indicate importance for their social network*** and knowledge about nature***. Restorers and administrators shared some similar perceptions with each other, notably an emphasis on local nature conservation and stimulating local green spaces (all ***). We also want to highlight how administrators were relatively likely to expect impacts of their volunteer work on policy***, which they share with the recorders***. Especially frequent recorders also stood out for their high expectations of contributing to scientific research***, with 62.7% of frequent recorders perceiving their contribution to this aim as important or very important.

6.3.4 Current attitudes towards nature volunteering

In terms of nature volunteers' experiences, we first inquired what form of support they would need. Respondents were provided with six possibilities, and could pick up to two answers. By far the most common desired form of support was further training or coaching, with 44.8% of respondents selecting this option. All other options were selected by 14.3% to 19.2% of respondents; in order from least to

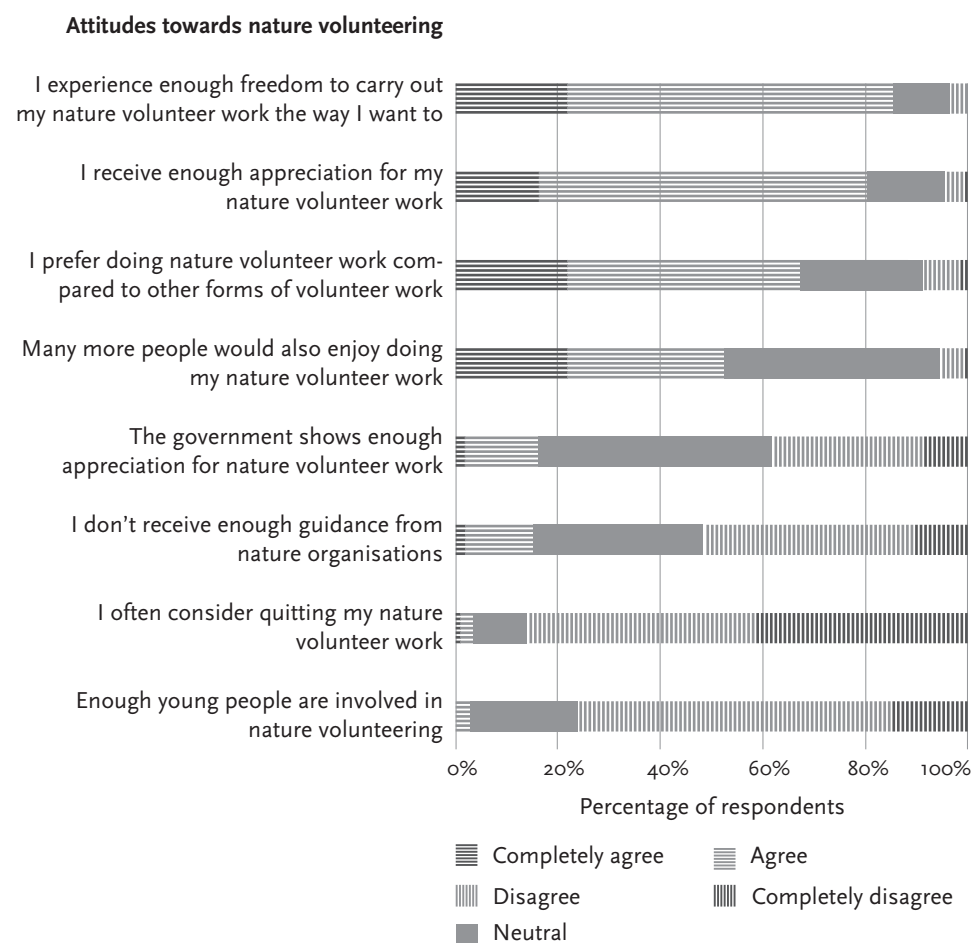


Figure 6.6 | Attitudes towards nature volunteering.

Ranked by descending order of combined 'Completely agree' and 'Agree' responses.

most often, these include support with arduous maintenance tasks (14.3%), reimbursement of expenses (14.8%), technical support (16.3%), a steady contact person (16.5%), and materials such as tools, soil or educational material (19.2%).

Here too we witnessed differences among types of nature volunteers, of which we highlight some here. We noticed very similar patterns between recorders and educators, who emphasised training and coaching (** for recorders, *** for educators), technical support (*** for both) and cost reimbursement (*** for both). Restorers were less in need of these forms of support (*** for all three), rather emphasising a need for materials*** and support in arduous maintenance tasks***. Administrators were not more or less in need of specific forms of support com-

pared to the entire sample, with the exception being a relatively high interest in technical support***.

Figure 6.6 shows the results of a series of statements on respondents' attitudes towards their volunteer work. Some encouraging findings include a high percentage of nature volunteers positive about the freedom in, and appreciation for, their volunteer work (85.3% and 80.3% respectively opted for either 'Agree' or 'Completely agree'), and 67.5% prefer nature volunteering to volunteering in other domains. In addition, only 3.3% of respondents frequently consider ceasing their volunteer work. We also uncovered some more mixed sentiments, however: between 33.0% and 46.0% gave a neutral response when asked about support from nature organisations, appreciation from the government, and whether other people would enjoy these activities. Finally, concerns about a lack of younger volunteers appear widespread, as only 2.8% agrees that enough young people are involved in nature volunteering, and a large majority (76.1%) disagrees.

We could also identify some differences among types of nature volunteers in how they responded to these statements. For example, in terms of receiving enough appreciation, frequent restorers*** and educators* responded relatively more positively compared to recorders*** and administrators**. Especially restorers appear positive that other people would also enjoy their activities***, and they are even less likely than the other groups to consider quitting***. Interestingly, while frequent recorders* and administrators*** are somewhat more doubtful whether others would enjoy their activities, they themselves report a relatively strong preference for nature volunteering over other types of volunteering (*** for recorders, ** for administrators). Finally, restorers appear more positive regarding governmental appreciation for their work compared to the other types of nature volunteers (** for restorers, *** for the other three).

6.3.5 Expectations for future involvement

In addition to respondents' perception of their current volunteer work, we also aimed to gain insight into their expectations for the future. Using a five-point scale, we found that a majority of respondents (63.1%) see similar amounts of nature volunteering in their future, with 25.2% expecting more and only 11.7% expecting less. Chi-squared analyses showed that especially restorers*** and recorders** expect higher engagement in the future.

In terms of broadening engagement, we analysed the type of activities nature volunteers would be interested in trying out, using the same list that we categorised

respondents' current volunteering with. Our data show that the most popular additional activity would be unstructured monitoring: of those respondents not yet doing this, 69.2% might want to get involved. We also found relatively high interest in structured monitoring (54.6%) and nature restoration (49.1%). Educational activities appear somewhat less appealing to those not yet involved (39.2% might be interested), while stands and stores (31.1%), management or board positions (30.2%) and policy involvement (28.7%) are comparatively less popular. In summary, we see that restoration and especially recording activities can count on significant interest among nature volunteers not yet involved in those activities.

Finally, we found some differences in how types of nature volunteers responded to these activity types. The overall finding from these analyses is that both recorders and educators generally report an above-average enthusiasm for trying new types of volunteer work (five and six out of seven activities respectively, all at ** or ***), while administrators emphasise educational volunteering and other administrative activities (all ***). Frequent restorers stood out for being comparatively less interested in trying different activities (for four activities ** or ***), despite the finding (reported above) that they are more likely to expect higher levels of engagement in the future. These results have important implications regarding diversification of activities, as discussed in the final section.

6.4. Discussion and implications

The goal of this study was to gain insight into the profile, motivations, experiences and future intentions of Dutch nature volunteers. Based on a diverse and large-scale sample ($N = 3775$), we have articulated a broad insight that is also sensitive to different types of nature volunteering. However, we also note that this picture should be complemented by more in-depth assessments; for instance, our study of motivations did not capture change over time, as has been called for in recent literature (e.g. Pagès et al., 2018). In addition, our broad inventory among both formal volunteers and informal citizen initiatives necessitated a self-selecting sampling approach, which (like our Dutch setting) somewhat limits generalisability. However, our considerable sample size and broad coverage enables identification of patterns of broader relevance, especially for countries with similar diversity in nature volunteering. In this final section, we first link some key findings to the broader literature, followed by the implications of this study for nature conservation.

In terms of nature volunteers' profile (RQ1), most striking are the advanced age and high level of education of our sample, which match patterns reported in other studies (Bruyere & Rappe, 2007; Guiney & Oberhauser, 2009). Regarding RQ2, we found that two motivations (contributing to nature conservation and a personal connection to nature) are of key importance to nature volunteers, regardless of activity type (Figure 6.3 and Table 6.1). These are closely followed by the opportunity to be outdoors, learn about nature, and social motivations. Nature volunteers expect their activities to be especially important for local and national nature conservation and their own knowledge about nature. Van den Born et al. (2018) also highlight the important role of knowledge and connectedness, and how they mutually reinforce each other, in motivating action for nature.

Regarding attitudes towards their volunteer work (RQ3), our respondents experience plenty of freedom and appreciation. However, many also report a desire for more training or coaching, and have concerns regarding a perceived lack of younger volunteers. Around 25% of our respondents indicate that they expect to do more nature volunteering in the future, and only 11.7% expect to be doing less; this hints at a significant potential for strengthening nature volunteering in the future (RQ4). However, we also found that some activities (especially biodiversity monitoring) are a more popular consideration than e.g. board membership. This aligns with findings by Weston et al. (2003, p. 210), who noted that bird conservation volunteers had little interest in administrative tasks.

Finally, we aimed to tease out differences based on activity type (RQ5). Amongst other findings, Figure 6.4 indicates that restorers have a somewhat divergent motivational pattern, with relatively strong emphasis on physical work and contributing to the neighbourhood. We also found that science is a relatively strong motivation for recorders, which they also expect their efforts to contribute to. In terms of current attitudes and future engagement, restorers are relatively positive about governmental appreciation for their efforts, and report relatively high levels of expected future engagement, yet appear less interested in trying new activities compared to other nature volunteers.

Before moving on the implications arising out of our results, one further limitation of this study must be addressed. The term 'volunteering' was used throughout this article with relatively little attention to its social and political dimensions. However, several scholars have argued why these aspects are important to keep in mind. For instance, Shachar et al. (2019) critically review several common assumptions behind volunteering, such as the notion that it is always an expression of free will and

unpaid leisure time. The authors note that certain expressions of 'volunteering', such as a perceived need to volunteer to be competitive in the job market, or being forced to carry out community service as a punitive measure, can significantly limit the degree to which volunteers experience free choice in their activities (pp. 251-253). Overgaard (2019) offers a similar perspective, arguing that volunteering should be seen not just as leisure but also as a form of unpaid labour, which brings to the fore issues such as job market accessibility and the way some forms of labour are valued more than others.⁴¹

These perspectives are important for understanding green volunteering as well, as they illustrate how issues of volunteer diversity and appeals for volunteering are embedded in larger social and political forces. For instance, biodiversity recorders are often mobilised as data contributors in ecological studies, yet biodiversity recorders have their own motivations, priorities and ways of working that may conflict with how the conditions for their participation are shaped by policy demands or project coordinators (Ellis & Waterton, 2004; Lawrence & Turnhout, 2010). In addition, our inquiry has assessed deeper motivations to participate in nature volunteering, yet a degree of necessity or even coercion may also factor into the decision to volunteer. The literature on environmental justice has in turn highlighted how a lack of sensitivity to volunteer participants' background, motivations and perceived barriers may reinforce issues of participant diversity. For instance, among participants in an environmental health project, Davis et al. (2020) found that those of higher socio-economic status were more likely to emphasise motivations related to learning or making a scientific contribution, while lower-income and Latino/Hispanic participants emphasised community solidarity and addressing pollution (p. 16). In other words, while our inquiry touches upon some important broader debates (e.g. how participant diversity may relate to not everyone being equally 'free' to volunteer, and why so much nature conservation work is carried out by volunteers in the first place), fully addressing these issues remains outside the scope of this study.⁴²

⁴¹ For instance, she illustrates how a feminist perspective helps elucidate how appeals for care work to be part of the voluntary sector may also work to reinforce underpayment of feminized labour (Overgaard, 2019, p. 139).

⁴² Aside from these discussions on the nature of 'volunteering', it is also important to recognise that not everyone shares the same definition of 'nature', and that what counts as 'nature' has political dimensions as well. Related cultural and political forces, such as the policy importance attributed to nature conservation and environmental protection, contribute to shaping supportive or challenging contexts for nature volunteering. For a more detailed illustration of this point, see Bell et al. (2008, pp. 3446-3448).

6.4.1 Implications

On the one hand, our study illustrates the importance of paying attention to differences among types of nature volunteers. Acknowledging these differences is relevant for determining optimal forms of appreciation and support, and for communication: for example, giving feedback emphasising the impact of volunteers' efforts, aligned to their motivations and expectations. In addition, this study provides relevant insights for volunteer managers wondering whether to diversify volunteers' activities. Our respondents express more interest in trying some activities than others, and some types of volunteers are more interested in broadening their current activities than others. Matching tasks and motivations is an important component of volunteer management (West & Pateman, 2016; Willems & Walk, 2013), and asking volunteers to take up unwanted extra responsibilities risks leading to diminishing motivation and eventually volunteer burnout (Measham & Barnett, 2008, p. 548).

However, while we elicited many relevant differences between types of nature volunteers, this study also offers another perspective. Despite how groups such as recorders and educators are sometimes treated as fully distinct, our results highlight that in reality many nature volunteers (here: 66.2%) are engaged in several of these activities. Similarly, many studies make a strong distinction between formal volunteering and informal citizen initiatives, yet almost 25% of our respondents take part in both. This illustrates how such demarcations are quite fuzzy in practice. This perspective has important implications for how nature organisations could conceive of volunteers' engagement. If many nature volunteers are engaged in diverse activities, and formal and informal volunteers are not mutually exclusive, it becomes especially important for practitioners to adopt a broad perspective on nature volunteering. Brudney and Meijs (2009) have advanced the notion of volunteers and their energy as a natural resource, one that must be managed responsibly to prevent unsustainable use and depletion. The key implication for nature organisations is to see the volunteers they work with as more than 'their volunteers', and other nature organisations as collaborators. Positive experiences in one volunteering programme stimulate future engagement in others, while negative experiences could lead to the decision to quit entirely (Brudney & Meijs, 2013, p. 33). As such, cherishing volunteers and managing volunteer energy becomes a shared responsibility of all organisations that are dependent on their efforts (Brudney & Meijs, 2009, pp. 575-576), which implies that nature organisations should nurture a collaborative mode of operation.

This perspective could also be a promising way to combat the difficulties with engaging younger nature volunteers, identified as a key issue by both nature organisations and our respondents. Authors such as Hustinx (2010b) have argued that volunteering is changing and diversifying, with volunteers placing less importance on ties to specific organisations, but rather on the aims and accomplishments of specific activities. With especially younger volunteers thus more likely to connect to activities rather than organisations, the importance of a more communal and collaborative perspective among nature organisations becomes clear. This need to break down barriers between nature organisations has also been noted in the recent action plan (Actieplan Groene Vrijwilligers, 2018), and can be seen in new initiatives such as the Green Traineeship, a collaboration between six Dutch nature organisations to provide young people the chance to take action for nature (IVN, n.d.).

Finally, this study aims to contribute to understanding citizens' action for nature, for which motivations are key (Bennett et al., 2018). This study shows how, regardless of activity type, the conservation of and connection with nature are key motivations for nature volunteering. We urge nature organisations to acknowledge and emphasise this strong nature-oriented motivation. At the individual level, this is important to do justice to people's reasons for participating, and helps prevent disengagement or crowding out (Rode et al., 2015; Vohland et al., 2019). At the societal level, acknowledging the key role of nature conservation and connection as motivations for volunteering is equally important. Bouman and Steg (2019) have argued that one of the key barriers in stimulating pro-environmental action is an expected negative response by others, and note that 'to unlock the full potential of people's biospheric values, people need to recognise that biospheric values are widely endorsed within the groups and society they belong to' (p. 29). This study adds to this perspective by showing that there is indeed a large community of people with strongly nature-oriented motivations dedicating themselves to environmental stewardship.

All across the world, an extraordinary number of active citizens play a crucial role in nature conservation through different types of formal and informal volunteering. Making their efforts and key motivations visible contributes both to greater appreciation of the individual, and the cultivation of a collective appreciation of citizens' actions for nature. This greatly benefits both nature volunteers and, through their crucial efforts, nature itself.

Acknowledgements

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Appendix C

Of the total sample of 3775 respondents, 3502 (92.8%) provided the four numbers of their postal code. Using ArcGIS, we constructed a distribution map of respondents (Figure 6.7) with dot size indicating the relative number of respondents (see legend). We extend our thanks to David de Jong (Radboud University) for making this figure.

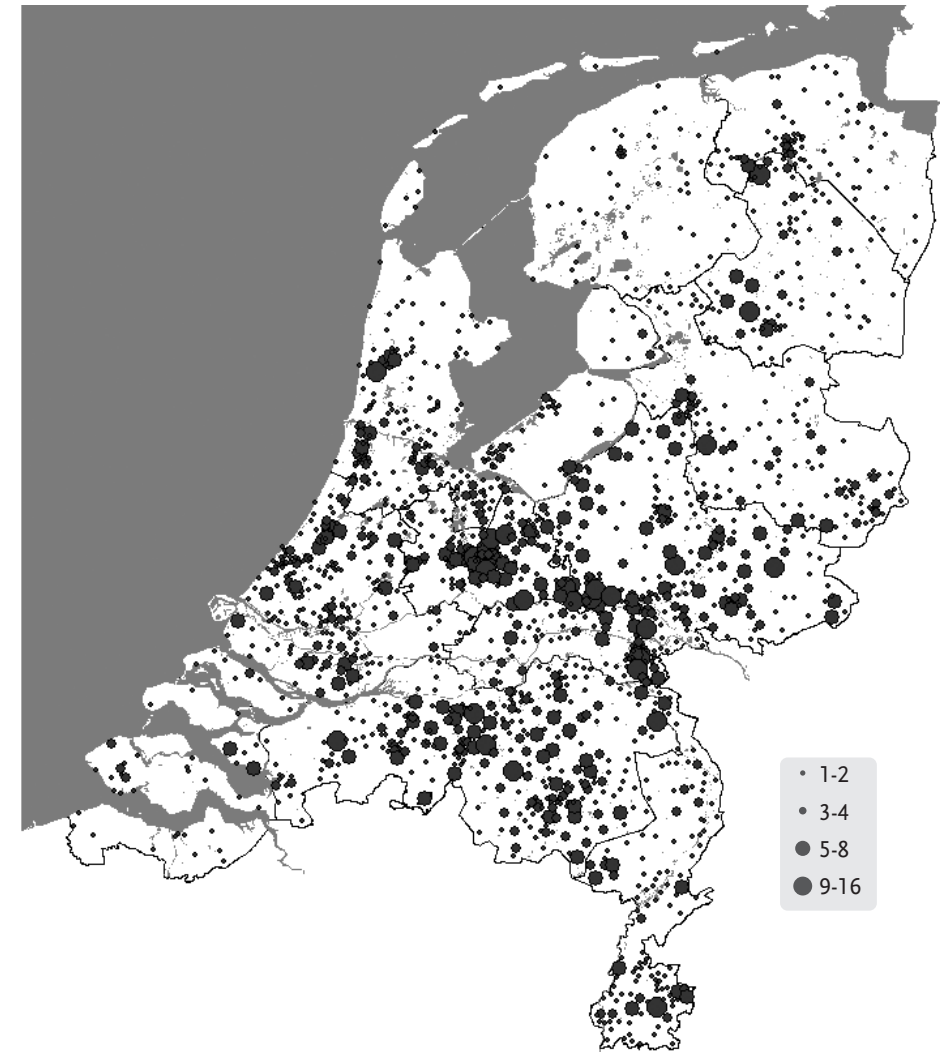


Figure 6.7 | Distribution of respondents across The Netherlands.

Source files: ESRI FGDB, CC-BY ESRI; BRK, CC-BY Kadaster; Shapefile, CC-BY J.W. van Aalst.

