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## Article

# Expanding the Role of Biodiversity in Laypeople's Lives: The View of Communicators

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**Abstract:** Biodiversity is a fundamental part of sustainable development, yet it is threatened by numerous factors associated with human population growth. The current lack of broad-based support for biodiversity conservation may be explained by the widening gap between people and nature. In order to conserve biodiversity, people should be engaged in biodiversity, yet it is not yet clear what potential is present in highly urbanized environments. We conducted semi-structured interviews with twelve biodiversity communicators in the Netherlands, a highly urbanized country, and used their perceptions and experiences to explore motivations, opportunities and challenges for expanding the role of biodiversity in people's lives in an increasingly urban world. Overall, the interviewees perceived the current role of biodiversity in laypeople's lives to be too limited, but they were positive about the potential to expand the role. Based on communicators' perceptions potential lies in a combination of direct exposure to biodiversity outdoors, the media, and education. Furthermore, strategically designed communication is also expected to play an essential part in opening people's eyes for biodiversity. The results are valuable both at national and international levels, as they can motivate and aid professionals operating in urbanized contexts at reaching out to their audiences about biodiversity.

**Keywords:** biodiversity communicators; qualitative study; lay perceptions; urban biodiversity; best practices; effective communication; biodiversity awareness

## 1. Introduction

There is a growing recognition that biodiversity is essential for sustainable development, reflected in the Sustainable Development Goals adopted by all United Nations member states in 2015 [1]. Increasing evidence demonstrates that biodiversity directly and indirectly contributes to sustainability, as it is interwoven with the three pillars that support a sustainable world: economy, society and environment [2–4]. Given this, biodiversity will be vital for meeting the needs of both current and future generations [4,5].

Biodiversity has been linked to critical processes and functions in ecosystems [6,7], and to people's well-being and health [8,9]. For instance, biodiversity supports food production, which may reduce poverty, and urban vegetation may enhance citizens' mental state [10,11]. Biodiversity further provides people with educational opportunities and other enriching ways of interacting with nature [12–15]. In line with this, it has been argued that biodiversity should be included in education for sustainable development [16] and sustainable urban development [17–19].

However, while the importance of biodiversity for sustainable development is receiving increased attention, biodiversity itself is rapidly declining [20,21]. Ecosystems, species and populations are exposed to numerous threats, including loss and deterioration of natural habitats, overexploitation of

organisms, and climate change [22,23]. As a result, species are becoming extinct at a speed of up to 1000 times the natural background rate of extinction [24,25], and worldwide around 1 million species of animals and plants are now threatened with extinction, many within decades [22]. If biodiversity loss continues, this will have far-reaching consequences, as it may compromise valuable contributions of biodiversity to ecosystem services, ultimately limiting its potential for sustainability.

Although biodiversity conservation has received attention in national and international agendas [26–30], focus seems to have been largely on legislating access to (genetic) resources [31–34]. Furthermore, current mobilization of the public seems to fall short given the severity of the biodiversity crisis [35]. This is worrisome, as protection of biodiversity depends on broad-based support from the public for continuous budgets and acceptance [36,37]. Moreover, public concern about biodiversity may encourage decision makers and drive public policy [38,39], and the current limited involvement from society will probably be insufficient for governments to change course [40].

### 1.1. Connecting People and Biodiversity

The lack of public support may be due to the widening gap between people and nature that is occurring simultaneously with the decline in biodiversity [41]. As the human population grows, natural habitats are converted to anthropogenic environments, which may cause an *extinction of experience*: a cycle of reduced opportunities for people to experience nature, apathy towards the natural world, and further degradation and loss of nature [42–44]. Exacerbating this loss of opportunity and orientation are people's fading memories of past levels of biodiversity, so that younger generations get used to lower baselines [45–48]. This masks the total decline and results in lower expectations regarding the quantity and quality of nearby nature [41].

The decline in biodiversity and the disconnection between people and nature are also reflected in society. It has been reported that nature is portrayed less than before in cultural products such as songs and film scripts [49,50] and that nature vocabulary is lost from societal and daily conversation [51–56]. Moreover, studies in different countries have suggested that laypeople's ecological knowledge is decreasing [57]. There is a growing literature suggesting a general lack of biodiversity awareness in the lay public [58–61]. For instance, people may not be aware of species richness in their immediate environment [19,62–64].

These trends are worrisome, as they could make it hard to engender broad-based support for biodiversity conservation. A public illiterate about biodiversity will further not be equipped to make informed decisions. To change this, people need to be engaged in biodiversity, and improved strategies and various forms of communication are required to disseminate biodiversity effectively to society. In particular highly urbanized countries are faced with the challenge of making biodiversity an issue that all people can relate to [65].

However, it is not yet clear what potential is present in areas that have become or are becoming increasingly urbanized. While it will be harder to provide urbanites with direct experiences of wilderness, cities do harbor synanthropes: species that adapt well to environments made by humans [66,67]. Moreover, while city dwellers may have fewer nature experiences outdoors [68], they can still learn about biodiversity via various vicarious sources, which are abundant in urban environments [69]. More research is required to establish whether the urban environment is sufficient for human-nature interactions to unfold, and what role communication could play.

Exploring best practices in biodiversity communication is a good first step towards expanding the role of biodiversity in laypeople's lives. People who professionally communicate biodiversity to a lay audience have gained personal experience with disseminating information about biodiversity in many forms. Moreover, they are faced with challenges associated with the rapidly urbanizing world, including loss of nature experiences and knowledge in their audiences. Finally, while contact between people and nature may be declining, biodiversity communicators are expected to play an increasingly important role in promoting awareness and support for biodiversity conservation. Exploring their perceptions and personal experiences therefore sheds light on the potential to raise

biodiversity awareness and support even in the most urbanized countries. Such insights are valuable at international levels and may empower those involved in nature communication and education, which could ultimately help avert biodiversity loss.

### *1.2. Aim of the Study and Research Questions*

We conducted an interview study with 12 biodiversity communicators in the Netherlands, one of the most urbanized and densely populated countries in the world, with 92% of the population residing in cities [70]. Although levels of education in the Netherlands are relatively high, biodiversity awareness is limited [60,71,72]. In addition, Dutch citizens were found to be a little less positive about the importance of biodiversity than people from other members of the European Union, and relatively few felt personally affected by biodiversity loss [73].

The study presented in this paper was part of a larger project on communicating biodiversity. We adopted a qualitative approach, as we aimed to explore in depth the range in individual perceptions. We aimed to answer the following questions:

- (1) How do biodiversity communicators perceive the current role of biodiversity in Dutch laypeople's lives?
- (2) How do biodiversity communicators perceive the desired role of biodiversity in Dutch laypeople's lives?
- (3) According to biodiversity communicators, which potential is present for expanding the role of biodiversity in laypeople's lives in The Netherlands?
- (4) What are best practices in communicating biodiversity amongst Dutch biodiversity communicators?

## **2. Materials and Methods**

To explore in depth the perceptions of Dutch biodiversity communicators we adopted a qualitative research approach, conducting semi-structured interviews and using qualitative content analysis. We chose a qualitative methodology as it provides opportunities and flexibility suitable for grasping the variety of views in different people [74,75]. In this way, the approach can also complement quantitative studies.

### *2.1. Selection of Participants*

We targeted biodiversity communicators in the Netherlands, regarded as people who communicate nature or biodiversity in their paid or voluntary work to the general public, or to specific groups such as children, farmers or building contractors. As we aimed to map the range in perceptions instead of quantifying the frequency of certain views or generalizing an 'average view' [76], we purposively searched for people within and outside of our network with different professions or voluntary work and different mediums of communication. When a potential interviewee was found, an invitation was sent via e-mail or social media (e.g., LinkedIn).

Within twelve interviews we achieved saturation, evidenced by repetition of certain answers and arguments provided by the interviewees. As the number of participants was sufficient for the aims of our study (e.g., we did not seek to quantify differences between gender) we decided to stop the sampling process at that point. This was in line with Guest, Bunce, and Johnson [77], who concluded that a sample of twelve interviews would be sufficient for discovering a full range of themes and for crafting a stable codebook. The interviewees, aged 28 to 65, included 6 men and 6 women (see Table 1).

**Table 1.** Overview of the twelve participants, with their profession (main paid or voluntary work related to biodiversity) and age; pseudonyms have been used to guarantee anonymity.

Participant	Age	Profession
1 Dale	62	Project leader Natural History Institute; member of municipality committees about greenspace
2 Julia	42	Self-employed park ranger and nature communicator; initiator people-nature connection project
3 Shane	36	Ecological consultant
4 Lori	56	Primary school teacher
5 Oliver	39	Urban ecologist and media communications officer; chairman bird shelter
6 Tara	42	Urban ecologist and ecological advisor
7 Helen	44	Coordinator of funding related to biodiversity; initiator neighborhood nature garden
8 Matt	64	Editor-in-chief at a zoo; chairman natural city park
9 Carol	65	Nature guide/nature educator
10 Rick	28	Project manager nature conservation organization
11 Amy	36	High school teacher (biology-related subjects) and PhD-student
12 John	58	Self-employed writer/text-editor, writing mainly about biodiversity

## 2.2. Instrument

The interviews were semi-structured and covered in the following order:

- the role of biodiversity in the profession and personal life of the interviewee
- the role of biodiversity in the lives of Dutch laypeople, as perceived by the interviewee
- potential to expand the role of biodiversity in Dutch laypeople's lives, as perceived by the interviewee.

These themes were chosen in light of existing literature and the overarching research project on communicating biodiversity of which the study was part. The sequence of the three themes was chosen, because an initial focus on participants themselves would be a good starting point for them to start thinking about the lay public and the Netherlands in general.

We used an interview guide with mainly open-ended questions. Per theme questions were phrased in a neutral and non-leading way (e.g., 'How do you perceive ...' and avoiding 'Don't you think that ...?'). In addition to the main questions, keywords and possible follow-up and probing questions were added to the interview guide to anticipate and facilitate in-depth exploration. In practice participants regularly raised issues referred to in the questions even before these questions were asked, which confirmed the natural flow in the themes and questions.

In this paper we use the term biodiversity in line with the definition of the Convention of Biological Diversity as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems" [26]. To account for differences in interpretation of the multi-dimensional and value-laden concept [78–81], we asked each interviewee as a first question to express their view on the term.

To test the interview guide a pilot interview was conducted, after which formulation and order of some questions was altered. The interview guide can be found in the Supplementary Materials.