Appendix D

	Recorders	Restorers	Educators	Administrators
Demographics				
Age	<.05	<.001	<.001	<.01
Gender	<.001	<.001	<.001	<.001
Education	<.01	<.05	<.001	<.001
Organisational form	<.001	<.001	<.001	<.001
Expected importance				
Nature conservation in own environment	<.05	<.001	n.s.	<.001
Own knowledge about nature	<.001	<.01	<.001	<.01
Nature conservation in the Netherlands	<.001	<.01	n.s.	n.s.
More green in own environment	n.s.	<.001	n.s.	<.001
Social network	n.s.	<.01	<.001	<.001
(Spatial) policy by the government	<.001	<.05	n.s.	<.001
Scientific research	<.001	<.001	<.001	<.001
Desired support				
Support with arduous maintenance work	<.01	<.001	<.001	n.s.
Reimbursement of expenses	<.001	<.001	<.001	n.s.
Technical support	<.001	<.001	<.001	<.001
Steady contact person	n.s.	<.01	n.s.	n.s.
Other materials (tools, potting soil, educational materials, etc.)	<.001	<.001	<.05	n.s.
Training/coaching	<.01	<.001	<.001	n.s.
Attitudes towards current volunteering				
I experience enough freedom to carry out my nature volunteer work the way I want to	n.s.	<.05	n.s.	n.s.

	Recorders	Restorers	Educators	Administrators
I receive enough appreciation for my nature volunteer work	<.001	<.001	<.05	<.01
I prefer doing nature volunteer work compared to other forms of volunteer work	<.001	n.s.	<.01	<.01
Many more people would also enjoy doing my nature volunteer work	<.05	<.001	<.05	<.001
The government shows enough appreciation for nature volunteer work	<.001	<.01	<.001	<.001
I don't receive enough guidance from nature organisations	<.05	n.s.	n.s.	n.s.
I often consider quitting my nature volunteer work	n.s.	<.001	<.05	n.s.
Enough young people are involved in nature volunteering	<.05	<.001	<.001	<.001
Expectations for future involvement				
Future amount	<.01	<.001	n.s.	n.s.
Structured monitoring	<.001	n.s.	<.01	n.s.
Unstructured monitoring	<.001	<.01	<.001	n.s.
Restoration / Maintenance	n.s.	a	n.s.	n.s.
Educational activities	<.001	<.001	<.001	<.001
Stands & Stores	n.s.	<.001	<.001	n.s.
Management & boards	<.01	n.s.	<.001	<.001
Contributing to policy	<.01	<.01	<.001	<.001

^a Since all current restoration volunteers already carry out this activity, this response option was not presented to them.

Table 6.2 | Overview of crosstabs analyses of different variables for each type of nature volunteer.

For more detail on the procedure, see section 6.3.1. The table shows the p-values for each chi-squared test; n.s. = not significant. The analyses of motivational data are not listed in this table, as those data are already included in Figure 6.4.

7

The everyday reality of nature volunteering

*An empirical exploration of reasons to
stay and reasons to quit*

This chapter has been submitted as: Van den Born, R. J. G., & Ganzevoort, W. (2021). *The everyday reality of nature volunteering: An empirical exploration of reasons to stay and reasons to quit*.

Abstract

Volunteers are crucial for ecological research and nature conservation and education. However, the experiences of nature volunteers, and what motivates them to stay or to quit, have received little empirical attention. This despite calls in the general volunteering literature for volunteer management to pay more attention to retaining and supporting current volunteers.

Using open survey questions among a diverse sample of formal and informal Dutch nature volunteers ($N = 3775$), we present a qualitative analysis of important aspects of the everyday reality of nature volunteering. This includes the factors that could cause nature volunteers to quit, and what motivates them to keep going. We also inquire into difficult situations encountered by volunteers, as these have been identified as important reasons to quit.

We find that difficult situations and reasons to quit in nature volunteering reflect a variety of factors, including conflicts and tensions, volunteers' personal circumstances (employment, age, health), and insufficient support or appreciation. Our respondents are motivated to continue because of pleasure in the activities and the people they meet, but also by a connection with and love for nature, and the role of nature volunteering in living a meaningful and fulfilling life.

Our results illustrate how the decision to stay or quit as nature volunteers is informed by diverse considerations, many of which are not specific to nature-related activities. In our discussion, we highlight the importance of making volunteers' contribution to nature conservation explicit, voicing appreciation, and protecting them from feeling overburdened.

7.1 Introduction

As is true for many important challenges in the 21st century, the conservation of nature and biodiversity is highly dependent on volunteers. Volunteers play an important role in protecting and managing nature and greenspace, ecological research, and nature education (Bixler et al., 2014; Dresner et al., 2015; McKinley et al., 2017). Concerns related to recruitment challenges and the demographic profile of current nature volunteers are voiced frequently (Hobbs & White, 2012; Merenlender et al., 2016). This is not just true of the scientific literature; in the Netherlands the recent 'Action Plan Green Volunteers' (Actieplan Groene Vrijwilligers, 2018) highlights both the need for recruiting more volunteers, and for more diversity in their demographic profile.

However, volunteering scholars have cautioned that it is important to look beyond the question of how to recruit more volunteers, and pay much more attention to the experiences and support of current volunteers. Brudney and Meijs (2009) argue that current practices in volunteer management place an overly strong emphasis on recruitment, to the detriment of committing resources to supporting and appreciating current volunteers. The authors propose an alternative model of volunteer management that takes volunteers' current and future engagement and motivation as a starting point, rather than just the needs of the specific organisation to which a volunteer is currently committed (p. 575). From this perspective, volunteering is about more than an organisation designing activities and placing demands on volunteers, but rather volunteers and organisations jointly aligning their respective aims and possibilities to make sure volunteers maintain their motivation. This is not just important to sustainably manage volunteer involvement in their current role and prevent volunteer burnout (Byron & Curtis, 2001), but also to prevent volunteers from growing disillusioned with volunteering in the future, making it an important priority for all organisations working with volunteers (Brudney & Meijs, 2013).

Such a perspective on volunteering emphasises the importance of maintaining volunteers' motivation over the longer term, helping them deal with barriers and difficult situations, and supporting them to avoid burnout and other reasons to quit. In other words, it invites an increased interest in understanding volunteering from the perspective of the volunteer. This involves research to help understand volunteers' motivations, but also their experiences (West & Pateman, 2016). Indeed, Bussell and Forbes (2002, p. 250) argue that 'in a dynamic changing environment, where the number of voluntary organisations is growing and the volunteer pool is dimin-

ishing, organisations must understand not only what motivates volunteers but also what keeps them’.

Despite this clear need, Wilson (2012, p. 201) notes that the experiences of volunteers have received far less attention in empirical scholarship compared to the antecedents to volunteering, such as volunteers’ background, personality (Ackermann, 2019; Handy & Cnaan, 2007) and initial motivations to volunteer. This is noteworthy considering how several prominent models and theories in the volunteering literature emphasise the importance of studying volunteer experiences and the factors driving sustained volunteering. Clary and Snyder (1999) argued the necessity of studying not just why people become volunteers in the first place, but also why they continue to do so. Motivations that play a role in the decision to continue volunteering can be different compared to the initial drive to do so; for example, Clary et al. (1996, p. 494) found that volunteers with more years of experience reported learning and career-related motivations as less important compared to less experienced volunteers. Another important takeaway of their work is that the decision to stay or quit is influenced by both individual factors (e.g. motivations) and the events and circumstances encountered in the everyday reality of volunteering (Clary & Snyder, 1999, p. 159; see also Penner, 2002). This highlights the importance of eliciting and understanding the situations that volunteers encounter and their interaction with other individuals and organisations. This line of research also discusses the importance of matching volunteers’ experiences with their motivations (Houle et al., 2005; Willems & Walk, 2013), which logically identifies a mismatch between volunteers’ motivations and the events and circumstances they encounter as a cause for losing motivation and a reason to quit.

Other volunteering scholars have also emphasised the importance of studying the everyday experiences (good and bad) of volunteers. Snyder and Omoto (2008) advance their Volunteer Process Model (p. 7), which identifies the experiences of the volunteer as one of its three key stages of analysis (including aspects of personal and social experiences, as well as the organisational and societal context). Negative events and experiences can indeed be an important cause of volunteers quitting, even if they were otherwise content with their volunteering (Garner & Garner, 2011, p. 815).

7.1.1 The volunteer retention literature

Above, we showed how the literature already reveals some factors that play a role in keeping volunteers engaged. There is also a need for more insight into the difficult situations volunteers encounter, and their reasons for quitting. Some studies have

focussed on the factors that may cause volunteers to quit (e.g. Skoglund, 2006; Yanay & Yanay, 2008). Hustinx (2010a) studied reasons to quit among 99 ex-volunteers of the Flemish Red Cross, and found that most respondent raised at least one cause related to personal issues (such as time constraints, family demands or other personal circumstances). However, more than half the respondents (also) raised organisational issues, including support and appreciation as well as satisfaction with the volunteer work (p. 246). Similarly, in their survey study of motivations and reasons to quit among Flemish Scouts, Willems et al. (2012) found a range of possible reasons to quit, including practical constraints (e.g. time pressure), group processes (conflicts or lack of appreciation) and factors related to motivation (including a lack of learning, impact or challenge). However, they also found factors related to organisational support (e.g. lack of guidance) to play an important role.

In their review of the literature on volunteer retention, Locke et al. (2003) similarly distinguish between personal and organisational factors that influence the decision to stay or quit. Common personal reasons to quit include rapid changes in one’s personal life, moving house, or other time commitments (e.g. family care, a new job or the birth of a child). These factors are also found in research on barriers to volunteer; Sundeen et al. (2007) identified a lack of time, lack of interest in volunteering and health problems as the three most common barriers reported by non-volunteers. In terms of organisational factors, Locke et al. (2003) discuss negative experiences due to unprofessional conduct or lacking organisational capacity, being overburdened by requests and demands, a lack of freedom, and the rising feeling of not being appreciated by the organisers. They specifically highlight the importance of ‘a *congruence* between the goals of the organisation and those of the individual’ (p. 90, emphasis in original). While personal circumstances are thus found to be key factors in the decision to drop out of volunteer work, those may often be outside of the control of a volunteer organization (Bussell & Forbes, 2002, p. 251). On the other hand, organisational factors that constitute reasons to quit are more avoidable. The remainder of this section thus focusses on further identifying organisational factors that influence retention of volunteers.

Studer and von Schnurbein (2013) review the literature on organisational factors that affect volunteers’ experiences. One factor that they highlight for shaping a supportive environment for volunteers is the balance between paid staff and volunteers (p. 414). Conflict can arise because paid staff feel that their responsibilities are taken over by volunteers (Hager & Brudney, 2011, p. 142), but volunteers may also worry about being mobilised as replacements of paid staff. The balance between paid and volunteer staff relates to a broader issue of perceived (in)justice: Hurst

et al. (2017) found that intentions to quit were higher for volunteers who perceive injustice in how resources (including time and training) were distributed within a volunteer organisation.

Alfes et al. (2016) highlight how volunteers are less likely to quit if they feel a sense of psychological engagement in their activities, which the authors define as volunteers feeling 'fulfilled, invested, and energized by their volunteer tasks and feel[ing] the ability to express their true selves in the performance of their volunteer work' (p. 597). The authors argue that volunteer engagement helps volunteers deal with challenging events or circumstances (p. 602). Importantly, they also show that expressing appreciation and providing emotional support is an important way for organisations to inspire volunteer engagement. Garner and Garner (2011, p. 815) confirm that negative experiences can be detrimental to volunteers' motivations, as noted earlier, but also that support offered to volunteers by their organisation becomes especially important in light of negative events or experiences.

Harp et al. (2017) add that role ambiguity, a situation when volunteers are unclear of what is expected of them or what they can contribute, negatively affects volunteer engagement. Volunteers thus benefit from clearly defined roles that they can identify with (Snyder & Omoto, 2008, p. 13; Studer & von Schnurbein, 2013, pp. 416-417) as well as freedom and flexibility in choosing and scheduling activities (Haivas et al., 2013; Studer & von Schnurbein, 2013, p. 421). Unsurprisingly, scholars have illustrated that volunteers who feel pressured or coerced to carry out volunteer work report lower levels of satisfaction (e.g. Millette & Gagné, 2008) making freedom in carrying out volunteer activities an important factor in maintaining enthusiasm.

7.1.2 Reasons to stay and quit in nature volunteering

While the volunteering literature in general has spent relatively little attention on studying volunteers' experiences, this seems especially the case for the literature on nature volunteering. Miles et al. (1998) noted that more attention ought to be paid to understanding nature volunteers' experiences, including negative experiences and costs of volunteering (p. 39). These topics require more attention, as volunteer experiences may differ markedly between domains, and the literature on nature volunteering currently appears to draw on insights from the general volunteering literature only to a limited degree. Here we draw on some insights from work that has studied reasons to stay or quit in nature volunteering, before detailing our research objective and research questions.

In line with the literature discussed earlier, some scholars in the field have investigated the differences between motivations to start and motivations to stay as a nature volunteer. For example, Asah and Blahna (2013) studied the factors associated with conservation volunteers' commitment. They found that nature-related motivations scored higher when volunteers were asked why they volunteer in the first place, compared to motivations related to contributing to the community and meeting social aims, which instead were better predictors of volunteers' sense of commitment. In an earlier study, Ryan et al. (2001, p. 639) had found similar patterns. They reported that volunteers gave high importance to motivations such as learning and contributing to the environment, yet commitment over a longer period of time was better predicted by social relations (meeting new people and bonding with familiar ones) and organisational support (including clarity of tasks and well-organised activities).

The study of O'Brien et al. (2010) looked at both the experiences of conservation volunteers but also at hindering factors. Participants highlighted the physical nature of the work and social bonding with fellow volunteers as important draws, while barriers to continue included a lack of challenge or feedback, and exclusionary group dynamics (pp. 540-541). Dresner et al. (2015, p. 1005) found through focus groups that social bonding and love for working in nature helped keep some volunteers going, though others quit due to perceiving themselves as lacking sufficient knowledge, or failing to see how their effort could make a significant contribution. Indeed, whether volunteers feel that what they do matters is found to be important in several studies. For instance, while respondents in a study on environmental volunteering projects in Greece (Liarakou et al., 2011) reported well-organised activities to be an important factor in the decision to volunteer again in the future, they were also motivated by 'immediate and visible results' (p. 659). Gooch (2005) also found that volunteers valued doing important work that contributed to environmental stewardship and learning, but sometimes struggled to balance volunteering with other time demands (work, family). Pagès et al. (2018) also found personal circumstances, such as commitments to work or family, to be common reasons for conservation volunteers to become inactive. These results mirror personal reasons found in the broader volunteering literature.

The important role of the social setting, within both volunteer groups and the larger organisation, for the decision to stay or quit is also found in some work on nature volunteers. Abell (2013) studied volunteers in animal conservation, and found that social factors played an important role in motivating continued volunteering: respondents appreciated feeling valued within a project, and meeting and working

with likeminded people (p. 166). At the same time, conflicts could arise if some volunteers were perceived as having different goals or priorities, which threatened group motivation and could result in the decision to quit.

Finally, studies of community gardening (Pitt, 2014; Rosol, 2012; Sonti & Svendsen, 2018) have highlighted several aspects that keep volunteers committed, including finding pleasure and fulfilment in the activities, and their relaxing and therapeutic qualities. However, these authors also identified several organisational factors that may lead volunteers to quit: for example, Pitt (2014, p. 88) highlighted unprofessional conduct by the organisers and a lack of appreciation and freedom in carrying out the activities, and Rosol (2012, p. 248) similarly found that bureaucratic control would diminish commitment amongst community gardeners.

7.1.3 Research aim

The preceding sections have demonstrated that there remains much to learn about how volunteers experience their volunteer work. We have also shown how this is especially true for the challenging situations volunteers might encounter, the factors that keep them going, and why they may decide to quit. We identified several personal and organisational factors that influence volunteers' decision to stay or quit, which includes how they deal with difficult situations. Finally, we have argued that there is especially a lack of empirical work on how such factors play out in nature volunteering, with available empirical results matching some of the findings from the broader volunteering literature. Based on these observations, the objective of the present paper is to provide further insight into the main reasons why nature volunteers decide to quit or continue, using the Dutch context to do so. Since much of the volunteer literature (both in general and regarding nature volunteering) focusses on formal volunteers, i.e. those conducting their activities under the auspices of some formal organisation (Lee & Brudney, 2012), we also include nature volunteers in more informal settings such as neighbourhood initiatives. This allowed us to include a broader community of nature volunteers, though the goal of our analysis is not to compare both groups. Based on our objectives, we formulated the following three research questions to guide our empirical enquiry:

1. What are the most difficult situations that nature volunteers report experiencing?
2. What do nature volunteers report as most important (actual and potential) reasons to quit nature volunteering?
3. What do nature volunteers report as the most important reasons to continue their activities?

7.2 Data and methods

The data presented in this paper were collected as part of a larger survey study into the profile, motivations and experiences of Dutch nature volunteers (Ganzevoort & van den Born, 2020). This study took a broad view on nature volunteering, including in its sampling not only volunteers physically working in nature (e.g. nature restoration and greenspace management), but also volunteers in nature education, biodiversity citizen scientists and volunteers involved in coordination and administration (e.g. volunteer board members). As part of a section on volunteers' experiences, the survey included a series of four open questions to which respondents could enter free-text responses of any length. In line with our research questions, these four questions were as follows (translated from Dutch):

1. What was the most difficult situation you were confronted with in your nature volunteering? ($n = 1883$)
2. If you know people who quit nature volunteering, what was the most important reason for doing so? ($n = 2039$)
3. For what reason have you ever quit nature volunteering, or what could be a reason for you? ($n = 1852$)
4. What is the most important reason for you to continue with your nature volunteering? ($n = 2730$)

We opted for open questions for several reasons. Firstly, we did not identify a suitable existing model or typology to use as a survey instrument, and encountered a limited availability of existing survey items on reasons to stay or quit volunteering, especially in the context of nature-oriented volunteer work. As such, we opted for a more exploratory empirical approach using open survey questions. Perhaps a more important methodological consideration, however, was the added depth a more qualitative analysis of free-text responses would offer. By allowing for free-text responses, we offered respondents the opportunity to voice their reasons and experiences in their own words, without being biased by prompts from pre-designed response options formulated by the researchers. Our questions specified that we were looking for key situations, reasons or considerations; while our objective is not to isolate one 'most important' factor at the expense of all others, we did want to challenge our respondents to identify truly crucial considerations for them in the decision to stay or quit.

The online survey was launched in October 2017 and distributed through the networks and social media of a great number of Dutch organizations and platforms involved in nature volunteering. These included biodiversity monitoring societies

working with volunteers to collect biodiversity data, organisations working with volunteers for nature and greenspace management and restoration, volunteer nature education programmes, botanical gardens and nature-oriented citizen initiatives. We also mobilized the social networks of the volunteers themselves by requesting respondents to send the survey to fellow volunteers. Over the span of five weeks, we collected 3786 responses; after data cleaning, 3775 responses remained as the final sample of the survey study.

Since open questions are relatively demanding for respondents, and our questions tackled some potentially sensitive topics, we opted to make each of the four questions optional. This means that response rates differed per question; the number of responses are listed after each of the questions above. This created four datasets for further analysis.

In order to analyse these data, for each dataset we used a qualitative coding approach to categorise the answers provided by the respondents. As a first step, the first author carefully read each of the responses in a dataset, applying codes to each response. Since responses sometimes reflected more than one event, motivation or issue, we opted to allow more than one code per response where appropriate. As more codes were developed, these were constantly compared to the existing code list, sometimes resulting in codes being split or merged with previous ones. This process of constant comparison continued until an entire dataset had been fully coded. At this point, a final check of the completed code list was done to verify that codes did not overlap with others and that they reflected the contents of the coded passages well. As a final step in the analysis, for each code the number of coded passages was determined to arrive at total counts for comparison of relative occurrence. These steps were repeated for each of the four datasets.

For the first three questions, we present a text box (Boxes 7.1 to 7.3) with all response categories that were attributed to at least fifty responses. Since we found more commonalities in the responses to the reasons to continue nature volunteering, for the final question the text box (Box 7.4) lists all response categories that were used at least a hundred times. In the accompanying text, we describe these main themes in the responses and provide some illustrative quotes from the datasets (translated into English by the authors). However, in a qualitative analysis importance should not only be attributed to the most common responses. As such, in the text we also describe responses that occurred less often, but still revealed some interesting events or experiences.

7.3 Results

7.3.1 Difficult situations encountered in nature volunteering

When analysing the difficult situations that nature volunteers had to deal with, six types of situations were mentioned more than 50 times (Box 7.1). By far the most mentioned are conflict situations: disputes and arguments among volunteers, or between the volunteer and other individuals or involved parties (e.g. nature organisations). Respondents describe situations in which fellow volunteers 'demand more and more privileges for themselves little by little, and try to maintain those privileges through intrigue and stirring trouble' or note 'conflicts with farmers, local citizens or hunters who are not happy with bird protection measures'. Being confronted with illness or even death of fellow volunteers is also something that volunteers experience as very difficult and distressing, as is witnessing accidents in the field, for instance when performing conservation work such as trimming or cutting trees.

Working on a project together requires a mutually agreed-upon vision, yet this is not always the reality of volunteering. The third most mentioned type of difficult situation related to different opinions and conflicting visions that obstruct collaboration. These can be among volunteers, but can also relate to disagreement with the decisions or demands made by a volunteer organisation; for example, one respondent struggled with a 'mismatch between my vision on sustainability and those of the rest of the organisation'. Nature volunteers also encounter aggression: they mention dog owners who refuse to leash their dogs, angry recreationists or authoritarian colleagues. Moreover, and related to this aggression, several volunteers note that they find it difficult to call people to account to address this kind of behaviour and ignorance.

As will have become clear from our analyses above, most difficult situations that nature volunteers encounter are related to interaction and collaboration with fellow volunteers and others. However, in fifth place we find an issue of a different order. Because of a general perceived shortage of volunteers and difficulties in recruiting and retaining them, current volunteers frequently feel that they are being asked to do too much. Some specifically refer in this context to the small number of young people that join the group.

Also mentioned regularly, though less so than the situations described above, are managerial hassle, intense physical work, people or organisations that do not stick to agreements and rules, and having to keep motivating and enthusing fellow

volunteers or excursion participants. Some volunteers also report a lack of appreciation, or feel that they themselves or others lack sufficient knowledge. Others mention macho behaviour and one-upmanship (which, according to these respondents, especially men are guilty of) and situations in which they as women did not feel treated equally. Finally, some mention the tension between professionals and volunteers: 'The unpleasant feeling that volunteers have to do the work formerly done by paid employees'.

1. Conflict situations (175)
2. Experiencing illness and accidents (of fellow volunteers or themselves) (95)
3. Differing opinions or visions that hamper collaboration (81)
4. Dealing with aggression and angry people (68)
5. Becoming overburdened due to a shortage of volunteers (65)
6. Calling others (e.g. fellow volunteers or recreationists) to account for their behaviour or ignorance (51)

Box 7.1 | Difficult situations in nature volunteering mentioned at least 50 times.
Code frequencies in brackets.

7.3.2 Reasons why others quit nature volunteering

Aside from reasons why our respondents themselves would quit, as discussed in the next section, many volunteers will have experienced situations in which others decided to drop out. Understanding those situations also provides insight into reasons for volunteers to quit. We thus asked our respondents for factors that caused fellow volunteers to quit their nature volunteering (Box 7.2).

By far the most commonly expressed reason why other volunteers quit is ageing and health problems, which is mentioned more than twice as frequently as the second reason: a lack of time. This lack of time is often caused by obligations to family (including family care) and education. One volunteer noted in this context that fellow volunteers had quit due to 'age, lack of time and because volunteers are asked to do more and more, which slowly changes the voluntary character into something obligatory'. Related to this, we also found signs of conflict between paid and volunteer work: many respondents mention that fellow volunteers quit when they found a job or found their regular job to be too demanding. At a fourth place, we find disagreements or conflict concerning the nature of the volunteer work or the conduct of the organisation. People also mention that volunteers' interests changed. The support and appreciation of organisations also seems to be very im-

portant, because people report that a lack thereof was a reason for others to quit. Examples included comments that 'the board didn't show enough appreciation' or that 'conservation organisations don't listen well (enough) to people on the ground doing the work. People don't feel like they're taken seriously'.

Reasons mentioned fewer than 50 times include moving house, and tensions between professionals and volunteers: fellow volunteers sometimes felt that they were doing work previously done by paid employees, and that paid employees think they know better.

1. Ageing and health problems (798)
2. Lack of time (361)
3. Paid job (145)
4. Conflicts/discord (78)
5. Other interests (64)
6. Lack of appreciation (59)
7. Personal circumstances (50)
8. Lack of (practical) support (49)

Box 7.2 | Reasons why others quit nature volunteering mentioned at least 50 times.
Code frequencies in brackets.

7.3.3 Reasons to quit nature volunteering

A comparison between Boxes 7.2 and 7.3 shows a strong resemblance between the reasons to quit for our respondents' fellow nature volunteers, and the reasons why they themselves have ever quit, or potentially would quit. In fact, the top three reasons are identical (Box 7.3). Respondents are afraid that high age and health problems could make it physically too strenuous to continue their volunteer work in nature, and once again, family, family caring and paid employment can sometimes be hard to combine with volunteering. We also notice some differences in relatively prominence, however. For instance, while lack of support and appreciation from organisers was already reported as important reasons for fellow volunteers to drop out, our respondents are especially likely to voice them as reasons for quitting themselves. One respondent would quit if they ever noticed 'that my organisation offered no or insufficient support to their volunteers, while at the same time expressing how incredibly happy they are with the efforts of the volunteers', while another complains about 'the totally inactive attitude of the organisation towards the volunteers. Even a New Year's wish is too much to ask'.

The results on difficult situations in nature volunteering discussed above (Box 7.1) already showed that most related to interaction and collaboration with other people. It comes as no surprise that people are inclined to leave if such interactions are not characterised by a positive atmosphere in the group, when conflicts arise, or when people disagree about the direction of the volunteer work and involved organisations, or with the actions of fellow volunteers. One respondent voiced this reason to quit as follows: ‘When collaborating with colleagues doesn’t go well. There has to be a connection with the people you work with’.

Mentioned less frequently than the reasons above are situations in which bureaucracy and rules prevail or when too much time is spent on administrative tasks: ‘The organisational stuff, that is something I already have to do at my job. I want to go out in nature and get to work without first having to make all sorts of arrangements’. Volunteers are also inclined to quit if they no longer perceive their work as meaningful and effective. Another reason is moving house, although several respondents mention they would look again for nature volunteer work at their new place. Finally, it is striking that although we asked for reasons to quit here, a reasonable number of volunteers emphasise they do not consider quitting at all: ‘Stopping is not an option. Nature needs nature workers’, ‘Stopping with green work is unthinkable for me’ and ‘I have never stopped and would only stop if I pass away’.

1. Ageing and health problems (659)
2. Lack of time (247)
3. Paid job (140)
4. Lack of appreciation (99)
5. Lack of (practical) support (66)
6. Atmosphere in the group (63)
7. Conflict situations and discord (63)

Box 7.3 | (Potential) reasons for our respondents to quit nature volunteering mentioned at least 50 times. *Code frequencies in brackets.*

7.3.4 Reasons to continue nature volunteering

The reasons our respondents gave for why they continue nature volunteering despite its sometimes-difficult reality are incredibly diverse, and many answers were mentioned by multiple respondents. Therefore, all answers reported at least 100 times are listed here, resulting in a list of nine reasons (Box 7.4).

The top three reasons mentioned relate very strongly to the activities themselves: respondents reported taking pleasure in being involved in their activities, and they

enjoy working together with other people. The opportunity to be outside in nature while volunteering is also an important and unique reason to continue with nature volunteering: ‘To be outside in nature is always a pleasure, especially when it contributes to nature management’. Volunteers report that they want to continue as long as they experience the work to be meaningful and fulfilling: one respondent notes that ‘it is fulfilling to be able to give people, young and old, a nice and educational experience in nature’ while another comments that ‘it brings joy and meaning to my retired life’.

Besides the desire to be active in nature, three other nature-related reasons are frequently mentioned. Almost 200 volunteers emphasised that they find it very important to pass on love for and knowledge about nature to others, with another 75 respondents specifically mentioning a generational issue of passing appreciation of nature on to the next generations: ‘I can share my experience with young people and they can help me cross a ditch’. Almost as many respondents are driven to continue by their desire to contribute to the conservation of nature and landscapes, often in their own local area. Finally, we found connectedness with and love for nature to be an important motivational factor for continued nature volunteering. Reasons that are given between 50 and 100 times are: the work is important and necessary (out of care for nature and the earth); for the sake of future generations; enjoying the beauty of nature; staying healthy by doing nature volunteering; and volunteering being part of respondents’ identity (‘Nature volunteering is a way of living for me’).

1. Pleasure in the activities (662)
2. Working together with other people (518)
3. Being active in nature (424)
4. Meaningfulness & fulfilment (246)
5. Achieving results & useful work (221)
6. Sharing knowledge of and love for nature with others (195)
7. Contributing to conservation of nature and landscape (184)
8. Learning and discovery (163)
9. Connection with and love for nature (116)

Box 7.4 | Reasons to continue nature volunteering mentioned at least 100 times. *Code frequencies in brackets.*

7.4 Discussion

7.4.1 Methodological reflection and suggestions for further research

This study is based on a survey approach, using open questions to gain insight in reasons to quit and stay as a nature volunteer. This explorative approach was needed in order to give participants enough freedom to articulate their personal motivations. However, in future research, we could gain more nuanced insights by using methods such as qualitative interviews or survey questions with ranking options. For instance, respondents reported different types of conflicts, ranging from specific conflict situations to bad atmosphere in the group or conflicting opinions or visions. To learn more about how to deal with these conflicts, a more detailed view of their characteristics would be relevant, for which approaches such as in-depth case studies would be fruitful.

Like most studies based on self-reporting, this study is vulnerable to some biases. Although responses were anonymous, they could still be influenced by the (sub-conscious) wish to provide socially desirable responses. This may be true especially for the question on reasons to quit of respondents' fellow volunteers: there is a double danger of interpretation bias here, since participants report to us what others told them. Some volunteers might have quit because of in-group conflicts or clashing visions, but opted to tell the group that they did not have time anymore. However, while we recognise these possible biases, we also consider the collected data on this issue very valuable, as it provides us with insight into a larger group than only our study participants. Moreover, our high number of respondents helps strengthen the reliability of our results.

Finally, our approach elicited motivations for staying committed as a nature volunteer, rather than only the decision to become one. However, this still presents a relatively static picture of motivations that does not fully do justice to the complex and dynamic nature of motivations, which change and interact over time. Longitudinal studies of motivation for nature volunteering (e.g. Pagès et al., 2018) are of great importance to improve our understanding of these dynamics, and link volunteers' experiences with changes in their motivation over time.

7.4.2 Reflection on the results

As stated in the introduction, scholars have argued that current practices in volunteer management tend to emphasise recruitment at the expense of supporting and appreciating current volunteers (Brudney & Meijs, 2009). Our results show that volunteers themselves recognize this lack of support and appreciation, as it

appears to be a reason to quit for themselves as well as for others. Our results show that besides practical reasons to quit (age, health, lack of time), social factors are common difficult situations that can lead to quitting. In line with Byron and Curtis (2001), these results show the importance of helping volunteers to deal with barriers and difficult situations, avoiding burnout and prevent volunteers from growing disillusioned with volunteering in the future.

An important aim of this paper was to extend volunteering research on difficult situations and reasons to stay and quit to the specific domain of nature volunteering, as we found this literature to pay less attention to these matters. Regarding difficult situations and reasons to quit, a significant finding is that many of the situations, barriers and reasons reported by our respondents do not appear specific to nature volunteering, rather matching well with factors identified in earlier research on broader volunteering (see section 7.1.1). These include practical and personal issues of time and health, group tensions and conflicts, a feeling of being overburdened with requests to volunteer, and a lack of support or appreciation. These findings illustrate the broad relevance of these factors for understanding volunteers' experiences and reasons to stay or quit, also in the everyday reality of nature volunteering.

Then again, some barriers and issues we encountered are perhaps more characteristic to the activities common to nature volunteering. For instance, some respondents highlighted how bureaucratic control and administrative tasks presented a barrier to get in contact with nature. This speaks to how many types of nature volunteering involve relatively physical tasks (especially those related to nature management or restoration). The physical nature of such work can be an important draw for participants (e.g. O'Brien et al., 2010), but as our results show they may also constitute reasons to quit (for instance due to ailing health), or may increase the risk of accidents and injuries, which were mentioned frequently as difficult situations. Dealing with anger or aggression, such as in conflicts with recreationists over protected areas, is also something that may be relatively common in some types of nature volunteering.

When looking at the most important reasons to stay, we can distinguish two groups of motivations. One includes more practical and action-oriented motivations: having pleasure in the activities, working together with other people, being active in nature and doing useful work there. Having genuine pleasure in volunteering, making social connections and the feeling of making an impact are motivating factors that are found in previous work on nature volunteers' experiences (e.g. Abell, 2013;

Dresner et al., 2015) but are important for many forms of volunteer work. The second group of motivations relates to doing green volunteer work because it is meaningful and fulfilling in one's life, out of a connection with and love for nature, and from a desire to learn or to teach about nature. This importance of connection with and love for nature for continued volunteering is in line with other studies (Bell et al., 2008; Ganzevoort & van den Born, 2020; Guiney & Oberhauser, 2009) that have identified connection with, concern for and desire to learn about nature as important motivations for action for nature. Moreover, research shows that meaningfulness is one of the most important motivations for highly committed actors for nature (Admiraal et al., 2017; Van den Born et al., 2018). Our study confirms that meaningfulness is also an important motivation for a broader group of nature volunteers.

In line with authors such as Asah and Blahna (2013) and Ryan et al. (2001), we thus find that while nature-related motivations are of key importance for nature volunteers' decision to volunteer, when looking at their commitment over the longer term we must not lose sight of factors unrelated to nature specifically. The importance of enjoyment in the volunteer work and productive cooperation with other people, and the significant impact of conflicts and personal circumstances on the decision to quit, show that the everyday reality of nature volunteering involves nature-related, individual and social motivations. Nature volunteers' decision to stay involves altruistic and self-oriented considerations (Bixler et al., 2014), and the decision to quit volunteer work is not always a pre-planned decision to pursue other opportunities, but can also be deeply emotional and driven by conflicts or a lack of appreciation or support (Hustinx, 2010a, pp. 250-251). Volunteers' motivations, and their everyday experiences in a specific group or initiative, both influence the decision to stay or to quit (Willems et al., 2012).

7.5 Conclusions

Our results expand the empirical literature on reasons to stay and quit in nature volunteering, but our findings are also relevant to nature organisations working with volunteers. Volunteer management practices can pay more attention to volunteers' experiences, and here we elaborate on three routes: showing gratitude and appreciation, providing feedback on volunteers' importance to nature conservation, and protecting them from feeling pressured and overburdened.

The importance of showing appreciation for volunteers' efforts is important in any domain, and our results confirm that this is no different in nature volunteering. Showing appreciation is a crucial step, especially because volunteer organisations can exert a great deal of control over it, meaning that volunteers quitting due to lacking appreciation is much more avoidable than situations in which age or health drive the decision to quit. Nature organisations should make their appreciation clear and explicit, and should continue to do so rather than assuming that existing volunteers will feel appreciated without further organisational efforts. Importantly, volunteer organisations should not be too quick to assume that material gestures are of most value. While for some volunteers they might be, it can be much more important to ensure that volunteers feel seen, valued, supported and taken seriously. In the words of one of our respondents, a simple New Year's wish should not be too much to ask.

This connects to the importance of feedback. In line with other studies among green volunteers (e.g. Dresner et al., 2015, p. 1005), we found that volunteers greatly value seeing the importance and effectiveness of what they are doing, and understanding how what they do matters for nature conservation. Feedback that makes volunteers' contribution and value explicit is an important way to achieve this (Guiney & Oberhauser, 2009), and can be combined effectively with showing appreciation. In line with work on motivation matching (Clary & Snyder, 1999), such feedback strategies should take the diverse motivations of volunteers into account.

Finally, it is important to reflect on the broader context of nature volunteering. In line with discourses extolling the virtues of active citizenship, there is an increasing pressure on citizens to actively contribute to nature and greenspace (Buijs et al., 2019). While recognition of the great contribution and potential of nature volunteering is a positive thing, such pressure has its risks. Our data illustrate how some volunteers feel that they are being asked to do too much, or do work previously done by paid staff, both of which may eventually factor into the decision to quit. Increasing pressures to volunteer may erode motivation, deplete volunteer energy in the long term (Brudney & Meijs, 2013), and even raise questions as to the degree to which nature volunteering remains voluntary. Since a sense of freedom and lack of coercion are important to maintain motivation, organisations and governments should be careful in how they approach promoting nature volunteering. By taking the experiences and motivations of current nature volunteers as a starting point, as this study does, the key priority will be for nature volunteers to feel supported and appreciated, in order to preserve both their motivation and their crucial importance for nature conservation now and in the future.

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Synthesis

In this final chapter, I first bring together the results of the empirical studies in order to answer the research questions. In section 8.2, I reflect on the central aim of this thesis, understanding action for nature through studying green volunteering. I do so by first formulating several implications of my work for theory and research on green volunteering, followed by my conclusions on what the research brought together in this thesis teaches us about action for nature and the transformative potential of green volunteering.

In section 8.3, I build on the preceding sections to draw out several practical implications for nature organisations and other stakeholders working with green volunteers. Finally, in section 8.4 I place the design of my research in a broader context of possible research approaches, and use this to formulate suggestions for further research.

8.1 Synthesis of the results

In section 1.4, I formulated the four research questions (RQs) of this thesis: the profile of Dutch green volunteers, their motivations for volunteering, how they experience their volunteer work, and their expectations for the future. Here I draw on the five empirical chapters to assess what conclusions can be drawn based on the results.

RESEARCH QUESTION 1

What is the profile of Dutch green volunteers, in terms of their social-demographic profile and activities?

In terms of demographic profile, the empirical studies to some degree confirm patterns reported in the literature on citizen science and green volunteering as described in section 2.2. Most notably, in terms of age we found high mean ages among our samples (53.7 years among biodiversity recorders in general, 53.2 years in the study among participants in the Dutch National Bee Survey (DNBS), and even 61.8 years among green volunteers). In the study among green volunteers, almost half the respondents were above the age of 65.

The results also appear to confirm the high levels of education frequently noted in the literature. The percentage of respondents that has completed an academic or higher vocational education amount to 61.7% (Chapter 3), 64.9% (Chapter 6) and 65.2% (Chapter 5). When compared with the same percentage among the general

Dutch population (29.4% (Statistics Netherlands, 2018)), we see how Dutch green volunteers appear to have a relatively high level of education.

In terms of gender, the results are mixed. In the study among biodiversity recorders in general, we found a significant overrepresentation of men (75.4%), with female respondents also having been active for a lower number of years. We also found a higher number of male respondents in the study among green volunteers (62.8%), though the difference is less pronounced. However, a majority of the DNBS respondents is female (60.6%).

Finally, in terms of activity profile an important finding is that different types of green volunteering are not mutually exclusive. While some studies treat participants in specific types of green volunteering (e.g. recording or education) as distinct groups of people, in Chapter 6 we found that a majority (66.2%) of respondents are involved in more than one type. Similar observations were found in the other two studies; Chapter 3 revealed that over half the biodiversity citizen scientists surveyed had done some form of restoration volunteering, and Chapter 5 found among DNBS participants that many respondents did not just take part in other forms of biodiversity recording, but also in volunteer activities such as nature restoration or education. Chapter 6 also found that participation in formally organised green volunteer work and more informally organised nature-oriented citizen initiatives is not mutually exclusive, as 23.9% of respondents took part in both. Chapter 3 reveals a similar finding regarding preferred taxa of volunteer recorders: while data on some taxa are submitted more widely and frequently than others (with the top three consisting of birds, insects and mammals), these were once again not mutually exclusive practices. Recorders with a passion for birds may also submit sightings of mammals, and volunteer entomologists may have an interest in recording flora as well. A key conclusion in term of activity profile of green volunteers is thus that many of the typologies or dividing lines that have been drawn up in the field are fuzzier and less mutually exclusive than is assumed in research or practice.

RESEARCH QUESTION 2

What are the motivations for green volunteering?