## 2.3. Conducting the Interviews

All interviews were conducted in 2018 and 2019 by the first author, who made individual appointments with the participants beforehand. Each interview was in Dutch, face to face and

conducted at a quiet place (e.g., a private office). On the way to each interview the interviewer prepared mentally by 'bracketing' [82], and before the interview started he aimed to establish rapport with the interviewee, e.g., by reassuring the participant that there were no wrong answers [75].

Before the first interview question was asked, the study and interview were briefly introduced without directing the respondent towards certain themes. All respondents were guaranteed anonymity and informed consent was obtained from the participants via a written consent form (see Supplementary Materials). No time restrictions were placed on the interviews, and the respondents were informed that they were free to leave at any time. After permission was granted by the participants, interviews were audio-recorded.

To allow for a natural flow of the conversation, participants were encouraged to elaborate on their answers, and the interviewer followed where the participants would lead him. As a result, the order of the questions occasionally differed from the sequence in the interview guide. Moreover, certain questions were rephrased so that they fitted the respondent (e.g., primary school teacher Lori was asked about her classroom experience). Lastly, to allow for emerging insights, some interview questions were added or rephrased as the research progressed, which is important for uncovering new concepts and exploring themes thoroughly [83]. For instance, in the first interview the influence of the media on people's perceptions of biodiversity emerged, so we added questions related to this subject in following interviews. For the above reasons each interview was unique concerning the exact order of the questions, the time spent on each specific question, and the depth with which each theme was explored. On average the interviews lasted 1 h 30 min (1 h 15 min–2 h 30 min).

#### 2.4. Analysis

Audio-recordings of the interviews were transcribed verbatim using Express Scribe (version 8.14). The transcribed interviews were coded and analyzed with ATLAS.ti (version 8.2.34), following the basics of thematic analysis as described by Braun and Clarke [84].

The transcripts were analyzed in three phases. In the first phase, the first author took stock of the data by skimming through the transcripts, and he designed an initial set of codes. Some codes were based on the literature and the research questions, while others emerged from the data. The first and last author checked the reliability of the codebook as suggested by Evers [85] by independently coding one transcript and comparing their results; discrepancies were resolved after discussion, e.g., a few codes were refined and clarified. For instance, it was decided that the code 'Prof\_role\_personal', concerning the role that biodiversity plays in the personal life of the interviewee, should exclude past experiences, as the code 'Prof\_expanded' already covered that. The two researchers then independently coded a second transcript, and after discussion the researchers concluded that the codebook was now stable and reliable. The final codebook can be found in Table 2.

In the next phase, the first author coded the remaining transcripts, meanwhile writing memos. For each code, variation was mapped and patterns were sought in segments from all transcripts taken together. Moreover, overarching outcomes and relationships between different codes were traced (e.g., by comparing and connecting coded segments from different codes). For instance, it became clear that in describing ways to expand the role of biodiversity in people's lives, interviewees referred to both past and current experiences with nature, which were part of different codes. Progress was regularly discussed by all three researchers.

In the third and final phase, the outcomes of the analysis were put into a broader perspective, by making connections to the literature and by determining possible future directions for research.



**Table 2.** Codebook used to code the interview transcripts. With ‘role of biodiversity’ we refer to people’s knowledge/skills/awareness, interest/experience, affinities/care, behavior, and values related to biodiversity. For clarity, two codes not relevant to answering the research questions are not displayed.

Code Nr.	Code Title	Description (References Made by the Interviewee to ...)
<b>Theme 1: Current role of biodiversity in laypeople’s lives</b>		
1	Laypeople_role	... the role that biodiversity plays in the lives of laypeople and his/her thoughts and/or feelings about this.
<b>Theme 2: Desired role of biodiversity in laypeople’s lives</b>		
2	Laypeople_role_should	... the role that biodiversity should or would not need to play in the lives of laypeople.
3	Laypeople_role_important_why	... why the role that biodiversity plays in the lives of laypeople is important or not important (e.g., the link between knowledge-interest-affinities).
4	Prof_role_personal	... the role that biodiversity <i>currently</i> plays in his/her personal life.
5	Prof_motivation_aims	... his/her goals, aims and motivations in the profession, including actual outcomes.
<b>Theme 3: Potential to expand the role of biodiversity in Dutch laypeople’s lives</b>		
6	Expanded_prof	... when, where and/or how the role that biodiversity plays in his/her life expanded/developed.
7	Expand_lay_opportunities	... potential opportunities in the Netherlands for laypeople to develop/expand the role that biodiversity plays in their lives; excluding those in the profession of the participant (= Code 10) and media (= Code 9).
8	Expand_lay_barriers	... potential challenges/barriers for laypeople to develop/expand the role that biodiversity plays in their lives; excluding those specifically experienced in the profession of the participant (= Code 10) and media (= Code 9).
9	Expand_media	... the influences of the media on the role that biodiversity plays in laypeople’s lives, including their potential in expanding/developing it.
<b>Theme 4: Best practices in communicating biodiversity amongst Dutch biodiversity communicators</b>		
10	Prof_com_how	... effective or non-effective ways of communication related to biodiversity in the profession, i.e., what does or does not work or should be kept into account.
11	Prof_com_how_challenge	... potential challenges/barriers experienced in communication related to biodiversity in the profession.