For the inquiry into motivations of green volunteers, we provided respondents of each study with a list of motivations to select from and rank these according to relative importance. A key finding across all studies is that motivations directly relating to nature carry great importance. In each of the studies, the desire to contribute to

nature conservation ends up in the overall top three motivations, even at the top spot in the studies among DNBS participants (Chapter 5) and broader green volunteers (Chapter 6). Among the biodiversity citizen scientists surveyed in Chapter 3, a personal connection to nature ended up as the most highly ranked motivation. This motivation also ended up in the top three in all of the empirical studies. Learning about nature (Chapter 3) and learning about bees specifically (Chapter 5) round out the top three for those studies, while among the broader group of green volunteers learning more about nature is just barely edged out of the top three by the desire to spend time outdoors.

The results of Chapter 6 also indicate both stability and variety in the relative prominence of motivations for different types of green volunteer work. On the one hand, one notable finding was the consistent prominence of nature conservation and connection as the two highest-ranked motivations, regardless of type of green volunteer work. Other motivations did differ in relative prominence for different types of green volunteering, however: the results seem to indicate that restoration volunteers emphasise some motivations (the physical nature of the volunteer work, contributing to the neighbourhood, spending time outdoors) which were of relatively less importance for other types of green volunteering. For educators and administrators we found some other motivations to be given relatively great emphasis, such as improving other people's nature connectedness, learning about nature, and the plight of future generations. Of course, in these analyses it is once again important to keep in mind that these categories are not mutually exclusive, meaning these differences in motivations should be interpreted as being associated more with types of volunteer work, rather than types of people.

In terms of motivations that were ranked somewhat lower, it is relevant to reflect for a moment on the social motivation of working together with people. In the study among green volunteers in general, working together with people ended up fairly high in the overall ranking, yet further analysis also indicates that this was relatively strongly associated with restoration activities compared with the other types. The results from Chapter 3 show that among a sample of biodiversity citizen scientists specifically, 'working together with people' was one of the lowest-ranked motivations. The relatively low importance of this motivation for biodiversity citizen scientists matches the finding from Chapter 3 that over 90% of respondents reported doing their biodiversity recording on their own. Then again, a sense of collective effort and sharing experiences with others is also relevant in biodiversity citizen science (Bell et al., 2008), and Chapter 3 found hints of this dimension. For instance, respondents reported drawing on the knowledge of their fellow volun-

teers and experts in their network to aid in improving accuracy in reporting observations, as demonstrated for instance by the online community built around the platform *waarneming.nl*. It is also interesting to note that Chapter 5 reports that 23.9% of respondents participating in the DNBS did their bee recording together with family members.

RESEARCH QUESTION 3

How do green volunteers experience their volunteering?

The third research question deals with how green volunteers experience their volunteer work. Chapter 6 approached this question using a series of statements on volunteers' attitudes towards their green volunteering, which paint a varied picture. We found several encouraging patterns in the responses, especially that current green volunteers appear to experience an overall sense of freedom and appreciation in their work, and that they indicate a preference to volunteering for nature as compared to volunteering in other sectors. However, we noticed that governmental appreciation received a more mixed response compared to appreciation in general, witnessed similar results for the degree to which volunteers received sufficient support, and found widespread concerns over a lack of young green volunteers. Upon delving further into this issue of support, we find that green volunteers would especially appreciate more training and coaching (selected by 44.8% of respondents), with other forms of support (such as technical support, cost reimbursement and support in physically strenuous tasks) also being selected by some respondents. For all of these elements of green volunteers' experiences, experiences and needs differed between demographic variables and types of green volunteering.

A specific type of experience in nature-oriented volunteering is how nature itself is experienced. As highlighted in Chapter 1, green volunteering is attributed significant promise in terms of connecting people with nature and fostering experiences in nature. However, not much is known about what sorts of nature experiences are particularly significant or memorable in the context of green volunteering. As such, Chapter 4 set out to provide more empirical insight into the significant nature experiences of biodiversity citizen scientists. We found that such experiences could reflect a general type of experience or a particular setting or event, though the thrill of discovery (such as rare or surprising finds) reappears often. Chapter 4 emphasised that this thrill of discovery reflects a *personal* sense of discovery; in other words, it could range from extraordinary to everyday sightings, with the importance coming from a sense of discovery for the individual. Elements of learning

and contributing to science and conservation could also be located in these experiences, drawing parallels to our data on motivations.

Biodiversity citizen science offers an opportunity for nature experiences, but from the perspective of contributions to science, the sharing of biodiversity data collected by volunteers is a key aspect. While Chapter 1 discusses the growing literature on data standards and quality of volunteer-collected data, it also illustrates how the viewpoints and experiences of the volunteers themselves regarding biodiversity data sharing have received much less attention. Chapter 3 contributes to this underresearched topic by reporting quantitative data on the viewpoints of Dutch biodiversity citizen scientists. A main finding is that, on the one hand, almost half the respondents see their collected biodiversity data as a public good, an encouraging finding in the context of open data and open science movements. On the other hand, this viewpoint of biodiversity data as a public good did not mean that volunteers support unconditional data sharing, or are unconcerned with how organisations handle the data they submit. Chapter 3 highlights several points of tension, including questions of anonymity, and how volunteers appear to reflect on not just the manner in which data are shared, but also the goals of the data user.

Finally, one type of experience in green volunteering that is especially prominent in discussions on biodiversity citizen science is learning experiences, in line with the aims of many citizen science projects to stimulate learning among participants. In light of this prominence, Chapter 5 assessed to what degree participation in the DNBS fostered learning about bees, shifting perspectives on bees and actions to support them, as well as changing views on citizen science or citizenship. Based on how respondents self-reported such changes, it appears that the DNBS accomplished both increased knowledge as well as higher intentions to act in support of wild bees. However, a series of attitudinal scale measures offered little indication that significant changes in attitudes had taken place. This chapter also reflected on how learning in green volunteering can be influenced by the design of the project or the profile of its participants.

RESEARCH QUESTION 4

What are their expectations in terms of future engagement and reasons to continue or quit green volunteering?

Two of the empirical chapters, Chapters 6 and 7, provided insights into green volunteers' expectations for the future in terms of levels of engagement, activity types, and reasons to stay or quit. In terms of engagement in the future, Chapter 6 found

that 63.1% of respondents expect to continue volunteering for nature to a similar degree as they do now. Only 11.7% of respondents expected to be doing less green volunteering in the future, while 25.2% anticipated increased engagement in the future. However, rather than only focussing on *intensification*, we also questioned to what degree this could be paired with *diversification* of activities. As detailed in Chapter 6, levels of interest in potential future activities appeared to be associated with the current activities in which respondents are involved. To highlight one example, restoration volunteers were relatively likely to indicate doing more green volunteer work in the future, yet showed below-average interest in many of types of green volunteering activities surveyed. In other words, this may indicate that the enthusiasm to do more in the future is linked relatively strongly with a continuation of their current activities. This result highlights the importance of distinguishing between intensification and diversification in studying future volunteering intentions.

In terms of likelihood of quitting and reasons to quit, Chapter 6 reports the encouraging finding that only 3.3% of our respondents often consider quitting green volunteering. However, we also collected more qualitative data on reasons why respondents might continue or quit in the future, difficult situations they encounter, and their perceptions of why fellow volunteers quit. Chapter 7 confirms that green volunteers identify many reasons why they intend to continue their volunteer work: the pleasure they take in the practical and social aspects of their activities, but also the importance of their volunteer work for contributing to nature conservation and education, a personal connection with and love for nature, and the role their volunteer work plays in living a meaningful life. However, Chapter 7 also finds that green volunteers encounter many difficult situations that may end up becoming reasons to quit. Reasons to quit include personal issues such as time constraints, aging and health problems, but also relate to a lack of support or appreciation, and conflicts and tensions with other volunteers or with volunteer organisations. This chapter thus illustrates how nature-related, personal and social factors all play a role in green volunteers' decision to stay or to quit.

8.2 Main conclusions and implications for theory

Having summarised and synthesised the outcomes of the empirical chapters of this thesis, this section formulates the main conclusions of this thesis. Before discussing my contributions to understanding action for nature and its transformative potential (section 8.2.2) I first draw on my results to formulate several implications

for theory, i.e. how we as a scientific community think about and study green volunteering. I start with my contributions to thinking about the characteristics and boundaries of green volunteering, followed by implications for biodiversity citizen science in the context of open science, and finally addressing reflections on the study of motivations for green volunteering.

8.2.1 Implications for understanding and studying green volunteering

On definitions, understandings and boundaries

An important takeaway of the literature reviewed in Chapter 2 is that both the volunteering literature and the citizen science literature are characterised by a vivid debate about definitions, boundaries and characteristics of what such voluntary work entails. As noted in the previous section, however, an important finding across the studies I conducted is that some of the categories and boundaries used in the literature (amateur or professional, citizen scientist or not, volunteer or non-volunteer) become quite blurred in the everyday reality of green volunteering. Furthermore, section 2.1 argued that social phenomena such as volunteering do not lend themselves well to universal definitions, affirming the importance of determining criteria within a specific research context. Thinking of different types of volunteering as existing on a range (e.g. from researcher-driven to community-driven, or more formal and more informal) has helped me greatly to reflect on the wide variety of activities that can be incorporated under the banner of green volunteering. This leads me to formulate two implications for scholarship on green volunteering: acknowledging more informal forms of green volunteering, and the importance of researchers providing clarity as to their understanding of terms such as ‘volunteer’.

Firstly, one important choice I made based on the reviewed literature is to adopt a relatively broad conceptualisation of biodiversity citizen science and green volunteering, not just in terms of the wide breadth of activities included but also in terms of the level of formal organisation. This choice is in line with calls for greater acknowledgement of and research on informal volunteering (Lee & Brudney, 2012) and citizen initiatives (Igalla et al., 2019). Considering my finding that formal and informal green volunteers are not two mutually exclusive groups of people but rather exist on a continuum, there is much value in including more informal green volunteering (e.g. neighbourhood greening initiatives and incidental biodiversity recorders) in scholarly debate, rather than only looking at formal volunteering for nature organisations. Based on my findings, I would thus argue that adopting a broad perspective on green volunteering does justice to the diversity of activities and the varying levels of formal organisation that characterise green volunteering in practice.

Regardless of whether scholars decide to follow this call for adopting a broad understanding of green volunteering, however, another important implication for theory building is for scholars to be clear about their understanding of their object of research. As scholars it is vital to be explicit about what we understand citizen science or green volunteering to be in a given research context, and the sort of activities (and thus people) we include and exclude. It is important to do so for at least two reasons. Firstly, from the theoretical side, science thrives through discussion and debate. Clarity on terminology and demarcation is crucial for this, both in terms of conceptual contributions and comparability of empirical findings. Considering how the characteristics and boundaries of volunteering and citizen science are an important area of contemporary debate in the field (see Chapter 2.1 and e.g. Duží et al., 2019; Pettibone et al., 2017), it will be vital for scholars to be transparent about the choices they make in demarcating their objects of inquiry.

My approach in this thesis regarding biodiversity citizen science, i.e. not providing an overarching definition but clarifying the types of activities I understand to belong under the term as I use it, is in line with several recent publications in the field. For instance, as noted in a recent report on learning in citizen science, ‘Clearly, no single definition can encompass the broad range of activities that exist under the umbrella of citizen science’ (National Academies of Sciences, Engineering, and Medicine, 2018, p. 31). In addition, a recent set of guidelines on the characteristics of citizen science argues for practitioners, scholars and policymakers to develop discipline- and context-specific criteria since ‘attempting to define a universal set of rules for exclusion or inclusion is difficult, and might even limit the advancement of the field’ (European Citizen Science Association, 2020, p. 1).

Secondly, from the methodological side of things, it means that when conducting research on volunteers, it will not suffice to simply ask potential respondents or interviewees if they are a volunteer or a citizen scientist, as those terms mean different things to different people (Eitzel et al., 2017) and not everyone you aim to include may self-identify as such.⁴³ Simply asking people whether they ‘volunteer’ obscures the types of activities carried out, as well as the specific domain in which volunteers operate (Overgaard, 2019, p. 130). When studying volunteers, it may be important to give people an overview of the sorts of activities you include under the

⁴³ In fact, in some cases, volunteers or citizen scientists may actively reject the label, or project staff may actively avoid such labels in fear of negative connotations. For instance, one project staff member quoted in a study of marine citizen science (Kelly et al., 2019, p. 5) avoided the term ‘citizen science’ towards their volunteers for fear of raising barriers to participation due to the label ‘science’ possibly evoking knowledge or educational demands

banner of terms such as volunteering, to help respondents recall activities that they might not associate with the term.⁴⁴

On the (open) science of biodiversity citizen science

One of the topics to which this thesis contributes insights is the increasing debate within academia on open science, sharing of data and how this opens up participation in science. Much emphasis has been placed on the potential for citizen science to contribute to open science and open data agendas, and even to play an important role in a ‘data revolution’ (Franzoni & Sauermann, 2014; Fritz et al., 2019; Rathenau Instituut, 2020; Suman & Pierce, 2018; Wehn et al., 2020).⁴⁵ While diverse considerations are important in this discussion (including political, financial and technical aspects), one that this thesis offers reflection on is the perspectives of the involved citizen scientists themselves, which (at least in the literature on biodiversity citizen science) receive little scholarly attention (but see Fox et al., 2019; Williamson et al., 2016). This is a grave oversight, as Ellis and Waterton (2004, p. 99) illustrate how a perceived lack of transparency about what happens to submitted biodiversity data, and how volunteers’ efforts relate to decisions made on the basis of these data, can stifle engagement and lead to an increasing feeling of disconnect.

An important contribution of this thesis for thinking about open science is that the perspectives of the volunteers must not be forgotten. Chapter 3 demonstrates how volunteers have their own views on who owns biodiversity data and under what conditions these should be shared. My data show that biodiversity citizen scientists differ in their viewpoints: different perspectives were present (data as a common good, species organisation as custodians of data, data as personal property) which all received different levels of support. While my data thus provide no blueprint for how to design data sharing policies that align with volunteers’ viewpoints, they do call for taking volunteers’ perspectives into account when designing such policies, and for making one’s considerations clear and explicit (Groom et al., 2017; Pocock et al., 2017, p. 13).

⁴⁴ See Bekkers and Wiepking (2006) for a similar argument related to surveying charitable donations.

⁴⁵ These arguments may also link this to empowerment and democracy; for instance, Carton and Ache (2017, p. 241) call for governments to facilitate and support initiatives of citizens to monitor their environments, not just for the valuable knowledge generated but also to reduce information monopolies and contribute to democratising knowledge generation. See also Craglia and Shanley (2015).

Importantly, the debate should go beyond only ownership⁴⁶ and the conditions under which data are shared or used (e.g. guidelines around attribution or use for financial gain) but should also reflect on the purposes for which data are used. While scholars and organisations that submit biodiversity data to databases like the Global Biodiversity Information Facility (GBIF) might have limited influence over the aims of data users, at the very least these considerations ought to be made explicit to volunteers. After all, I found indication that especially the goals of the user feature prominently in how biodiversity citizen scientists reflect on data sharing. If volunteers at any point start perceiving that data users mobilise submitted data to legitimise decisions seen as harmful for nature or treasured species⁴⁷, volunteers (in their role of ‘data custodians’) may opt to stop sharing data. Being transparent over how data are shared, with whom and what this means for the ways data might be used could promote trust in the stakeholders involved and prevent the aforementioned feelings of alienation and disconnect.⁴⁸

On studying motivations of green volunteers

Finally, an important notion throughout this thesis is that understanding motivations is crucial for understanding action for nature (Bennett et al., 2018; Phillips et al., 2019). Based on the literature brought together in Chapter 2, and my findings throughout this thesis, an important implication for theory relates to the wide variety of motivations for green volunteering, including those associated with nature, the self and social dimensions. Importantly, I found that nature-related motivations were attributed great importance by our respondents, further highlighting the importance of the ‘green’ in green volunteering. However, that nature-related motivations were attributed crucial importance should not be confused with green volunteering being motivation by complete altruism. Indeed, while contributing to nature conservation was one of the most important motivations, so was a personal connection with nature and learning about nature and biodiversity.

⁴⁶ For further arguments on why ‘who owns biodiversity data?’ may not be the most important question to ask in volunteer biodiversity recording, see Turnhout (2020, p. 144).

⁴⁷ In the terminology of Ellis and Waterton (2005, p. 685), this would constitute a violation of the ‘imagined contract’ between biodiversity recorders and nature.

⁴⁸ Of course, one may also argue that, if volunteers dislike the choices made by an organisation, such transparency may actually harm trust. In some cases, it may indeed trigger significant internal debate among and with volunteers on who can access and use the data and for what purposes. However, I would argue that these are necessary debates to carry out if we aim to truly see citizen scientists as colleagues in a scientific endeavour and avoid making them into ‘automated data-drones’ (Ellis & Waterton, 2004, p. 98).

In addition, Chapter 7 highlights how motivations to do green volunteer work may differ from the factors that keep volunteers motivated and enthused. This chapter found that while nature-related motivations certainly played an important role in keeping green volunteers engaged, so did the social dimensions of volunteering, as well as the sense of pleasure and enjoyment associated with the volunteer work. Methodologically, Chapter 7 thus also illustrates why using different question types to inquire into motivations helps achieve a richer understanding.

In line with insights from the volunteering literature discussed in section 2.3, I thus also find that a combination of motivations drive green volunteering. This cautions us as scholars not to be trapped into an overly binary distinction between ‘altruistic’ and ‘egocentric’ motivations for action, as this not only fails to do justice to the complex reality of green volunteering, but also risks casting more self-oriented motivations as somehow ‘lesser than’. Considering the importance of one’s personal connection with nature as discussed in Chapter 1 (and in the next section), my results suggest we ought to strongly disagree with such a simplified notion.

8.2.2 Conclusions: Understanding action for nature and its potential for building connectedness

Through studying green volunteering in the Netherlands, the larger aim of this thesis is to contribute to our understanding of action for nature, why citizens take such action, and ultimately the transformative potential of green volunteering. I now turn to drawing together some key insights in light of this aim. As noted previously in section 1.2, I do so by focussing on the potential for green volunteering to offer opportunities for building and strengthening connection with nature and contributing to nature conservation, and how our results address this potential. While green volunteering may also contribute to other types of transformation, for instance at the institutional level, these remain beyond the scope of my investigation.

As discussed in Chapter 1, the array of environmental issues we face these days, from resource scarcity to pandemics to climate change, have been linked to a fundamental lack of connection with the natural world (e.g. Miller, 2005; Pyle, 2003; Zylstra et al., 2014). Seen from this perspective, fostering familiarity with as well as understanding and appreciation of the natural world becomes a key priority for addressing sustainability concerns. One illustration can be found in the work on leverage points for sustainability, where reconnecting humans and nature is considered an important priority (Abson et al., 2017). Thus, increasing contact, familiarity and connection with nature is an important way in which green volunteering has transformative potential. The work in this thesis joins the work of some other scholars

in linking green volunteering to how this both expresses and affects participants’ connection and wider engagement with nature (e.g. Brombal, 2020; Lawrence, 2006). For example, Hawkes and Acott (2013) discuss the transformative potential of allotment gardening in terms of altering people’s relationship with nature, arguing that ‘the transformative potential of allotments as places where people can engage in genuinely thought-provoking relationships with nature can perhaps be seen as a way of stepping towards more environmentally conscious communities’ (p. 1131). If we want to understand this thesis’ contribution to understanding action for nature, a central question thus becomes: What do my results imply for the transformative potential of green volunteering?

Chapter 1 highlighted three perspectives through which the literature has approached the issue of human-nature disconnect: a lack of physical contact with nature, a more cognitive decrease in knowledge and familiarity, and concerns over a diminishing emotional connection and feelings of concern and care for nature. Since many types of green volunteering offer participants the opportunity to be outside, observe flora and fauna and contribute to concrete action for nature (Zylstra et al., 2014, p. 131), green volunteering has transformative potential in terms of addressing (or even redressing) each of these dimensions (see e.g. Schuttler et al., 2018). Indications for this are found readily in my data. Chapter 4 shows how biodiversity citizen science offers opportunities for many types of significant nature experiences, with the chance of new discoveries especially memorable for the respondents. Chapter 6 demonstrates the enthusiasm of many green volunteers and their commitment to the diverse actions for nature in which they are involved. In addition, the motivational data collected across the empirical studies in this thesis highlight a central role for protecting nature, connecting with it, and learning more about it. As shown in Chapter 5, biodiversity citizen scientists participating in the DNBS reported significant outcomes in terms of learning about wild bees, but also in terms of appreciating them and providing knowledge and inspiration on how to take action for them. Learning about and connecting with nature have been shown to interact in inspiring highly committed actors to dedicate themselves to action for nature (Van den Born et al., 2018), and my results suggest that similar motivations play a key role for the much broader group of green volunteers in the Netherlands. This thesis thus suggests that green volunteering holds much potential in offering opportunities to learn about, connect with and take action for nature. From this perspective, my results demonstrate why making volunteers’ efforts and motivations visible, and making sure they are supported, appreciated and facilitated, is so vital. With so many people motivated to take action for nature through green volunteering, facilitating and nurturing

their engagement can help stimulate its transformative potential for nature conservation now and in the future.

Then again, my work also helps to flesh out some cautionary comments on the transformative potential of green volunteering. An important caution relates to the profile of green volunteers, one of the main research questions of this thesis. While green volunteering offers its participants opportunities to foster connectedness with nature, the finding that green volunteering currently appears to attract participants with a specific profile means we must be cautious in casting it as a society-wide solution to human-nature alienation. Across my studies, I found a high average age and especially a high level of education among the respondents. Gender patterns differed between the studies: the two large-N studies among broad samples of biodiversity citizen scientists and green volunteers in general found a majority of male respondents, while a majority of the surveyed DNBS participants is female. Although my sampling approaches preclude me from claiming these patterns to be wholly representative of green volunteering in the Netherlands or other countries (as discussed in detail in e.g. Chapter 3), they resonate with concerns voiced within the sector itself (Actieplan Groene Vrijwilligers, 2018) and in the literature on green volunteers and volunteering in general (Hobbs & White, 2012; Johnson et al., 2018; Pandya, 2012; Sundeen & Raskoff, 2000).

This issue of diversity in volunteers' profile leads to another important conclusion. As noted above, my work offers several examples of how green volunteering offers opportunities for action for nature and inspires further action. These include the diversity of activities volunteers are engaged in (Chapter 6), the significant number of biodiversity citizen scientists who also work in the nature or environmental sector (Chapter 3) and the additional green volunteer work of the surveyed first-time DNBS participants (Chapter 5). In other words, these results suggest that engagement in green volunteering activities may also stimulate further engagement in action for nature. For instance, Dresner et al. (2015, pp. 1002-1004) show that stewardship volunteering could be linked to broader environmental actions among participants, including discussing their action for nature with others and a sense of empowerment in public life. Deguines et al. (2020) similarly found that sustained participation in a butterfly citizen science programme was associated with biodiversity-friendly changes in participants' approach to gardening. However, rather than only seeing these as indications of the transformative potential of green volunteering, we must acknowledge how this process may also work in an opposite direction: pre-existing knowledge of and affinity with nature may be an important motivation for joining, as well as a channel through which people

become involved. Nature organisations play an important role in organising green volunteering opportunities, and logically also become important channels through which these opportunities are communicated. The individuals reached through these channels are likely those with pre-existing affinity for nature or motivation to take action for it.

While reaching this audience may aid efficiency in recruitment for green volunteering, it also could limit its transformative potential. For instance, Chapter 5 critically examines the opportunities for biodiversity citizen scientists to learn not just in terms of monitoring strategies or species names, but also 'deeper' or more transformative forms of learning. Transformative learning in nature-related projects may include shifting one's view on the values of nature, human-nature relationships or the relationship between science and society, and draws parallels with literature on single-, double- and triple-loop learning (Tschakert & Dietrich, 2010), in which triple-loop learning includes deep reflection on one's worldviews and core assumptions. Transformative learning has been discussed in both the context of citizen science (e.g. Bela et al., 2016; Groulx et al., 2017; Ruiz-Mallén et al., 2016) and green volunteering (Chao, 2017). Green volunteering may be an especially promising site for transformative learning, considering how practical experiences are an important trigger for deeper reflection (Chao, 2017, p. 2669). Chapter 5 discusses this perspective and suggests that participation in green volunteering has such promise for even highly engaged and experienced volunteers, yet also notes that one important factor to take into account when reflecting on the potential for transformative learning is the profile and motivations of the participants. In addition, Chapter 5 illustrates how self-reported shifts in perspectives may differ from measurable changes in attitudinal scales, which carries methodological implications for studying transformative learning among such a highly engaged group.

8.3 Implications for practice

The previous section reflected on the main aim of this thesis: contributing to further understanding of action for nature and the transformative potential of green volunteering. Here, I draw on my findings to develop several recommendations for practitioners working with green volunteers. These can provide inspiration to nature organisations aiming to further nurture a supportive environment for green volunteers, while also potentially being inspiring to green volunteers themselves, who can implement them in their own volunteer work or stimulate organisers to do so.

To structure my recommendations, I start with those addressed to nature organisations in three different roles: as communicator, as organiser of activities, and as recruiter (sections 8.3.1 to 8.3.3). In section 8.3.4, I wrap up this section by stressing the importance of cooperation between different stakeholders to jointly strengthen support and appreciation of green volunteers.

8.3.1 The volunteer organisation as communicator

My results suggest several recommendations for volunteer organisations regarding how they communicate with green volunteers, how they shape their messages and the language they use, and how this can be better aligned with volunteers' motivations and experiences. For instance, Chapter 4 calls for allowing more emotional language when speaking of flora and fauna, as we found that individual species, and individual plants and animals, were much more commonly discussed in reported significant nature experiences compared to more general language such as 'biodiversity' or 'ecosystem' (see also Buijs & Elands, 2013; De Kleyn et al., 2020; Larson et al., 2016). The importance of adapting your language to your volunteers is also emphasised by other authors, who caution that the warlike metaphors sometimes used in biodiversity monitoring and invasive species projects, such as 'blitzkrieg' (Pagès et al., 2019, p. 109), can be counterproductive and even offensive to volunteers motivated by an ethic of caring for nature.

Another important responsibility related to communication relates to feedback to volunteers, a topic emphasised in the citizen science literature especially (e.g. De Moor et al., 2019; Land-Zandstra et al., 2016b; Sandhaus et al., 2019; Sickler et al., 2014) yet relevant for any form of volunteer work. Chapters 3 and 6 both found that green volunteers have high expectations regarding the contributions of their volunteer work to a variety of goals, and an important method to keep volunteers motivated is to make clear how they contribute to progress on these goals. While impacts on volunteers' knowledge or connectedness to nature may be more difficult for an organisation to make visible⁴⁹, my motivational data also show that contributing to nature conservation and management is a key motivation for green volunteers, with biodiversity citizen scientists specifically also being motivated to make scientific contributions. Feedback that makes tangible to what concrete management decisions, conservation successes and scientific datasets or publications volunteers have contributed is an important step for any green volunteering ini-

⁴⁹ Though see the next section for some comments related to designing projects for learning and reflection.

tiative (De Vries et al., 2019; Guiney & Oberhauser, 2009). This aligns with the finding from Chapter 3 that almost half the respondents of that study reported wanting more insight into policy and management impacts of their biodiversity recording. Importantly, feedback should not be an afterthought or something that only appears months after a project finished, as this can greatly diminish future motivations for participating (Druschke & Seltzer, 2012), which from the perspective of volunteer energy (Brudney & Meijs, 2009) would constitute a great loss. I thus call on organisers to resist the urge to only provide feedback on achievements once they are finalised (since a scientific publication, or the return of a targeted species, may take years), but to provide rapid feedback on new developments and preliminary insights. This poses its own set of challenges (for instance, scientists may not want to risk drawing erroneous conclusions based on incomplete data), yet providing regular updates on progress, linked to the diverse aims of a project and the different motivations of its participants, is a vital step.

In terms of language used to talk to and about volunteers, I would be remiss not to reflect on the term 'amateur', often used in the context of citizen science especially. On the one hand, the opening quote of this thesis speaks appreciatively of the term 'amateur', its etymology going back to the Latin verb *amare*, meaning 'to love' (Oxford English Dictionary, 2020a). On the other hand, in contemporary use 'amateur' tends to carry connotations of 'unprofessional' or even 'inept', which should invite caution in using it in the context of volunteering. After all, aside from its negative connotations, the term may invite overly harsh dividing lines between 'experts' on the one hand and 'amateurs' or 'non-experts' on the other (Ellis & Waterton, 2004, p. 98). This risks misrepresenting the significant expertise among volunteers (Bell et al., 2008, p. 3446), with some individuals taking up both roles depending on the context of their participation. When talking about biodiversity citizen scientists and other green volunteers, we must thus always ask ourselves whom we include under the label of 'expert'. A question that this debate raises is the following: does this call for a complete avoidance of the term 'amateur', or will we attempt to draw on its original meaning, one who loves, exactly how Huxley (1959) used it?

Finally, as should have become clear throughout this thesis, an important responsibility of the volunteer organisation as communicator lies in ensuring communication is a two-way street. In other words, while the above recommendations address how to *speak* to volunteers, it is just as important to *listen*. This relates to their motivations, their needs, and how they experience their volunteer work; my comments on sharing biodiversity data in section 8.2.1, and the importance of recognising the

viewpoints of the volunteers, are but one example. Listening to volunteers, asking them about these matters, and then using this information to align with their needs and interests, are crucial steps that I address in the next section.

8.3.2 On organising green volunteering activities from a volunteer-centric point of view

In light of the empirical work presented in this thesis, which offers greater insights into profile, experiences and motivations of green volunteers, here I reflect on how to connect to such insights in designing activities for green volunteers. One way to do so relates to adopting a more volunteer-centric perspective, in which organisations approach thinking about and engaging with volunteers from the perspective of the volunteers themselves, just as much as from the perspective of the organisation and its aims.⁵⁰

Adopting a more volunteer-centric perspective revolves around two key recommendations for organisations working with green volunteers: *Ask*, then *Act*. First, do not be too quick to make assumptions about why volunteers get or stay involved in an initiative; rather, recognise that they may be driven by a diversity of motivations, that these may differ significantly between volunteers, and that these may not necessarily align with the organisers' motivations. Similarly, my empirical work shows that nature experiences and ways in which volunteers learn show great diversity, and Chapter 7 illustrates how volunteers may stay or quit for a diversity of reasons. As such, an important first step is to ask volunteers about their motivations and experiences. In addition, since motivations and experiences can change, and volunteers tend to identify multiple motivations important to them, this requires taking an active and continued interest in volunteers' perspectives.

Secondly, while the very action of taking an interest may already contribute to seeing volunteering from the volunteers' perspective, a next step would be to use this information to align project activities to match volunteers' motivations and positive experiences. Based on my findings I highlight three examples of how to do so:

⁵⁰ My use of the term 'volunteer-centric' is inspired by the work of Brudney and Meijs (2009) who put forward a 'community-centered' approach to volunteer management, in contrast to the established focus on the volunteer organisation and its needs. This community-centred approach sees volunteer engagement as a joint negotiation between all involved parties (including but not limited to all volunteer organisations, volunteers and funding agencies) with the aim to maintain volunteer energy in the long term (p. 575). Since my data concern the perspective of the volunteer specifically, I focus here on this aspect of broadening our gaze beyond the needs of a specific volunteer organisation. I return to this 'community-centred' approach in section 8.3.4.

motivation matching, sensitively approaching intensification and diversification of activities, and designing for learning.

Motivation matching (Clary & Snyder, 1999) refers to aligning volunteers and activities in such a way that volunteers can fulfil their own motivations for volunteering. For instance, volunteers who are strongly motivated by social motivations would quickly lose motivation if faced with little opportunities to connect with other people, and volunteers for whom improving other people's connection with nature is an important motivation would cherish seeing themselves making such an impact first-hand. The volunteer-centric aspect here centres on taking the motivations reported by the volunteers themselves as a starting point to see how activities can be made rewarding for them, which in turn can maintain motivation for taking action for nature. For instance, Chapter 4 found that a personal thrill of discovery was emphasised by many respondents, and as such providing opportunities for such experiences can be a way for organisers to help volunteers make memorable experiences in nature, which may positively contribute to both motivation for monitoring and connectedness with nature. Respondents from whom the search (or 'quest') for a specific species is highly motivating would likely enjoy projects focussed on locating specific species (e.g. invasive alien species), while those who use biodiversity monitoring as a way to build place attachment would likely be a good fit for regular monitoring projects.

Motivation matching also implies that care must be taken with approaching volunteers with activities that do not align with their interests and motivations; this brings me to the issue of intensification and diversification of activities. On the one hand, in Chapter 6 almost 90% of respondents expect to be doing at least a similar amount of green volunteer work in the future, with about 25% expecting to do more. This would seem to support the notion of offering current green volunteers more and diverse opportunities to get involved in further activities (as suggested by e.g. Miles et al. (1998, p. 38). However, the results also show that enthusiasm for some potential activities is higher than for others, and that this partly seems to depend on the current type of green volunteering activities. Some volunteers may feel particularly passionate about their current activities and would like to do more of that type of work (indicating potential for *intensification*), while others may be less enthusiastic to invest more time but would like to try their hand at a greater diversity of responsibilities (indicating potential for *diversification*). From the perspective of matching tasks and motivations (West & Pateman, 2016), it thus becomes important to gain insight into what sorts of activities are of interest to an organisation's current volunteers, which are not, and how this relates to volunteers' profile

and current activities. As argued further in Chapter 7, this is important because repeatedly offering activities to volunteers that do not match their interests and motivations may lead to perceived pressure to oblige, or more generally stifle commitment and erode motivation, potentially leading to volunteer burnout (Measham & Barnett, 2008, p. 548) and a loss of volunteer energy in the long run (Brudney & Meijs, 2009).

I end this section with a comment on learning, which across my studies I have found to be an important motivation for green volunteers, especially for younger volunteers and those involved in biodiversity citizen science and educational volunteering. Section 8.2 highlighted transformative learning as an important dimension of green volunteering. However, Chapter 5 also discusses how projects that only involve volunteers in limited tasks that leave little room for creativity and reflection may not offer much chance for transformative learning to take place. In light of this, authors such as Bonney et al. (2016, p. 11) and Evely et al. (2011, p. 121) encourage projects that aim to stimulate deeper forms of learning to specifically design for this, for instance by actively inviting participants to reflect on how participation has shaped their visions of nature or their views on science. Other scholars (e.g. Chase & Levine, 2018, p. 7; Liberatore et al., 2018; Rohden et al., 2019) have highlighted the learning potential of peer interaction and community building. Projects may thus do well to organise fora for volunteers to interact and share knowledge and experiences with each other and with project staff (whether through physical get-togethers or online), as this has potential to positively affect learning and strengthen motivation. Feedback to help volunteers develop themselves further can support their learning and personal development, for instance by making their progress tangible to themselves and raising their feelings of competence (Ryan & Deci, 2000; Tiago et al., 2017).

8.3.3 The volunteer organisation as recruiter

The work presented in this thesis provides further indication that engagement in green volunteering is more common among some demographic groups than others, with biases in terms of age and education level especially standing out. This section reflects on insights offered by our results on the sorts of interventions that may prove fruitful to involve a broader segment of the public in green volunteering. The first question that arises, however, would be if there is even a need for diversification in green volunteering.

Why diversify?

On the one hand, whether greater diversity among green volunteers is important

depends on the goals of a project and its organisers. For example, if the goals of a biodiversity citizen science programme largely revolve around collecting highly accurate and complex data for ecological monitoring of a difficult-to-identify species group, it may be most fruitful for the organisation to engage a select group of highly specialised and experienced volunteers, who may not be diverse at all in terms of profile.⁵¹ On the other hand, the same programme might benefit from having more diverse volunteers to improve geographic coverage or safeguard continuity in monitoring. In addition, if the same programme also has ambitions in terms of education, connecting people with nature, building support for conservation measures or empowerment of local communities, organisers would have every reason to pay significant attention to diversity in the profile of participants. This balance is something I highlight in Chapter 5, when we discuss the balancing of scientific and outreach ambitions in citizen science programmes (see also Brouwer & Hessels, 2019; Sauermann et al., 2020, p. 10). This balancing act is also found in other forms of green volunteering; for instance, in educational volunteering a greater diversity in terms of cultural background of educational volunteers would demand more resources but may also open up opportunities to reach a wider audience.

Of course, the abovementioned arguments are all reasoned from the perspective of organisations working with green volunteers. If we approach the topic of diversity from a volunteer-centric point of view, however, further arguments come into play. Seen from this perspective, green volunteering is one opportunity for people to learn, take action, and accomplish important personal goals. In terms of building a supportive environment for the transformative potential of green volunteering, it is vital to prevent motivated individuals from being impeded in taking action for nature. Potential green volunteers would lose their motivation if they feel unwelcome or unfit for the volunteer work they would like to pursue. Reasoned from both the organisation, the volunteer and stimulating action for nature, there is sufficient cause for green volunteer organisations to identify opportunities for diversification.⁵²

⁵¹ As one illustration of the benefits of involving volunteers with a specific profile, in a study of citizen science research on wild carrots Rome and Lucero (2019) show how the established scientific credentials and expertise of the citizen scientists involved in the project helped strengthen the trustworthiness of the data for use in policymaking. As Spiers et al. (2019, p. 21) note, 'the scientific efficiency of a citizen science project may occasionally directly conflict with the aim of social inclusivity'.

⁵² Of course, efforts to diversify should not come at the expense of appreciating the work done by current volunteers. In my own efforts to share my findings with practitioners and volunteers, I have witnessed first-hand how calls to diversify can be interpreted this way by dedicated volunteers who fit the established demographic profile. This too is a communication

How to diversify?

So what would taking actions for stimulating diversity in volunteers' profile look like? I distinguish here between reducing barriers to volunteering, and responding to a more diverse palette of motivations. Firstly, as mentioned in section 2.2, a common barrier to volunteering concerns time constraints and struggles to combine volunteer work with other responsibilities. Not all factors that influence this can be controlled by a volunteer organisation (Nesbit et al., 2018), but what they can do is take steps to help volunteers more easily align volunteering with their other responsibilities. For instance, some organisations require volunteers to be available for specific times of day, specific days of the week, or a minimum amount of hours a week. While understandable from the viewpoint of efficiency and convenience of the organisation (which would be an organisation-centric perspective), taking a more volunteer-centric perspective would suggest less reliance on such time demands, as they amount to a significant barrier for people to engage in the volunteer work, even if they have the motivation to do so. Opportunities for more intermittent and short-duration volunteering could reduce barriers to younger participants, who otherwise would be constrained significantly by study or work obligations. Other approaches include altering the day on which weekly activities are carried out, offering volunteers the opportunity to enrol for preferred timeslots, offering different intensities of participation within a programme (e.g. a weekly restoration group that also has a once-a-month event), or the use of volunteer 'flex pools'.⁵³ Within biodiversity citizen science programmes, offering opportunities for citizens to get involved in several stages of the research process without *requiring* them to do so can reduce barriers to participate. Developing further ways to make use of 'casual' nature observations in biodiversity research (Horns et al., 2018; Van Strien et al., 2016) would also allow a broader group of individuals to contribute to studying the natural world, including those for whom systematic monitoring routes are infeasible (Maund et al., 2020). Volunteer organisations can thus stimulate diversity by removing (or at least reducing) barriers for potential volunteers with an underrepresented profile (Sundeen et al., 2007).

A second important step if one wishes to engage underrepresented groups in green volunteering involves recognising that their motivations may well differ from those of current green volunteers (as represented in this thesis), and to connect with these motivations. This entails communication and outreach tailored to different

challenge that volunteer organisations (and scholars!) will need to tackle.

⁵³ 'Flex pools' are channels for volunteers who do not wish for regular engagement to enrol and be notified if incidental helping hands are needed. Some Dutch nature organisations are already implementing such initiatives.

publics in order to speak to their profile and motivations (see e.g. Chu et al., 2012, pp. 70-71; Fücks et al., 2019; Van Galen, 2019) and how they experience and connect with nature and greenspace (Kloek, 2015).⁵⁴ Pandya (2012) notes that diversification requires linking goals of a project with community priorities, which also means these might have less to do with nature, biodiversity or contributing to academic research (Davis et al., 2020, p. 16; Wesseling et al., 2019, p. 17). This also points to the role of networks; green volunteering opportunities are often communicated through existing networks of nature organisations, so tapping into new networks (neighbourhood associations, schools, sports organisations and religious organisations) holds much potential to reach new audiences. However, these organisations all have their own motivations as well, further broadening the palette.⁵⁵ Combining such a broad array of motivations can be challenging, especially in terms of meeting all of them within a single initiative (Sorensen et al., 2019). However, if a nature organisation is committed to engaging a wider audience, this also means engaging a wider range of motivations.