### 3. Results

We describe results within four overarching themes: (1) current role of biodiversity in Dutch laypeople’s lives, (2) desired role of biodiversity in Dutch laypeople’s lives, (3): potential to expand the role of biodiversity in Dutch laypeople’s lives, and (4): best practices in communicating biodiversity amongst Dutch biodiversity communicators. In line with O’Brien et al. [86], we selected quotations that clearly articulated general patterns in the data to illustrate findings, and translated them from Dutch to English. Ellipses show where parts of the sentence non-essential to the meaning were omitted. To ensure anonymity pseudonyms have been used to indicate participants.

#### 3.1. Theme 1: Current Role of Biodiversity in Laypeople’s Lives

We asked the biodiversity communicators how they perceive the current role of biodiversity in laypeople’s lives. Overall the interviewees consider the role to be rather limited. Several express that most citizens do enjoy and appreciate biodiversity consciously or unconsciously, apparent from recreation in greenspace, anecdotes at social gatherings, and conversations about local wildlife, yet the interviewees also argue that laypeople’s perceptions of biodiversity are incomplete, and their connection with it superficial. According to the communicators, biodiversity only plays a big role in the lives of a small group of hobbyists and nature lovers who regularly visit nature (e.g., to watch wildlife).

### 3.1.1. Lack of Knowledge

The majority of the communicators note that many laypeople have poor knowledge of biodiversity. For instance, it is mentioned that people do not seem to understand that different species depend on each other. Dale exemplifies this by referring to people who put up nest boxes, as they would like to see more birds, yet they do not want insects.

In particular, it is mentioned that many citizens, adults as well as children, know little about species occurring in the local environment. It seems that perceptions are directed more to charismatic, exotic species. When self-employed writer John presented one of his books to a group of rural children and showed them a common coot (*Fulica atra*), he recalls his surprise when none of them succeeded in identifying the bird, even though it can be found almost everywhere in the Netherlands:

*I thought that they would start shouting 'COOT!' (laughs) That did not happen. And then ( ... ) hesitantly, you know: "grebe?" (John)*

Several communicators further describe that laypeople are not aware of changes in biodiversity. For instance, Shane refers to his vacation on Hawaii, where he noticed tourists in awe of the jungle, not aware of the deteriorating ecosystem, where invasive species have replaced native species:

*Actually, not one tree or plant is native there, they are all exotic. But their experience is totally awesome: "The nature on Hawaii is marvellous!" That is what people tell you, while my heart aches as I'm walking there. (Shane)*

In line with this, Julia expresses that many Dutch citizens have forgotten how varied and biodiverse meadows looked in the past:

*They rush past those bright green deserts thinking: "oh yes, those are meadows". But that is not true. Those bright green fields, that is all just desert. An ecological disaster zone. (Julia)*

### 3.1.2. Ambivalent Attitudes

Apart from a lack of knowledge, the communicators express that laypeople's attitudes towards biodiversity are mixed. They mention that many laypeople do not see themselves as part of nature and in line with this, several note that many citizens do appreciate biodiversity, yet from a distance. For these people, nature is miles away, and should not be in their backyard:

*There are many people who say: "you know, we shouldn't aim to turn cities into nature reserves. There are nature reserves and there are cities, and there is countryside. Countryside that's where potatoes should be harvested, cities are where people drive around or get stuck in traffic, and nature reserves, that's where deer roam and birds sing." (Oliver)*

In addition, several interviewees mention that people seem unaware of what biodiversity offers them. For instance, Oliver mentions that some people may say they do not really like nature, whereas in fact they will enjoy bird sounds in a park. Furthermore, exciting elements of nature regularly go unnoticed by people, and people may not realize that species viewed as a nuisance may in fact provide balance in the ecosystem, thereby preventing pests later on. Several communicators argue that laypeople often focus on a small number of obvious utilitarian services that biodiversity provides:

*A tree is for providing shade, a tree is not for insects or for birds. And parks exist because you want to be able to walk somewhere ( ... ) It is more like a décor. ( ... ) That it's a tree that constitutes a living community of insects and herbivores and fungi, most people are not aware of that and therefore do not appreciate that. ( ... ) I think that's a great shame, because people no longer see the dynamics and the interesting phenomena. (Dale)*

Others too describe that the lay public may use biodiversity as a décor. Shane notes that predominantly exotic biodiversity, such as tigers and elephants, is used as background scenery to pose



with for pictures, while Oliver describes the ambivalent attitudes that people may display towards city animals:

*One day they feed pigeons and the other day they say "they shit on everything". ( ... ) Once (pigeons) are called "flying rats" and then again they are "so beautiful", and then they take a picture of the bridge together with those pigeons, and say "the city is such a beautiful place". (Oliver)*

Taken together, the interviewees think that many Dutch laypeople perceive biodiversity in a limited and superficial way, as many citizens lack knowledge of biodiversity, show mixed attitudes, and seem unaware of what biodiversity could offer them.