I end this section on diversification with the relatively high mean age found across my studies. On the one hand, one may argue that people simply have more time to volunteer after a certain age. If new generations of green volunteers continue coming, why be concerned about an underrepresentation of younger people? However, with early experiences in nature identified repeatedly as an important factor in shaping attitudes towards and action for nature later in life (e.g. Brewer, 2006; Van den Born et al., 2018), and Chapter 1 highlighting both an 'extinction of experience' with nature and a shifting role for volunteering, it may not be as self-evident for people to start volunteering for nature anymore. Studies have also indicated that volunteering earlier in life can reduce barriers to volunteer later in life (Snyder & Omoto, 2008, p. 18).⁵⁶ Furthermore, Chapter 6 found that the overwhelming

⁵⁴ While organisations' ambitions in terms of diversification will logically have to be balanced with their available resources, creative recruitment practices can be an important intervention in boosting diversity among volunteers, as demonstrated by e.g. Dean (2016) in a study of class distinction in youth volunteering.

⁵⁵ This also speaks to the role of personal appeals for recruiting volunteers. On the one hand, scholars have highlighted the important role of social networks and 'being asked' as an important factor in the decision to volunteer (Haski-Leventhal & Cnaan, 2009). On the other hand, relying too much on the personal networks of staff and existing volunteers may also not benefit diversity, as personal networks may consist largely of people with similar backgrounds and levels of familiarity with green volunteering.

⁵⁶ Although this may depend on the degree to which volunteering was a choice rather than a requirement. Several scholars (e.g. Stukas et al., 1999; Warburton & Smith, 2003) have illustrated how coercion or pressure to volunteer may diminish young people's intention to volunteer in the future.

majority of surveyed green volunteers themselves also identified a lack of sufficient younger volunteers. Considering all these factors, there appears to be a clear reason for practitioners to identify opportunities to engage more young people in green volunteering. Experiences in nature and building connection with nature early in life are important processes, and green volunteering is one activity that can help contribute to this.

8.3.4 On communities, society and cooperation

In the previous sections, I focussed on implications of our findings for nature organisations in terms of designing volunteer activities, support and appreciation for green volunteers, and diversity in volunteers' profile. However, my findings are not only of relevance for organisers of green volunteering activities. As introduced in footnote 50, Brudney and Meijs (2009) called for a community-centred approach to volunteer management, wherein all parties that have a stake in volunteering cooperate to ensure volunteers have a rewarding time and their enthusiasm is maintained beyond the here and now. Haski-Leventhal et al. (2018) echo this point, noting that it is not enough to focus only on the micro-level of a specific volunteer activity, but that supporting volunteers requires alignment of and cooperation among volunteers, volunteer organisations, public bodies and policy (p. 1155). Chapter 1 also touched upon this point, noting that action for nature ought to be supported by policies and institutions, and certainly not obstructed. Section 8.2 already touched upon a few important points of attention, such as adopting a broad view of biodiversity citizen science and green volunteering. Here, I formulate two implications of my findings for the wider community of stakeholders. One relates to the matching of the formal and informal worlds, and the second to cooperation between volunteer organisations and looking beyond 'your' volunteers.

An important implication of my work is that it is important not to focus only on formally organised green volunteer work, to avoid overlooking the actions for nature carried out in informal settings. If nature organisations and governmental actors wish to support green volunteering, they thus ought to think beyond formal initiatives and determine how they could also include the needs of green citizen initiatives and casual biodiversity observers. This importantly implies determining how best to support them, or at the very least not work against them. After all, the literature on citizen initiatives has shown how citizens' actions for nature organised in the 'informal world' outside of established institutions (Hassink et al., 2016, p. 5) do not take place in an institutional vacuum but operate within and rely on existing formal procedures and practices (Bisschops & Beunen, 2019; Mattijssen et al., 2017; Meijer, 2018; Witheridge & Morris, 2016). Franklin and Marsden (2015) and

Krasny and Tidball (2012, p. 272) thus recommend governmental actors to take a more facilitative role and recognise when not to interfere to avoid the danger of hampering or co-opting such initiatives.⁵⁷ This highlights the importance of good working relationships with formal actors and mutual trust (Hassink et al., 2016), and illustrates why public actors have to ensure that their policies, discourses and routines facilitate and support rather than undermine action for nature.⁵⁸ This can be challenging, as citizen initiatives may pursue actions for nature that are not in line with priorities of local governments or other institutional stakeholders (Buijs et al., 2019, p. 54; Van Dam et al., 2015). However, considering the increasingly prominent role played by informal citizen initiatives in many domains (including nature and greenspace), how institutionalised stakeholders relate to these initiatives will be a crucial matter in the years to come.

Secondly, cooperation between nature organisations and other stakeholders working with green volunteers will be increasingly vital. Section 1.3.3 discusses how volunteering scholars have witnessed a change (or rather, pluralisation) in motivations for volunteering, with long-term organisational ties (and concomitant involvement with these organisations as a volunteer) losing importance compared to actively choosing volunteering opportunities based more on the activities' aims and their alignment with a volunteer's motivations (Hustinx & Lammertyn, 2003). Chapter 6 draws on this perspective for contextualising our findings on green volunteers' motivations and experiences, which offers important implications for cooperation in green volunteering. After all, if (as suggested by this perspective) it is the aim of an activity, rather than the specific organisation organising it, that draws in contemporary volunteers, this offers fruitful grounds for further collaboration among nature organisations in offering volunteering opportunities around specific species, objectives or landscapes. While it comes with its own set of challenges, stronger collaboration offers benefits from an organisation-centric point of view (e.g. sharing of experiences and skills and more efficient use of personnel and budgets), while from a community-centred point of view (Brudney & Meijs, 2009) it is a vital step towards a shared responsibility to ensure volunteers are supported now and in the future.

⁵⁷ Buijs et al. (2016, 2019) make a similar argument, noting that governments ought to strike a balance between retreating and offering space to active citizens on the one hand, and facilitating them to ensure connectivity between initiatives on the other.

⁵⁸ De Groot et al. (2015, pp. 20-21) use the term 'systematic demotivation' to describe how some ways of framing and approaching environmental problems, such as presenting biodiversity loss as a natural and inescapable phenomenon, can serve to demotivate action for nature.

Finally, this perspective may also imply that a strong focus on ‘our’ or ‘your’ volunteers is a double-edged sword. On the one hand, creating a sense of community within a volunteer group, and a feeling of ownership of and identification with an organisation and its goals, can benefit motivation and retention of volunteers (Bauer & Lim, 2019). On the other hand, we must be mindful of the tension between keeping ‘your’ volunteers committed to your organisation, and facilitating them having rewarding experiences elsewhere. When volunteers choose to pursue volunteering opportunities at a different organisation this could be perceived as a loss or a failure from an organisational perspective, yet from the volunteer’s perspective this might well be a healthy development in terms of learning, empowerment, maintaining motivation and developing their personal narrative. Seen from the perspective of action for nature, volunteers must continually find themselves in a context that motivates them to take such actions, rather than losing motivation due to being in a context that no longer fits their priorities and motivations. Overall, my recommendations centre on striking a balance between the needs and priorities of nature organisations, volunteers, public bodies and policy, and shaping a motivating and supportive context for green volunteers.

8.4 Recommendations for future research

As I near the end of the synthesis of my thesis, and look back upon the questions and topics that my research has shed some further light on, I am fully aware that my work raises as many questions as it answers. This is a reality of conducting scientific research, where the more you discover, the more you become aware of everything that deserves further study. It is also a logical result of the need to demarcate one’s object of study (as discussed in Chapter 2), which necessitates prioritising some dimensions or objects of study over others. In addition, in section 1.5 I drew on Integral Theory and the Volunteer Process Model to highlight how my approach to studying green volunteers is one of many possible approaches to research. In this section, I return to these models to develop several recommendations for future research. After doing so, I end by sketching some of the ways in which I will continue my research on green volunteering in the context of the ENVIRO-CITIZEN project.

In the terminology of Integral Theory, my research focussed on the individual level (surveying individual volunteers) and on the interior dimension (the personal experiences and motivations of these individuals). Similarly, in terms of the Volunteer Process Model my work is located largely at the individual level, covering both the

antecedents (motivations), experiences and consequences (e.g. learning) of green volunteering. Naturally, my research presents plenty of promising avenues for further investigation in these dimensions. In line with our aim of developing a broad national overview, our survey among biodiversity citizen scientists (Chapters 3 and 4) and the broader population of green volunteers (Chapters 6 and 7) necessitated a sampling approach that precluded random or stratified sampling. Drawing on such approaches (e.g. among specific volunteer groups with known demographic profiles) would thus be informative to compare findings with the broad national sample surveyed here. Using similar reasoning, the survey among DNBS participants (Chapter 5) captured a relatively small sample in light of the total population of participants, so further inquiries into citizen science learning outcomes among larger and more diverse samples would add to the growing literature on learning in citizen science (Peter et al., 2019; Turrini et al., 2018). Such work would also be especially informative if carried out in other geographic settings than much of the literature on green volunteering appears to draw on. While further studies in North America and Western Europe remain important, studying green volunteering in other regions (see e.g. Braschler, 2009; Loos et al., 2015; Requier et al., 2020; Sakurai et al., 2015) contributes to more well-rounded insights into why people around the world take action for nature.

Beyond sampling, my work also offers other recommendations for future research on the individual and internal dimensions of green volunteering. This includes several recommendations for further survey research: for instance, Chapter 3 invites further work on studying biodiversity recorders’ views on open data and data sharing (see e.g. Fox et al., 2019) and Chapter 5 offers several pointers for further research on learning outcomes in biodiversity citizen science. The latter include looking beyond content knowledge by including more transformative learning related to behavioural intentions or the human-nature relationship (Edelson et al., 2018), reporting null or negative results, and using more sensitive scale items and response formats to tackle ceiling effects. In terms of survey research on motivations, it is important to recognise that the research presented here paint a fairly static picture of motivations, though Chapter 7 discusses how motivations to initiate green volunteering may differ from those that inspire volunteers to stay engaged. As argued by other scholars in the field (Land-Zandstra et al., 2016b; McDougale et al., 2011; Pagès et al., 2018) one recommendation for further research would thus be to dedicate greater attention to the temporal aspects of volunteer motivations. Aside from this temporal complexity, being sensitive to factors such as age, gender and educational background may reveal patterns in the motivations green volunteers attribute more or less importance to (Asah et al., 2014; Bramston et al., 2011). This

thesis has found several instances of this, but more work unravelling these patterns is needed. In addition, research aimed at untangling differences in profile between participants in more formal and informal green volunteering could contribute to debates in the literature on whether informal volunteering might be more inclusive towards groups less commonly engaged in formal volunteering (Buijs et al., 2016, p. 3; Lie et al., 2009, p. 707; Wilson, 2012, p. 177) or whether citizen initiatives may also reinforce existing inequalities (Mattijssen, 2018, p. 11; Mees et al., 2019, p. 205).

Sensitivity to volunteers' profile also extends to ethnic and cultural background (Saldivar-Tanaka & Krasny, 2004), which the research conducted here did not include as a variable. As such, how the patterns found here differ for volunteers of different cultural and ethnic backgrounds remains a question for further research. While often not included as a variable, survey studies on biodiversity citizen scientists (Chase & Levine, 2018; Merenlender et al., 2016; Postles & Bartlett, 2018) and green volunteers more broadly (e.g. Donald, 1997; Guiney & Oberhauser, 2009) that do report ethnic or cultural background often find a strong representation of white participants. Wilson (2012, p. 184) raises the methodological point that European studies of volunteering seem less likely to include ethnicity or cultural background as a background variable compared to studies from the United States. A suggestion for further survey research into the motivations and experiences of green volunteers would thus be to make sure a question on ethnic or cultural background is included in the demographic questions.

If I stay for another moment within the individual and internal quadrant of Integral Theory, another suggestion for further research relates to combining the strengths of both qualitative and quantitative approaches, since the work presented here is largely quantitative. Both methods excel at answering different types of research questions; whereas my quantitative work is fit to answer questions of distribution and relative importance, qualitative approaches would offer more opportunity to gain an in-depth understanding of some of the motivations and experiences I studied. For example, I found people's personal connection with nature to be a key motivation throughout this thesis, yet can offer fewer insights into what this connectedness means to people exactly, or whether it is mostly emotional, cognitive, experiential, or all of the above (Ives et al., 2017). Interviews with green volunteers about what connectedness to nature means to them would be one way to help achieve this. Similar approaches would be valuable for any of the motivations discussed here, such as volunteers' attachment to place (what is it that makes cherished places special?) or contributing to science or conservation (what exactly do

people expect this contribution to be?). Using a variety of methods to study the link between motivations and significant nature experiences, as discussed in Chapter 4, would also be a fruitful avenue for further research. Finally, my review of debates surrounding the 'what' of green volunteering also presents an interesting avenue for further mixed-methods research: how do volunteers in biodiversity citizen science and other green volunteering initiatives themselves reflect on terms such as 'volunteer' and 'citizen scientist'? Do they identify as such, and why (not)? And how are these terms understood and appraised by people who currently do not volunteer, but might in the future (Haski-Leventhal et al., 2019)? If we aim to continue those important debates as a scholarly community, we would be remiss not to include the voices of the volunteers themselves.

However, Integral Theory and the Volunteer Process Model also help grasp that the individual and internal dimensions of green volunteering are only part of the picture. Working from the individual and exterior quadrant could mean utilising ethnographic methods or action research to follow and work with green volunteers in their everyday activities, studying aspects such as how volunteers behave towards fellow volunteers, analysing their conversations, and studying sources of harmony and conflict. This also offers opportunities to tackle several dimensions of the Volunteer Process Model that have received relatively little attention in this thesis, such as how volunteers form groups and bond with each other (Haski-Leventhal & Cnaan, 2009), or how knowledge, groups norms and routines are shared in networks of volunteers and involved practitioners (Richter et al., 2018).

At the collective level, and related to the organisational and societal dimensions of the Volunteer Process Model, further research could take the volunteer organisation or citizen initiative itself as a unit of analysis (Studer & Von Schnurbein, 2013). Rewarding topics of inquiry would include the culture within green volunteer organisations regarding the division of roles and responsibilities between paid staff and volunteers (Handy et al., 2008; Woodcock et al., 2017), how highly committed and active green volunteers are identified and supported (Einolf & Yung, 2018), and organisational views and practices related to diversification of green volunteers (De Rond, 2019). A review by Wehn and Almomani (2019) of incentives and perceived barriers for participation in citizen-driven environmental monitoring revealed that the views of organisational stakeholders (e.g. land managers or scientists) had received relatively little attention in the literature, which offers another promising perspective for studying green volunteering.

Relevant legislation or institutions are also a fruitful area of further inquiry. For example, Chapter 6 found that there were some mixed responses among volunteers as to whether they felt appreciated by the government, which calls for research on how governmental actors and policies (whether in the Netherlands or in other countries) frame the role of citizens and volunteers in action for nature. This aspect also relates to some of the ethical and political aspects of green volunteering, such as critically examining overarching discourses on public and private responsibility related to nature and its conservation (as noted in section 6.4). For instance, authors such as Rosol (2012) have raised critiques regarding the increasing promotion of volunteering in green space governance, in light of neoliberal trends of 'outsourcing' governmental responsibilities to the private and civic sector.⁵⁹ Such a lens would offer valuable reflections on the research presented here.

The collective quadrants of Integral Theory also offer important input for a research agenda into the transformative potential of green volunteering, connected to the rising scholarly attention to sustainability transformations more generally (Scoones et al., 2020). As section 8.2.2 made clear, my results address how green volunteering has transformative potential through offering opportunities to express and strengthen connection with nature and to take action for nature. Another topic of research, however, concerns its *societal* or *institutional* transformative potential. Firstly, this could involve studying the role that green volunteers might play in mobilising and inspiring others to take action for nature (e.g. Johnson et al., 2014), or how more broadly communicating appreciation for green volunteers and their motivations could inspire others (Bouman & Steg, 2019; Krasny et al., 2014b, p. 183). Secondly, I heartily recommend further research into the degree to which citizens' action for nature could trigger institutional change. After all, Abson et al.'s (2017) call for re-connecting humans and nature was not only about personal worldviews and actions but also about how these inform the intent and design of policies and practices (see also Ives et al., 2018).⁶⁰ Studies of how green volunteers

inspire transformations in governance (e.g. Mattijssen et al., 2019; Spijker & Parra, 2018) are one way to gain more insight into this dimension of the transformative potential of green volunteering.

In summary, in terms of further progressing this field of research, diverse studies approached from these different quadrants and dimensions will each add a new piece to the puzzle, which would allow us to work towards achieving an integral understanding of green volunteering, action for nature and its transformative potential. My final recommendation relates to a different way to achieve a more integral understanding: drawing on diverse literatures. Throughout this thesis, I have been inspired by valuable contributions from work on green volunteering, biodiversity citizen science, ecology, science and technology studies, and the general citizen science and volunteering literatures. As I argued in Chapter 1, I believe crosspollination and mutual inspiration between these literatures is vital if we are to address grand challenges such as how to support and cherish citizens' action for nature, a challenge too great for any one discipline or literature. When taking up any of the above suggestions for future research, I thus strongly recommend fellow scholars to let themselves be inspired by the different fields of scholarship that have important insights to add.

Coda: EnviroCitizen

My research will continue for the coming years within the Horizon2020 project EnviroCitizen (<https://www.envirocitizen.eu>). Based in the environmental humanities (Bergthaller et al., 2014; Sörlin, 2012), EnviroCitizen takes as its starting point that environmental citizen science has focussed much on the 'science' while somewhat forgetting about the 'citizen'. Focussing on volunteer involvement in birding (through bird observations and bird ringing), the aim of this project is to study how birding contributes to participants learning about, becoming invested in and taking action for nature. To conceptualise this transformative potential of biodiversity citizen science, the project draws on the concept of environmental citizenship, which *inter alia* encompasses the knowledge, attitudes and abilities necessary to take individual and collective action at different scales to combat existing environmental problems and prevent new ones (Hadjichambis & Reis, 2020).

⁵⁹ Some citizen science scholars have voiced similar concerns, linking calls for citizen science participation to debates surrounding neoliberalism in science and 'scientization' of environmental politics (see e.g. Kimura & Kinchy, 2016; Lave, 2012; Vohland et al., 2019), as well as notions of politics and citizenship embedded in different forms of citizen science (Fan & Chen, 2019).

⁶⁰ This is also true beyond nature-related activities. As Rowbotham et al. (2019, p. 124) note more generally, 'While the transformative potential of citizen science for individual people has been documented, its potential for organizational and institutional transformation has not been well demonstrated'. For further discussion on the potential for citizen science to question and change hierarchies in knowledge production, see Chen (2019), Lave (2015) and Mahr and Dickel (2019).

A consortium of scholars from seven European countries⁶¹ and partnering ornithological non-profits, our work will include studying volunteer birding in the past and present, as well as designing interventions to strengthen development of environmental citizenship through birding in the future. In many ways, the work I will carry out is a direct continuation of the research gathered in this thesis, while also tackling some of the new questions it has raised. In terms of similarities, some of our key topics of inquiry will include the ‘who?’ and ‘why?’ of historical and contemporary volunteer birding, including motivations for taking part, approaches for engaging young people in birding, and mechanisms of in- and exclusion regarding gender and cultural diversity. In terms of new approaches, much of the empirical work will be carried out using ethnographic and other qualitative methods, including investigating the social interactions in volunteer groups and how learning and mentoring work in practice. Our work on engaging children will focus on a school setting, including the challenge of how to design materials and projects to stimulate transformative learning. This aligns with previous work on the transformative potential of biodiversity citizen science participation among children and youths, for instance in terms of their learning process and their agency in taking conservation action now and in the future (Ballard et al., 2017; Makuch & Aczel, 2020).

In the coming years I will thus be able to strengthen my existing lines of inquiry while tackling some of the points of attention suggested in this synthesis. I hope my thesis will inspire other scholars and practitioners to critically discuss my work, to take up some of the many intriguing questions that remain, and to join me in putting green volunteers in the spotlight.