### 3.2. Theme 2: Desired Role of Biodiversity in Laypeople's Lives

When asked to describe the desired role of biodiversity in laypeople's lives, many biodiversity communicators express that it is a shame when people are unaware of biodiversity and the role that it could play in their lives. They describe the relevance and value of biodiversity in their own lives, and advocate expanding the role in laypeople's lives:

*I think the world around us is so fascinatingly beautiful. I really can't understand that so many people are so indifferent about it. I think that it's a shame, because I think it can enrich your life. (Rick)*

#### 3.2.1. Basic Knowledge and Awareness

According to the interviewees, laypeople should have a general understanding of biodiversity. Amy mentions the importance of understanding 'the big picture' or 'system' from an ecological and evolutionary point of view, and she prioritizes concepts and knowledge about processes. Similarly, Matt emphasizes that people should be aware that biodiversity provides stability in an ecosystem, and that species are connected to each other and to the environment. In line with this, Oliver states:

*Being aware that your life and the life of all those plants and animals are connected in a certain way, and that you have an impact on those other species, and vice versa they also have an impact on you, I think that that realization is important, that you understand that you cannot completely shut yourself off from that. (Oliver)*

Furthermore, several communicators argue that laypeople should have basic knowledge about species:

*Children must know the difference between a frog and a toad. I seriously think that that's important. And that you know that it's a cold-blooded animal. And of course that you have mammals ... How many adults would call a deer "roe". Honestly, that makes my hair stand up on the back of my neck. (Julia)*

However, the opinions of the interviewees differ as to which level of specificity is required. Several communicators prioritize that people can distinguish species or know in-depth information about them, instead of naming them:

*Whether you know that a grebe is called a grebe, I find that less interesting than its behavior. (Amy)*

In line with this, Oliver mentions that in order to enjoy bird sounds, you do not really need to know which species is singing. In his view species names are labels that have little value in themselves, although you do need them when you communicate about species. In contrast, a few communicators strongly advocate the value of species identification skills and the relevance of names. For instance, John compares species, including their names, to words that a person needs to talk the language of nature, and he sees naming as a necessary step towards knowing more about species and loving them.

Independent of the level of specificity, the majority of the communicators stress that people should become familiar with local flora and fauna. For instance, Helen would like children to know

which birds live in their neighborhood, and Oliver mentions that children should become aware that hedgehogs not only live in the forest, but also visit gardens. Primary school teacher Lori argues firmly that not only her pupils but people in general should get to know native species, and compares this to knowing the city or country where you live. She sees it as part of connecting to the environment and believes that native flora and fauna should be the starting point in learning about biodiversity:

*I think it is strange when you sit in your garden and you do not recognize a red admiral that flies past you, while you do know the name of a butterfly in Brazil. Well, it shouldn't be like that. First you should know what you have in your own country, and only then what is on offer abroad. (Lori)*

### 3.2.2. Value of Biodiversity Knowledge

The communicators provide different arguments why laypeople should learn about biodiversity. Some mention that knowledge about biodiversity can enhance a person's well-being in nature; e.g., because species that pose risks such as nettles can then be avoided, while fear for harmless species such as dead nettles (*Lamium*) is reduced. Moreover, several interviewees argue that knowledge can add joy to the experience of nature. In particular, John voices this thought strongly, and he draws from his personal experiences as a diver in the Grevelingen, a Dutch salt lake:

*Incomprehensible how people went diving in the Grevelingen without knowing species. At least, that is really not fun! The water is cold, cloudy ... In order to have fun diving there you need to recognize that small sea squirt, and that anemone, and thus also all that little stuff. (John)*

Even in the absence of a real encounter, John argues that knowledge may trigger feelings of joy:

*Just knowing that a tiger is living somewhere, ( ... ) even if you don't see it, is sufficient for me. So the knowing is very important. (John)*

Several interviewees further point to a link between knowledge and awareness, i.e., that knowledge can 'open people's eyes to what is out there', again providing people with positive experiences:

*If you don't know at all that it exists, then you don't see it. You will just cycle past two grebes in courting display, but you won't realize it. But if you know it exists, then you notice it, and then you probably also like to see and recognize things. (Amy)*

Similarly, it is noted by several communicators that knowledge about biodiversity can provoke curiosity and spark a sense of wonder. Thereby, basic knowledge may encourage people to learn more:

*Suppose you know five species of trees ( ... ) only then will you see "Damn it, that is not an elm, that must be something else. So what is it then?" You are only going to wonder about that if you already know those five. (John)*

Nature educator Carol also believes that knowledge can induce interest, yet she also witnessed the opposite. She recalls that during one of her excursions a boy with well-developed identification skills quickly labeled a honeysuckle plant and walked on, while other children were mesmerized by the plant's tropical vine-like appearance. Therefore, Carol argues that knowledge, 'head', should always go hand in hand with 'heart' and 'hands'.

Finally, the communicators argue that knowledge about biodiversity may ultimately contribute to pro-environmental attitudes and pro-environmental behavior. For instance, it is expressed by several interviewees that growing awareness about species can trigger feelings of admiration, appreciation, and care for them. Julia is convinced that humans have an innate love for nature that needs to be stimulated via education. High school teacher Amy hopes to empower her pupils via her teaching, so that they can make informed decisions, e.g., about making a bee-friendly garden or giving money to environmental charities. In line with this, Tara mentions biodiversity awareness as an important precursor for sustainability and 'a better world'.

Overall, the communicators attach great importance to biodiversity, and to the role of it in laypeople's lives, and this motivates them in their profession. Via their work many of the communicators hope to broaden people's perceptions of biodiversity and trigger their interest and sense of wonder, which they think could ultimately instill feelings of love and care for nature and the environment. Most importantly, the interviewees want to offer people the chance to open their eyes for biodiversity. In the following section we will distill opportunities and challenges in expanding the role of biodiversity in laypeople's lives from the experiences and thoughts of the communicators.

### 3.3. Theme 3: Potential to Expand the Role of Biodiversity in Dutch Laypeople's Lives

The biodiversity communicators were asked how they perceive the potential in the Netherlands for laypeople to learn about, and develop interest and appreciation for biodiversity. We discuss opportunities and challenges in three main areas: (1): direct experience with available biodiversity, (2): media, and (3): education.

#### 3.3.1. Potential of Direct Experience with Available Biodiversity

Most importantly, the communicators firmly argue that even though the Netherlands is highly urbanized, there exist many opportunities for people to come into contact with biodiversity. Julia and Oliver note that Dutch biodiversity is actually surprisingly rich, as the country constitutes a river delta:

*I think that the opportunities are huge in the Netherlands. ( ... ) There is no country in the world with such rich biodiversity ... for we are and will always be the river delta of Europe. So it is just one large, wet mess here. And we know that, but we don't realize how cool that is. Because we like to see impressive mountains, but how rich is biodiversity there? Here biodiversity is rich, due to that soggy mess. That's why we have so many species. (Julia)*

Moreover, the communicators stress that biodiversity is not limited to nature reserves and that plants and animals can be found in abundance in cities too:

*Nature doesn't start at a nature reserve. ( ... ) Nature starts right outside your front door. ( ... ) There are always lichens on the pavement. (Julia)*

Lori refers to the tiny pond in her own city garden, in which she counted over 80 smooth newts and 40 toads, while Oliver mentions the port area in Rotterdam, where a large and healthy population of rabbits can be found, in addition to orchids, vast numbers of butterflies, and seals. Several interviewees even state that in the Netherlands nowadays biodiversity is probably higher in cities than in rural areas, where biodiversity has declined. Therefore, species may actually be more readily encountered in cities. In line with this, Rick mentions that fascinating natural phenomena take place even in gardens:

*I sometimes tell an audience, when I give a lecture: "You don't need to watch television. If you have a nice, good garden, a soap opera will be performed right in front of you. That just happens, at least when you see it, when you pay attention to it". (Rick)*

However, although the interviewees note that biodiversity is present, limitations to direct experiences with it both in and outside of cities are voiced as well. Several communicators describe that in a densely populated country, people face many distractions. For instance, although there are nature reserves in the Netherlands, Shane argues that high visitation numbers detract from the experience of nature there. Similarly, Amy describes that urban children often face distractions on their way to school, such as traffic, shops, and playgrounds, so they are more likely to overlook biodiversity, even though species may be as numerous inside as outside of cities.

In addition, it is mentioned that availability of and accessibility to greenspace differs between locations. For instance, Lori argues that in light of safety, children living in cities with lots of traffic have less freedom of movement to explore their neighborhood. Furthermore, several communicators note that biodiversity is rarely integrated in urban design:

*What you notice is that at the drawing table, when the plan is actually designed, there is never an ecologist, but always a landscape architect. And landscape architects love cultivated trees, ( ... ) they love sleek design, neat little rows ... (Shane)*

In line with this, city parks are often overregulated, as they are generally expected to look tidy and not be of any nuisance. For instance, Helen recalls that her idea of planting thorny bushes in the natural community garden that she initiated, was challenged as it might cause childrens' trousers to be torn. Similarly, Shane experienced that a housing association incorrectly assumed that residents wished for house sparrows to be removed from their street, whereas in fact they considered the birds part of their home.

Rick argues that future cities should incorporate more greenspace, and he states that the potential in raising people's awareness of biodiversity will depend on it:

*If we continue with the current vision on shaping and building cities, then indeed there is a substantially lower proportion of the Dutch population for which potential will exist to open their eyes. (Rick)*

### 3.3.2. Potential of the Media

In addition to direct experiences of biodiversity, communicators also mention indirect ways that hold potential for expanding the role of biodiversity in laypeople. In particular, it is expressed that the media can help raise awareness about and trigger interest in biodiversity. Primary school teacher Lori notices the impact of the media in her classroom:

*Of course you have got the BBC. And now the Netherlands of course is also starting to make fantastic nature films ... And the children here who are allowed to frequently watch nature films, well, you just notice that, they know a lot. (Lori)*

In particular, John attaches great importance to media such as books, photographs, and movies, as he believes that they add value to outdoor observations. He argues that outdoor animal sightings are often brief and disappointing, and that indoor materials such as books with beautiful photographs can counterbalance this. Moreover, he points out that media can portray a tiny beetle just as beautifully as an elephant.