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⁶¹ Cyprus, Estonia, the Netherlands, Norway, Romania, Spain and Sweden. Lead partner of the consortium is the University of Stavanger (Norway).

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Research data management

This thesis research has been carried out under the institute research data management (RDM) policy of the Institute for Science in Society (ISIS), found at <https://www.ru.nl/science/isis/research/research-data-management/> (last accessed 21-07-2020).

The empirical work carried out in this thesis resulted in survey data that, when combined, could be used to identify individual respondents (e.g. gender and age, postcode and/or province of residence, as well as leisure activities and organisational ties). In addition, the qualitative data reported in Chapters 4 and 7 include personal narratives that could be used to identify respondents.

It would thus be impossible to fully anonymise these data, and as such, the data were handled as personal data. The institute's RDM policy notes that empirical data sometimes 'cannot be shared publicly, for example due to privacy restrictions or other concerns' (p. 2). Following institutional policy for personal data, the data were stored in a folder with restricted access on the ISIS network drive. This is also in line with my commitment to the respondents, as in the introduction of each questionnaire respondents were promised that anonymity would be protected in processing the data, which includes storage.

In the table below, I detail the files stored on the ISIS network drive linked to each empirical chapter of this thesis, as well as their corresponding file paths.

Study 1 (Chapter 3 & 4)	
Questionnaire	Z:\Projects\626700_Wessel_Ganzevoort\Projects and data\Study 1 (Chapters 3 & 4)\Questionnaire Study 1.pdf
Raw Data File	Z:\Projects\626700_Wessel_Ganzevoort\Projects and data\Study 1 (Chapters 3 & 4)\Raw Data File Study 1.sav
Analysed Data File (Chapter 3)	Z:\Projects\626700_Wessel_Ganzevoort\Projects and data\Study 1 (Chapters 3 & 4)\Analysed Data File Study 1 (Chapter 3).sav
Analysed Data File (Chapter 4)	Z:\Projects\626700_Wessel_Ganzevoort\Projects and data\Study 1 (Chapters 3 & 4)\Analysed data file Study 1 (Chapter 4).atproj
Study 2 (Chapter 5)	
Questionnaire (pre)	Z:\Projects\626700_Wessel_Ganzevoort\Projects and data\Study 2 (Chapter 5)\Questionnaire Study 2 (pre).pdf

Questionnaire (post)	Z:\Projects\626700_Wessel_Ganzevoort\Projects and data\Study 2 (Chapter 5)\Questionnaire Study 2 (post).pdf
Raw Data File (pre)	Z:\Projects\626700_Wessel_Ganzevoort\Projects and data\Study 2 (Chapter 5)\Raw Data File Study 2 (pre).sav
Raw Data File (post)	Z:\Projects\626700_Wessel_Ganzevoort\Projects and data\Study 2 (Chapter 5)\Raw Data File Study 2 (post).sav
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Cleaned Data File (post)	Z:\Projects\626700_Wessel_Ganzevoort\Projects and data\Study 2 (Chapter 5)\Cleaned Data File Study 2 (post).sav
Analysed Data File (pre)	Z:\Projects\626700_Wessel_Ganzevoort\Projects and data\Study 2 (Chapter 5)\Analysed Data File Study 2 (pre).sav
Analysed Data File (post)	Z:\Projects\626700_Wessel_Ganzevoort\Projects and data\Study 2 (Chapter 5)\Analysed Data File Study 2 (post).sav
Analysed Data File (joint)	Z:\Projects\626700_Wessel_Ganzevoort\Projects and data\Study 2 (Chapter 5)\Analysed Data File Study 2 (joint).sav
Study 3 (Chapter 6 & 7)	
Questionnaire	Z:\Projects\626700_Wessel_Ganzevoort\Projects and data\Study 3 (Chapters 6 & 7)\Questionnaire Study 3.pdf
Raw Data File	Z:\Projects\626700_Wessel_Ganzevoort\Projects and data\Study 3 (Chapters 6 & 7)\Raw Data File Study 3.sav
Cleaned Data File	Z:\Projects\626700_Wessel_Ganzevoort\Projects and data\Study 3 (Chapters 6 & 7)\Cleaned Data File Study 3.sav
Analysed Data File (Chapter 6)	Z:\Projects\626700_Wessel_Ganzevoort\Projects and data\Study 3 (Chapters 6 & 7)\Analysed Data File Study 3 (Chapter 6).sav

Explanatory notes

- Since Chapters 4 and 7 originate from the same questionnaire and raw data files as Chapters 3 and 6 respectively, these were stored once.
- For Study 1 no separate cleaned data file was stored, as this file was continued in the analysed data file.
- Chapter 5 has two of each file, one for the initial survey (*pre*) and one for the follow-up survey (*post*). In addition, a separate data file was used for the joint analyses of both datasets (*joint*).

- Since the analysed dataset for Chapter 7 is in non-digital format, these data have been placed in secure physical storage at the institute.

Summary

We are constantly bombarded with news on worrying trend in nature and biodiversity, and analyses of the detrimental impact of human society and behaviour on the natural world. In turn, the scientific literature has reflected on varying explanations for why individuals, corporations and governments struggle to take action for nature. Yet in our quest to understand these matters, we sometimes risk losing sight of the countless individuals around the world who do take action for nature. Human action may be an important cause of many of the aforementioned problems, but such action is also a key resource in combating them. One important form of action for nature is green volunteering, as volunteers are a cornerstone of ecological research, nature conservation, urban greening and nature education. However, the people behind these impressive achievements, their experiences and motivations, tend to remain obscured and outside the lens of scientific inquiry.

The aim of my research on green volunteering, brought together in this thesis, is to redress this lacuna. I want to put the green volunteer in the spotlight: their profile, their motivations, and their expectations and experiences. Drawing on three survey studies among different groups of Dutch green volunteers, I provide more insight into who green volunteers are and why they do what they do. In doing so I contribute to our understanding of action for nature and its transformative potential.

This background to my work is explained in more detail in **Chapter 1**, where I connect to three important debates in the scientific literature. Firstly, my work ties in with concerns regarding humanity's waning connection with nature and the 'extinction of experience', as well as the suggested potential of green volunteering to stem the tide. Secondly, I draw on the literature on citizen science to show that citizen-collected biodiversity data are crucial for science and conservation, but that some important accompanying tensions have received little attention in the literature: how citizen scientists feel about sharing their collected data, and how they experience issues of ownership, transparency and trust. Thirdly, I discuss how my work relates to some important debates in the volunteering literature: about diversity among current volunteers, as well as a perceived pluralisation of motivations for contemporary volunteering. In Chapter 1, I also reflect on the methodological positioning of my work in relation to other approaches to research, on the navigation of methodological and disciplinary divides, and on balancing commitments to theory and practice.

In **Chapter 2**, I review the literature in three key areas to inform my research design. Firstly, I focus on the 'what?' of green volunteering. Definitions of phenomena such as volunteering are context-dependant and subject to considerable conceptual de-

bate. I show how the literature has debated the definitions, categorisations and boundaries of the terms 'volunteering' and 'citizen science', and I use these insights to adopt a broad understanding of green volunteering. This entails including four types of green volunteering in my research: recorders, restorers, educators and administrators. Secondly, in the 'who?' of green volunteering I investigate what we know of who takes part in it, focussing on the dimensions of age, gender and level of education. I identify commonly reported patterns in the literature, and discuss proposed explanations for these patterns. Finally, I focus on the 'why?' of green volunteering, reviewing the literature on motivations to identify several categories of motivations of green volunteers. I also position myself in relation to prominent typologies, including the distinction between intrinsic and extrinsic motivations, and altruistic and self-oriented motivations.

The empirical work in this thesis is presented in five chapters, based on three studies. Chapters 3 and 4 present the results of the first study, a survey among Dutch biodiversity citizen scientists ($N = 2193$). The research questions of **Chapter 3** cover three main dimensions: the profile of these volunteers in terms of socio-demographics and activities, their motivations, and their perspectives on sharing biodiversity data. In terms of profile, key findings include a high mean age and level of education among the respondents, and a diverse array of favoured taxa, with birds being the most commonly reported. As for motivations, the volunteers emphasised a personal connection with nature, and a desire to learn about and protect nature. The idea of biodiversity data as a public good received quite some support, but the results also indicate that biodiversity recorders share their biodiversity data under the assumption of certain conditions on data sharing. These include reflections on attribution, and on whether data users will use the data for the 'right' purpose.

Chapter 4 draws on the same study, but instead offers a qualitative analysis of significant nature experiences reported by our respondents. Based on an analysis of 1450 of such experiences, we conclude that biodiversity citizen scientists described a wide variety of nature experiences. These included both specific events and characteristic types of experiences, rare and everyday species, and aspects ranging from enjoyment of the outdoors to a deep sense of immersion in nature. The discovery of plants or animals unfamiliar to the respondents, however, is a frequently recurring theme in the responses.

Chapter 5 reports the results of a different study, a set of surveys among participants of the first edition of the Dutch National Bee Survey. Based on surveys completed before ($N = 373$) and after ($N = 208$) participation, we inquire into respondents'

profile, motivations, and learning outcomes. Like in the previous study, respondents are characterised by a high mean age and level of education, and conservation concerns and a desire to learn about bees are revealed to be highly ranked motivations. In terms of learning outcomes, we find a notable difference depending on the type of question asked. Respondents self-reported significant changes in their knowledge about, attitudes on and behavioural intentions regarding wild bees, yet scale-based attitudinal measures indicated little change between both measurement times. The discussion of Chapter 5 reflects on project-related, participant-related and methodological factors that may explain these results.

Finally, Chapters 6 and 7 report the results of a survey study among a large group of Dutch green volunteers ($N = 3775$), covering the four types of nature volunteering as presented in Chapter 2. Following the research questions of this thesis, **Chapter 6** covers four dimensions: green volunteers' profile, motivations, experiences and expectations for the future. These dimensions were studied across all respondents, but we also investigate differences based on the four types of nature volunteering. Some of the main findings include a high mean age and level of education, a key importance of nature connection and conservation as motivations of green volunteers, a widely shared sense of freedom and appreciation, but also significant concerns about a perceived lack of younger green volunteers.

Chapter 7 tackles another aspect of green volunteers' experiences: their reasons to stay and reasons to quit. Drawing on a series of open questions included in the larger survey reported in Chapter 6, we offer a qualitative analysis of the difficult situations green volunteers encounter, factors that led their fellow volunteers to quit, reasons to quit for our respondents themselves, and their motivations to keep going. Our results show that difficult situations encountered in the everyday reality of green volunteering (age or health issues, conflicts, lacking appreciation or support) match those found in studies on volunteers in other domains, though some specific aspects of nature volunteering can be found especially among reasons to stay.

The final chapter of this thesis, **Chapter 8**, starts by answering the research questions based on the empirical insights presented in the preceding chapters. I continue the synthesis by presenting my main conclusions and implications for theory. Key theoretical implications of my work include the need for all scholars to be clear about how they understand green volunteering, and to recognise that motivations of green volunteers are both highly diverse and prominently feature nature-related motivations. I also reflect on the implications of my work for debates about citizen science and open science, which would do well to include the voices of the

volunteers. In terms of my main conclusions regarding understanding action for nature and its transformative potential, I illustrate how green volunteering indeed offers many opportunities to stimulate cognitive, affective and experiential contact and connection with nature, as well as opportunities to take action for nature and contribute to nature conservation. On the other hand, my findings on green volunteers' profile means that we must not be too hasty to consider green volunteering a universal remedy for achieving human-nature (re)connection.

I continue the final chapter by formulating a series of implications for practice. I first discuss how nature organisations working with volunteers can draw on my work to further strengthen their understanding, support and appreciation of their volunteers. I discuss implications in terms of communication strategies, designing activities that match volunteers' motivations and inspire transformative learning, and recruitment practices that could help engage a more diverse public in green volunteering. I end the section by emphasising how appreciating and supporting green volunteers is not just a responsibility of individual nature organisations, but of all stakeholders involved in citizens' action for nature. This calls for increased cooperation between nature organisations, and a supportive role of government and policy. I end my thesis with a set of recommendations for future research, both taking a similar survey approach and research focussing on other dimensions of green volunteering. I also discuss how my own research into green volunteering will continue in the coming years, and invite other scholars to contribute to putting green volunteers in the spotlight.

Samenvatting

We worden voortdurend overstelpt met nieuwsberichten over de slechte staat van de natuur en biodiversiteit, en met analyses van de nadelige invloed van onze maatschappij en ons handelen op de natuur. De wetenschappelijke literatuur heeft op haar beurt veel inzicht verschaft over de vele factoren die verklaren waarom het zo moeilijk is voor individuen, bedrijven en overheden om in actie te komen voor natuur. Echter, in onze zoektocht naar dergelijke inzichten lopen we het risico te vergeten dat mensen over de hele wereld wel degelijk in actie komen voor de natuur. Menselijk handelen mag dan een belangrijke oorzaak zijn van veel van de bovengenoemde problemen, maar ons handelen speelt ook een belangrijke rol in de bestrijding ervan. Een belangrijke vorm van actie voor natuur is groen vrijwilligerswerk, aangezien vrijwilligers een cruciale rol spelen in ecologisch onderzoek, natuurbescherming, natuureducatie en vergroening in dorpen en steden. Maar de mensen verantwoordelijk voor al deze indrukwekkende prestaties, hun ervaringen en motivaties, blijven vaak onderbelicht en buiten het blikveld van wetenschappelijk onderzoek.

Het doel van mijn onderzoek naar groen vrijwilligerswerk, gebundeld in dit proefschrift, is om dit hiaat te helpen dichten. Ik wil de groene vrijwilliger in de schijnwerpers zetten: hun profiel, hun motivaties, en hun ervaringen en verwachtingen. Op basis van drie enquêteonderzoeken onder verschillende groepen groene vrijwilligers in Nederland geef ik meer inzicht in wie groene vrijwilligers zijn en waarom ze doen wat ze doen. Hiermee draag ik bij aan ons begrip over actie voor natuur en het transformatieve potentieel hiervan.

Deze achtergrond van mijn onderzoek wordt verder uitgelegd in **Hoofdstuk 1**, waar ik aansluit bij drie belangrijke debatten in de wetenschappelijke literatuur. Ten eerste sluit mijn werk aan bij zorgen over het verzwakken van de band tussen mens en natuur, de afname in directe natuurervaringen, en de gesuggereerde potentie van groen vrijwilligerswerk om het tij te keren. Ten tweede gebruik ik de literatuur over citizen science om te laten zien dat biodiversiteitsdata verzameld door burgers van onschatbare waarde zijn voor wetenschap en natuurbescherming, maar dat een aantal belangrijke bijkomende spanningen weinig aandacht hebben gekregen in de literatuur: hoe natuurwaarnemers zich voelen bij het delen van hun verzamelde data, en hoe zij zaken als eigenaarschap, transparantie en vertrouwen ervaren. Ten derde bespreek ik hoe mijn werk zich verhoudt tot een aantal belangrijke debatten in de literatuur over vrijwilligerswerk: over diversiteit onder huidige vrijwilligers, en over de bevinding dat vrijwilligers tegenwoordig meer diverse motivaties lijken te

hebben. In Hoofdstuk 1 sta ik ook stil bij de methodologische positionering van mijn werk ten opzichte van andere onderzoeksontwerpen, bij hoe ik omga met methodologische en disciplinaire grenzen, en hoe ik balanceer tussen theorie en praktijk.

In **Hoofdstuk 2** bespreek ik de literatuur over drie kernthema's om mijn onderzoeksonderwerp verder vorm te geven. Ten eerste focus ik op het 'wat?' van groen vrijwilligerswerk. Definities van fenomenen als vrijwilligerswerk zijn sterk afhankelijk van de context en onderwerp van aanzienlijk conceptueel debat. Ik laat zien hoe de literatuur zich heeft uitgesproken over de definities, categorisaties en begrenzingen van de termen 'vrijwilligerswerk' en 'citizen science', en ik gebruik deze inzichten om een brede opvatting van groen vrijwilligerswerk te ontwikkelen. Dit betekent dat ik vier types groen vrijwilligerswerk meeneem in mijn onderzoek: tellen, herstellen, vertellen, en bestuur & beleid. Ten tweede onderzoek ik de 'wie?' van groen vrijwilligerswerk: wat weten we over wie hieraan deelneemt, toegespitst op de dimensies van leeftijd, geslacht en opleidingsniveau. Ik signaleer een aantal frequent terugkerende patronen in de literatuur en bespreek gesuggereerde verklaringen voor deze patronen. Ten slotte richt ik mij op het 'waarom?' van groen vrijwilligerswerk, waarin ik op basis van de literatuur over motivaties verschillende categorieën van motivaties van groene vrijwilligers vaststel. Ik positioneer mij ook ten opzichte van prominente typologieën, waaronder het onderscheid tussen intrinsieke en extrinsieke motivaties, en altruïstische of zelfgerichte motivaties.

Het empirisch onderzoek is onderverdeeld in vijf hoofdstukken, gebaseerd op drie studies. Hoofdstukken 3 en 4 presenteren de resultaten van de eerste studie; een enquête onder vrijwillige natuurwaarnemers (citizen scientists) in Nederland ($N = 2193$). De onderzoeksvragen in **Hoofdstuk 3** betreffen drie hoofdonderdelen: het profiel van deze vrijwilligers in termen van activiteiten en sociaaldemografische kenmerken, hun motivaties, en hun perspectieven op het delen van biodiversiteitsdata. Qua profiel vinden we onder de respondenten een hoge gemiddelde leeftijd en hoog opleidingsniveau, en diverse voorkeuren voor bepaalde soortgroepen, al zijn vogels de meest doorgegeven soortgroep. Wat betreft motivaties benadrukken de vrijwilligers hun persoonlijke band met de natuur, de wens om meer te leren over natuur en haar te helpen beschermen. Veel respondenten kunnen zich vinden in het idee van biodiversiteitsdata als een publiek goed, maar onze resultaten laten ook zien dat vrijwillige waarnemers hun biodiversiteitsdata delen met de aanname dat de data onder bepaalde voorwaarden worden gedeeld. Dit betreft onder andere reflecties over erkenning van waarnemers, en over in hoeverre gebruikers de data voor de 'juiste' doelen zullen gebruiken.

Hoofdstuk 4 is gebaseerd op dezelfde studie, maar rapporteert een meer kwalitatieve analyse van bijzondere natuurervaringen zoals beschreven door onze respondenten. Op basis van een analyse van 1450 van dergelijke ervaringen concluderen we dat vrijwillige natuurwaarnemers een grote verscheidenheid aan natuurervaringen beschrijven. We vinden zowel specifieke gebeurtenissen als bepaalde types ervaringen, met zowel zeldzame als alledaagse soorten, en over het hele spectrum van genieten van buiten zijn tot een diep gevoel van verbondenheid met natuur. Echter, een vaak terugkerend thema in deze bijzondere natuurervaringen is het ontdekken van planten of dieren waar de respondenten nog niet bekend mee waren.

Hoofdstuk 5 betreft de resultaten van een andere studie, een tweetal enquêtes onder deelnemers aan de eerste editie van de Nationale Bijentelling. Op basis van enquêtes ingevuld voor ($N = 373$) en na ($N = 208$) deelname onderzoeken we het profiel, de motivaties en de leerervaringen van de respondenten. Net als in de vorige studie vinden we een hoge gemiddelde leeftijd en hoog opleidingsniveau onder de respondenten, en worden natuurbescherming en de wens om meer over bijen te leren hoog gerangschikt als motivaties. Wat betreft leeruitkomsten vinden we een aanzienlijk verschil afhankelijk van de manier waarop dit wordt gevraagd. Respondenten rapporteren zelf aanzienlijke ontwikkelingen in hun kennis over en houding ten aanzien van wilde bijen, en geven aan de intentie te hebben meer actie voor wilde bijen te willen ondernemen. Aan de andere kant zien we weinig verschuivingen tussen de twee meetmomenten in scores op verschillende kwantitatieve schalen. In de discussie van Hoofdstuk 5 gaan we dieper in op project-gerelateerde, deelnemer-gerelateerde en methodische verklaringen voor deze bevindingen.