Still, a few limitations related to the media are expressed as well. For instance, several interviewees note that the media involve the use of only a few senses, and that they may distort people's perceptions of biodiversity. Julia refers to the grassy plains featured in the pre-school television series 'Teletubbies', which look nothing like biodiverse meadows:

*One big bright green plain. With a small hill. Then there is one flower there, and there is one flower there. ( ... ) As such it is actually already indoctrinated: a meadow looks uniformly green. (Julia)*

Moreover, it is noted that the media feature spectacular images, after investment of much time and effort in shooting them, and that they use bombastic music and sounds. As a result, people may be disappointed by their actual nature experience outdoors. In addition, the communicators note that local flora and fauna currently receive little attention in the media, as exotic species predominate. Self-employed writer John correspondingly expresses that book publishers are usually mostly interested in books about charismatic and exotic animals, such as elephants or birds of prey. Finally, Dale mentions a popular Dutch TV-host of nature series for children, who unintentionally seems to encourage undesirable behavior of handling all animals that are encountered instead of simply observing them.

Taken together, currently the interviewees do not regard the media as a suitable replacement for outdoor nature experiences, yet potential could be increased if the media would broaden their scope to local and everyday biodiversity.

### 3.3.3. Potential of Education

Finally, education is highlighted by several interviewees as having potential for growing biodiversity awareness. Several communicators argue firmly that younger generations in particular are a suitable target group for learning about biodiversity, e.g., because they tend to be interested in nature and may stimulate their parents to learn about biodiversity as well. In particular, outdoor school activities are thought to add value to education about biodiversity. For instance, primary school teacher Lori expresses enthusiastically that she taught her pupils to use binoculars, and that they went to a city park to watch birds and butterflies. Similarly, nature educator Carol states that children learn much from the outdoor project that she is involved in, as they are allowed to directly experience and explore nature during unscheduled hours, while being assisted by nature educators. High school teacher Amy makes sure outdoor activities are included during the yearly school camp, and she prioritizes biology experiments to be conducted outdoors.

It is further mentioned that nature education should start in primary school and continue into high school, and that it would be helpful to improve the structuring of nature education; e.g., provide weekly lessons about nature or make it compulsory for schools to occasionally visit Dutch nature reserves. Julia argues that the Netherlands is a rich country that should have the means to allocate sufficient time and money to nature education. Finally, in addition to the role that schools could play, educational programs and projects organized by non-governmental organizations are mentioned as a pathway to learn about biodiversity, such as the OERRR-club for children from Natuurmonumenten and the webcam project ‘Enjoy Spring’ from Vogelbescherming Nederland.

However, a few challenges to expanding the role of biodiversity via education are also noted. For instance, it is mentioned that currently Dutch school budgets for nature education are very limited. Moreover, primary school teacher Lori expresses that young children are often very enthusiastic about nature, yet they seem to lose their interest later on, as high schools spend little attention on nature education. However, high school teacher Amy argues that young adolescents are mostly interested in their own bodies during puberty, so biodiversity is more suitable for lower and higher ages. Moreover, she states that high school curricula are already packed with other important topics that demand attention (e.g., global diseases and food production):

*If I were to set priorities, then knowledge about nature would rank relatively low I'm afraid, because I think those other things are also very important to them. (Amy)*

Finally, barriers are mentioned that prevent teachers from doing outdoor projects; e.g., that they can be a hassle to organize, or that suitable locations to do the projects can be far away. Dale further mentions that to avoid risks, schools do not always allow children to freely explore and experience nature, as he noticed when he suggested to do a bumblebee project with high school children:

*So I thought “they are going to catch bumblebees”. Well that was out of the question according to the school, ( . . . ) because “there could be someone allergic to bee stings and bees are dangerous, they sting”. I wonder: how will those children grow up? Please allow them to discover things! (Dale)*

Taken together, despite several challenges, the biodiversity communicators see potential in the Netherlands for laypeople to learn about biodiversity via both direct and indirect experiences. However, they do note that people will need help, and they describe how communication can help realize the existing potential. In line with this, the next section describes how the interviewees communicate biodiversity in their profession, providing further insights into how the role of biodiversity may be successfully expanded in laypeople's lives.

### 3.4. Theme 4: Best Practices in Communicating Biodiversity amongst Dutch Biodiversity Communicators

The biodiversity communicators were asked how they communicate biodiversity in their paid or voluntary work. From the interviews we distilled three main considerations that the interviewees keep

into account when communicating biodiversity to a lay audience: (1): choosing the right examples, (2): connecting with the target group, and (3): translation via imagination.

#### 3.4.1. Choosing the Right Examples

The interviewees carefully choose examples to communicate. Several communicators mention that they thoughtfully select examples that will spark interest; e.g., topics that are new to the public. Self-employed writer John states that after hearing in a natural history museum from a taxidermist that crows have white feathers underneath their black plumage, he added this surprising detail to the book he was writing. Similarly, editor-in-chief Matt, who works at a zoo, expresses that he includes intriguing details about animal behavior in his texts, and for this he draws from facts that are new to him as well.

Several communicators prefer to communicate everyday examples of local biodiversity, such as common city animals. These may serve as eye openers, showing the public what can be seen in the immediate, often urban surroundings:

*Something which is commonplace can very well be a discovery for someone who has never been made aware of it. So when you point out to people such small everyday findings in their own environment, then this will enrich their daily experience. (Oliver)*

One of the benefits of communicating about local flora and fauna is that these can be seen in real life, adding to people's experience. John highlights native plants in particular as reliable starting points for experiencing biodiversity outdoors, instead of animals like birds, which you may not always encounter:

*First have a look at plants, because those you can see anytime and anywhere, and you can name them. ( ... ) When you only look at birds, then you could return home with "it failed", and with plants you never have that. (John)*

Similarly, lichens are pointed out by a few interviewees as being fascinating subjects for people, especially when they hear interesting facts about them and observe them closely (e.g., with a hand lens).