Hoofdstukken 6 en 7 rapporteren ten slotte de resultaten van een enquête onder een grote groep Nederlandse groene vrijwilligers ($N = 3775$), waarbij alle vier de types groen vrijwilligerswerk zoals beschreven in Hoofdstuk 2 worden meegenomen. In het verlengde van de overkoepelende onderzoeksvragen van dit proefschrift bespreekt **Hoofdstuk 6** vier dimensies: profiel, motivaties, ervaringen en verwachtingen voor de toekomst. Deze dimensies bestuderen we voor de gehele groep deelnemers, maar we onderzoeken ook verschillen tussen de vier types groen vrijwilligerswerk. Een aantal van de belangrijkste bevindingen zijn een hoge gemiddelde leeftijd en hoog opleidingsniveau, het belang van de band met en bescherming van natuur als motivaties van groene vrijwilligers, een breed onderschreven gevoel van vrijheid en waardering, maar ook aanzienlijke zorgen over het ervaren gebrek aan jonge groene vrijwilligers.

Hoofdstuk 7 richt zich op een ander aspect van de ervaringen van groene vrijwilligers: hun redenen om te stoppen en redenen om door te gaan. Op basis van een serie open vragen uit de enquête besproken in Hoofdstuk 6 rapporteren we een kwalitatieve analyse van de moeilijke situaties waar groene vrijwilligers mee te maken krijgen, de factoren waardoor medevrijwilligers zijn gestopt, de redenen waarom onze respondenten zelf zouden stoppen, en hun motivaties om door te blijven gaan. Onze resultaten laten zien dat lastige situaties in de alledaagse realiteit van groen vrijwilligerswerk (leeftijd of gezondheidsklachten, conflicten, een gebrek aan waardering of ondersteuning) overeenkomen met factoren uit studies onder vrijwilligers in andere domeinen. Echter, zeker in de motivaties om door te blijven gaan vinden we een aantal specifieke aspecten van groen vrijwilligerswerk.

Het laatste hoofdstuk van dit proefschrift, **Hoofdstuk 8**, begint met het beantwoorden van de onderzoeksvragen op basis van de empirische resultaten uit de voorgaande hoofdstukken. Ik vervolg de synthese door mijn belangrijkste conclusies en theoretische implicaties te presenteren. De belangrijkste theoretische implicaties van mijn werk betreffen de noodzaak voor alle onderzoekers om duidelijkheid te verschaffen over hun opvatting van groen vrijwilligerswerk, en om te beseffen dat motivaties van groene vrijwilligers zeer divers zijn, maar dat natuur-gerelateerde motivaties een prominente rol spelen. Ik sta ook stil bij de implicaties van mijn werk voor debatten over citizen science en open science, waarin het belangrijk is de stem van de vrijwilligers mee te nemen. Wat betreft mijn belangrijkste conclusies met betrekking tot het begrijpen van actie voor natuur en het transformatieve potentieel hiervan: ik laat zien hoe groen vrijwilligerswerk inderdaad vele kansen biedt om cognitieve, affectieve en ervaringsgerichte natuurervaringen en verbondenheid met natuur te bevorderen, en om in actie te komen voor natuur en bij te dragen aan natuurbescherming. Aan de andere kant geven mijn bevindingen wat betreft het profiel van groene vrijwilligers redenen om groen vrijwilligerswerk niet te snel te zien als een universele oplossing voor het (her)verbinden van mens en natuur.

Vervolgens formuleer ik een serie implicaties voor de praktijk. Ik bespreek eerst hoe natuurorganisaties die met vrijwilligers werken inspiratie kunnen putten uit mijn werk om hun begrip, ondersteuning en waardering van hun vrijwilligers verder te kunnen versterken. Ik kom tot verschillende aanbevelingen voor communicatiestrategieën, voor het organiseren van activiteiten die aansluiten bij de motivaties van vrijwilligers en tot transformatief leren kunnen leiden, en voor wervingspraktijken die kunnen bijdragen aan het betrekken van een meer divers publiek bij groen vrijwilligerswerk. Ik eindig de praktijkimplicaties door te benadrukken dat het ondersteunen en waarderen van groene vrijwilligers niet slechts een verantwoordelijk-

heid is van individuele natuurorganisaties, maar van alle betrokken partijen die belang hechten aan actie voor natuur door burgers. Dit vereist toenemende samenwerking tussen natuurorganisaties, en een ondersteunende rol van overheden en beleid. Ik eindig mijn proefschrift met verschillende aanbevelingen voor vervolgonderzoek, zowel onderzoek met een vergelijkbare enquête-methodiek als onderzoek naar andere aspecten van groen vrijwilligerswerk. Ik licht ook toe hoe mijn eigen onderzoek naar groen vrijwilligerswerk zich de komende jaren voort zal zetten, en nodig andere wetenschappers uit eraan bij te dragen om de groene vrijwilliger in de schijnwerpers te zetten.

Dankwoord

Ken je dat gevoel, dat het leven je al vanaf je vroege jeugd een bepaalde kant op probeert te sturen? En dat je soms wat zijpaden moet bewandelen voor je er terecht komt? Zo voelt het voor mij om te mogen promoveren op onderzoek naar vrijwilligerswerk voor natuur. Een liefde voor planten en dieren is mij met de paplepel ingegeven, veelal door mensen die zich hier vrijwillig met hart en ziel voor inzetten. Ik wist als kind dan ook zeker: voor mijn werk wil ik daar ook iets mee doen.

Maar na teleurstelling over de (sterk mensgerichte) biologielessen op de middelbare school, en een biologie-voorlichting op de universiteit die vooral het lab bejubelde, trok ik de conclusie dat ik mij verkeken had. Ik ging een andere liefde achterna: een studie Engels. Maar al snel kreeg ik door dat, hoezeer ik ook geniet van *The Importance of Being Earnest*, er toch iets miste.

Door toeval vond ik in Nijmegen de masteropleiding *Milieu-maatschappijwetenschappen*, waar die interesse in mens en natuur weer flink werd aangewakkerd. En door allerlei andere toevalligheden volgde ik het keuzevak *Science and Societal Interaction*, waar ik Riyan leerde kennen (en wat ik inmiddels al vier jaar met haar mag doceren). Ik kon afstuderen onder gezamenlijke begeleiding van mijn eigen opleiding en het *Institute for Science in Society* (ISiS) waar Riyan werkte, en na mijn afstuderen probeerden we mij via een beursaanvraag te laten blijven. Die ging niet door, en achteraf gezien maar goed ook: maanden later kwam Riyan met het bericht dat er mogelijkheid was om parttime een onderzoek uit te voeren naar vrijwillige natuurwaarnemers. En de rest is geschiedenis.

Ik had nooit gedacht na zo'n omzwerving terug te komen bij diezelfde natuurvrijwilligers uit mijn vroege jeugd. En nu, na een serie verschillende aanstellingen op een diverse reeks onderzoeken, ligt hier dan een proefschrift op het onderwerp wat mij altijd zo aan het hart ging. Zo terugkijkend doemt bij mij de vraag op: waren het echt allemaal toevalligheden, of was het ook een beetje voorbestemd? Wat in ieder geval zeker is: zonder de steun van vele mensen had ik hier niet gestaan. Graag wil ik een aantal van hen hier bedanken.

Riyan, toen ik jouw proefschrift over *Visions of Nature* voor het eerst las viel alles voor het eerst in lange tijd op zijn plek; ik zag toen pas echt waarom de band tussen mens en natuur een onderwerp van onderzoek verdient te zijn. Inhoudelijk krijgen we energie van dezelfde vragen, en ik heb via ons werk ontzettend veel geleerd over mens en natuur. Met de oprichting van het *Centre Connecting Humans and Nature* (CCHN), met jou als directeur, kan ik geen betere plek voor dit onderzoek bedenken.

Maar misschien nog belangrijker ben je mijn grote inspiratiebron voor wat het betekent om wetenschapper te zijn. In onze nauwe samenwerking heb ik van dichtbij mogen zien hoe jij je weigert gek te laten maken door de individualistische en competitieve omgeving die de wetenschap soms kan zijn. Je weet goed waar je enthousiast van wordt, en maakt altijd tijd om met kritische en pragmatische blik naar mijn werk te kijken. Dank voor alles wat je de afgelopen zes jaar voor mij hebt gedaan, en ik ben heel blij dat we binnen EnviroCitizen weer een aantal jaren naaste collega's zijn.

Noelle, je bent pas in de laatste fase als tweede promotor betrokken geraakt bij mijn proefschrift, maar voor die tijd stak je je enthousiasme over mijn werk al niet onder stoelen of banken. Je hebt mij bij het schrijven van het proefschrift enorm geholpen met je rake adviezen en scherpe opmerkingen: mijn proefschrift heeft dankzij jou een nog scherpere focus en lijn gekregen. Maar meer dan dat wil ik je bedanken voor de onuitputtelijke passie en energie die je als hoogleraar en directeur naar ons instituut hebt gebracht. Op dat we nog lang mogen samenwerken!

Graag dank ik al mijn collega's bij ISiS voor de inspiratie en gezelligheid de afgelopen jaren. Ik voel me hier thuis, en ben blij dat ik als postdoc mijn onderzoek hier mag voortzetten. Specifiek wil ik een paar huidige en toenmalige collega's bedanken. **Laura**, we hebben veel samengewerkt binnen RiverCare, en ik heb bij meerdere publicaties samen met je mogen schrijven. We hebben veel gedeelde interesses binnen de wetenschap, dus hopelijk spreken we elkaar nog vaak! **Jan**, dank voor alle leuke gesprekken binnen RiverCare, in Umeå of gewoon bij al die borrels en lunches; je bent al sinds mijn afstuderen een vrolijke en gezellige collega. **Willem**, je scherpe pen heeft me veel geholpen om van het eerste artikel in dit proefschrift een beter verhaal te maken. Dank daarnaast voor al je bijdragen aan het debat over de toekomst van de universiteiten; *keep up the good fight!* **Lotte**, we waren kamergenootjes toen ik voor het eerst bij ISiS kwam werken, en we hebben zeker bij onderwijs wat meer samen kunnen optrekken de laatste tijd. Hopelijk komt dat gezamenlijke project er nog een keer! **Luuk** en **Wouter**, ik vond het leuk dat we de laatste tijd wat meer samen hebben kunnen schrijven. Onze twee congresbezoeken in Gent waren vol humor en boeiende gesprekken; lang leve de kantelmomentjes! **Hub**, ik wil je nog bedanken voor het in mij gestelde vertrouwen, en voor de vele jaren dat je als directeur ISiS hielp floreren. **Vera**, je bent niet alleen het organisatorische maar ook het sociale hart van de groep; hopelijk zijn we spoedig weer burenl!

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Uiteraard wil ik ook een aantal mensen van buiten ISiS bedanken. Ten eerste is mijn onderzoek mogelijk gemaakt door, en ontworpen in samenwerking met, allerlei organisaties die mens en natuur(onderzoek) bij elkaar brengen. Specifiek wil ik **Sander Turnhout** bedanken voor de nauwe samenwerking bij het opzetten van de onderzoeken onder natuurwaarnemers en groene vrijwilligers, en voor zijn enorme enthousiasme voor de natuur en haar bescherming. Ook **Henk de Vries** en **Cees Hof** (onderzoek natuurwaarnemers), **Rob Meijers** (onderzoek groene vrijwilligers) en **Nieke Knoben** (onderzoek Bijentelling) wil ik bedanken voor het mogelijk helpen maken van de verschillende studies. Voor financiële steun wil ik NLBIF en het Ministerie van Economische Zaken en Klimaat hartelijk bedanken. Ten slotte een woord van dank aan de leden van mijn manuscriptcommissie: **Ruud Foppen, Arjen Buijs** en **Lucas Meijs**. Ik waardeer het zeer dat jullie tijd hebben vrijgemaakt om mijn proefschrift zo grondig te lezen en te beoordelen.

Niet alle onderwerpen waar ik de afgelopen zes jaar aan heb gewerkt hebben hun weg naar dit proefschrift gevonden, maar dat maakt de ervaringen niet minder waardevol voor mijn ontwikkeling als wetenschapper. **Henk Eerden**, ik heb veel bewondering voor al je inzet voor de Pilot Langsdammen; ik vond het heel leerzaam hier als student en later als junior onderzoeker bij betrokken te zijn. Binnen River-Care leerde ik ook **Rob Lenders** kennen; Rob, we werken inmiddels samen binnen EnviroCitizen en verschillende artikelen, en ik wil je bedanken voor je humor en je scherpe opmerkingen bij onze overleggen. **Thomas Mattijssen** wil ik bedanken voor de vele gezellige en leerzame gesprekken de afgelopen jaren; ik ben heel blij dat een gezamenlijk artikel eindelijk gelukt is!

Ook dank ik graag een paar oud-collega's bij de afdeling Geografie, Planologie en Milieu waar ik ook mijn masteropleiding mocht volgen. **Mark** en **Maria**, ik wil jullie bedanken voor de kans om met jullie samen te werken binnen STAR-FLOOD, ik heb in die maanden enorm veel geleerd. **Pieter**, inmiddels ben je emeritus hoogleraar maar je blijft vast betrokken bij de afdeling. Ik wil je bedanken voor alles wat je me tijdens de studie hebt geleerd, en voor de inspiratie om in Nijmegen te komen studeren. Zo terugkijkend is dat een van mijn beste beslissingen.

Mijn onderzoek was er natuurlijk nooit geweest zonder al die mensen die zich in Nederland vrijwillig inzetten voor de natuur, op welke manier dan ook. Ik ken jullie namen niet, maar weet dat ik enorme waardering heb voor jullie vrijwilligerswerk. Ik hoop dat mijn proefschrift eraan bijdraagt om die waardering gemeengoed te maken.

Mijn werk heeft mij enorm gevormd, maar mijn leven daarbuiten net zozeer. Ik eindig dan ook graag met een paar dankwoorden op persoonlijk vlak.

Ik ben inmiddels al meer dan vijf jaar actief als vrijwilliger in de LHBTI+ gemeenschap, eerst bij Stichting Dito! in Nijmegen en daarna bij Stichting De Jonge Utrechtenaars (JU). Alle uren die ik zelf stak in vrijwilligerswerk gaven mij een kleurrijke lens om mee naar mijn onderzoek te kijken. Maar belangrijker dan dat: het gaf mij voldoende ruimte om ook vooral even niet met mijn onderzoek bezig te zijn, en mij in te zetten voor iets wat ook enorm belangrijk voor mij is. Dank aan alle geweldige mensen die ik via Dito! en JU heb mogen ontmoeten, met speciale dank aan mijn medebestuurders. Ik kijk met veel plezier terug op alle mooie evenementen die we samen hebben georganiseerd en meegemaakt.

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About the author

Curriculum Vitae

Wessel Ganzevoort was born in Utrecht (The Netherlands) on the 18th of October 1991. An avid reader with a passion for English, he started his journey into academia with a bachelor's degree in English Language and Culture at Utrecht University. During his second year, he took part in an interdisciplinarity lecture series on sustainability organised by the university's Studium Generale programme. This inspired him to follow a series of other courses on (amongst others) climate science, environmental impact assessment and organisational theory.

After completion of his bachelor's degree in 2012, it had become clear that this interest in the societal dimensions of environmental issues deserved further exploration. This led to the decision to pursue a master's degree in Social and Political Sciences of the Environment at Radboud University's department of Geography, Planning and Environment (GPE). Wessel's interest in people's perceptions of nature and landscape resulted in a thesis internship within the RiverCare programme, carried out at Rijkswaterstaat and supervised in cooperation between GPE and the Institute of Science in Society (ISiS). His thesis research combined qualitative and quantitative methods to study the perceptions of local fishermen and boaters regarding a proposed river intervention in the Waal. His thesis was awarded a shared third place in the University of Groningen's Herta Macht thesis prize in cultural geography.

After graduating (Cum Laude) in 2014, he was offered the opportunity to work as a junior researcher at GPE within the STAR-FLOOD project, supporting a European consortium in studying policy arrangements for flood risk management. As his involvement in this project was nearing its end, he was offered an additional part-time contract at ISiS to study the profile and motivations of volunteer biodiversity recorders. Wessel then stayed at the institute by returning to RiverCare, this time as a junior researcher, to continue the work on stakeholders' perceptions of changes in the river landscape.

Since several papers had been realised at this point, Wessel was offered a three-year PhD position in 2017 to continue this work. In these years he carried out further work on the profile, motivations and experiences of biodiversity citizen scientists and other green volunteers, contributed to publications on place attachment and the human-nature relationship, and was involved in different educational tasks at the institute.

Since finishing his thesis Wessel has continued working at ISiS as a postdoc researcher in the EnviroCitizen project, learning even more about volunteer involvement in studying the natural world, specifically ornithology. Considering the wealth of wonderful books and articles on birding, it is a good thing Wessel's passion for reading and English never left.

List of publications

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- Verbrugge, L., Ganzevoort, W., & van den Born, R. (2019). An integrated approach for measuring landscape values to support adaptive management. Poster presented at the Eindsymposium RiverCare, Lent(Nijmegen), 20 June 2019.
- Ganzevoort, W., & van den Born, R. J. G. (2019). The Dutch National Bee Survey: Citizen science as a new frontier in science communication? Poster presented at Etmaal van de Communicatiewetenschap, Nijmegen, 7-8 February 2019.

- Van den Born, R., Ganzevoort, W., & Mattijssen, T. (2019) Relational values and active citizenship for nature. Session organised at the ALTER-Net & EKLIPSE conference: The EU Biodiversity Strategy Beyond 2020, Gent, 17-19 June 2019.
- Ganzevoort, W., & van den Born, R. (2019) Connectedness with nature in citizen science. Presentation at the ALTER-Net & EKLIPSE conference: The EU Biodiversity Strategy Beyond 2020, Gent, 17-19 June 2019
- Ganzevoort, W. B., & van den Born, R. J. G. (2018). Green volunteering as a sustainability transition: Motivations and obstacles. Presentation at the IAPS conference on transitions to sustainability, lifestyles changes and human wellbeing, Rome, 8-13 July 2018.
- Ganzevoort, W., & van den Born, R. (2018). Groene vrijwilligers: Wie zijn ze, wat doen ze en wat drijft hen? Presentation at the Bijeenkomst Groene Vrijwilligers – Van praten naar doen, Utrecht, 7 June 2018.
- Ganzevoort, W., & van den Born, R. J. G. (2017). Motivations for monitoring: What drives volunteer biodiversity recorders? Presentation at the ALTER-Net conference on Nature and Society, Gent, 2-4 May 2017.
- Van den Born, R. J. G., Ganzevoort, W., & Verbrugge L. N. H. (2017). Engaging riverine stakeholders in evaluating major landscape changes: Results from public perception research. Presentation at the International Symposium on Society and Resource Management (ISSRM), Umeå, 19-22 June 2017.
- Van den Born, R., & Ganzevoort, W. (2017). Citizen Science data: Motivaties & verantwoordelijkheden. Presentation at the VSNU Impactfestival, Amersfoort, 23 November 2017.
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- Ganzevoort, W., & van den Born, R. J. G. (2016). Beyond 'data drones': Citizen scientists' concerns and motivations. Presentation at the International Conference on Citizen Observatories for Water Management (COWM), Venice, 7-9 June 2016.
- Ganzevoort, W., van den Born, R. J. G., Halffman, W., & Turnhout, S. (2016). Sharing biodiversity data: Citizen scientists' concerns and motivations. Poster presented at Future 4 Butterflies in Europe, Wageningen, 31 March to 2 April 2016.
- Ganzevoort, W., & van den Born, R. (2015). Onderzoek Citizen Scientists. Presentation at the NLBIF Symposium: Een zwaluw, twee vliegen en open ogen, Utrecht, 10 December 2015.

Other publications

- Ganzevoort, W. (2019, June 11). Geef kinderen de ruimte om zonder toezicht buit-

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Verbrugge, L., Ganzevoort, W., & van den Born, R. (2018). Belevingsonderzoek Langsdammen Waal: Bewoners, recreanten en binnenvaartschippers. Institute for Science in Society, Radboud University. <http://hdl.handle.net/2066/200542>

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Courses

Title	Year	ECTS
The Art of Finishing Up	2019	1
Loopbaanmanagement voor Promovendi	2019	1
Writing a Review Article	2019	1
Science Journalism and Communication	2019	3
Diversity & Inclusion	2019	1
Analytic Storytelling	2019	1
Lecturing (UTQ)	2018	--
Management voor Promovendi	2018	2
Statistics for PhD candidates by using SPSS	2018	2
Education in a Nutshell	2017	1