In addition to local biodiversity, several communicators draw from exotic biodiversity in their communication; e.g., Matt, who works in a zoo. John argues that in communication native biodiversity can be nicely supplemented by exotic biodiversity. He has regularly combined exotic and native animals in his writing, thereby illustrating similarities and simultaneously sparking interest in both local and global biodiversity:

*The tiger: fantastic predator. Catches prey three times as heavy as itself. But we have the weasel, and it catches prey twenty times as heavy as itself. (John)*

John further mentions that he frequently combines a range of species in his stories, to illustrate that biodiversity encompasses a multitude of lifeforms, yet he does choose clear representatives for each animal group (e.g., one mammal, one bird, one insect ... ). In this way he provides focus in his communication. Others also intentionally choose a clear focal point in their communication:

*You may point at twenty bird species, but then most of it passes you by. But if you nicely elaborate on just one, so that they really get to know the species, and you talk to those people again weeks later, they say: "Yes, I now see song thrushes everywhere", or "I see dunnocks everywhere". ( ... ) Suddenly they see it. It had always been there. Yet now it has obtained meaning. (Oliver)*

#### 3.4.2. Connecting with the Target Group

To communicate successfully, the biodiversity communicators use different ways of connecting to their target group. For instance, several communicators suggest to use interaction, and to think of what appeals to the views and interests of the audience, so that more people coming from different

groups can be effectively addressed. Rick, who as a project manager communicates with farmers and site managers, notes that his target group may hold prejudiced views against those who communicate biodiversity. He therefore is careful in choosing the wording in his communication, and he strategically chooses an opening:

*Farmers who are interested in nature often are because they like birds, such as meadow birds. And that is then your opening. ( ... ) I always try to connect to the question of the specific person ( ... ). So if I know that you like birds, then I will sketch the importance of insects from the perspective of birds, whereas if I talk to a manager who really loves a specific butterfly - they too exist - then I use that perspective. (Rick)*

Similarly, ecological consultant Shane experiences that clients from building companies, his usual target group, are rarely interested in flora and fauna; they just want to hear the implications that biodiversity present on their building site will have for their project. He therefore tries to find an opening to discuss biodiversity by connecting to clients' personal experiences with wildlife, and he notices that this makes clients more receptive to discuss and find solutions.

Moreover, in order to strike a chord with the public, multiple communicators point out that they prefer to craft positive messages, as these will be more readily received by the audience. For example, Rick states that a campaign about roadside flowers in which he was involved was named 'My roadside is flowering' instead of 'My roadside is mown', and Matt and John recommend to communicate possible solutions together with problems. In line with this, primary school teacher Lori emphasizes that in education an enthusiastic role model is vital.

### 3.4.3. Translation of Biodiversity

When crafting messages, the majority of the interviewees keep into account prior knowledge of their target group by avoiding jargon. For instance, a few interviewees prefer to skip the term 'biodiversity' and use 'nature' instead, and ecological consultant Shane intentionally avoids scientific species names in his rapports, as he argues that everyday names are more likely to spark interest and create an opening for dialogue. On the other hand, it is also mentioned that in communication some difficult words are fine (e.g., when they are explained) and it is argued that references to species should not be too vague, especially when names are informative:

*Every animal should have its name. So if you want to communicate, then "bird" or "insect" is unsatisfactory, "dragonfly" or "butterfly" is also unsatisfactory, yet a "swallowtail" is okay - you know. And I do that intuitively. (John)*

Moreover, the communicators use metaphors to make complex subjects related to biodiversity accessible; e.g., nature educator Carol compares pastures low in biodiversity to deserts, and thinks such translation aids retention. Working at a nature conservation organization, project manager Rick refers to the 'nectar scale' which his company designed. Roadside managers and owners can use this scale to determine the value of roadsides for pollinating insects on a scale of 1 to 5. Rick argues that the scale acts like a common language for ecologists, roadside managers and roadside owners, and he notices that the nectar scale motivates participants to improve the score. He links the success of the scale to its accessibility, as it is easy to understand and use:

*If you have a scale from one to five, everybody understands that if you score a one, you simply score below par. Yet if you would say "I have a roadside here and there are ten types of plants and five types of insects" nobody or only a few people will grasp that that is actually very few. (Rick)*

In addition to metaphors, the biodiversity communicators also describe other creative ways of translating biodiversity in their communication or education, e.g., to increase interest and retention. For example, several communicators mention that they use mnemonics to help people identify flora and fauna, and some use games to educate their public about biodiversity; e.g., Julia uses the game *statues* to communicate the lives of animals when she educates children.



## 4. Discussion

### 4.1. Current Role of Biodiversity in Dutch Laypeople's Lives

Biodiversity is seen as a fundamental part of sustainable development [2,3], yet it is under threat by a range of anthropogenic factors [21–23,25]. This makes it increasingly important that laypeople are aware of and support biodiversity. However, when we asked twelve biodiversity communicators about the current role of biodiversity in laypeople's lives in the Netherlands, they considered the role to be limited and fairly superficial. They argued that although Dutch citizens derive benefits from biodiversity, many are not aware of what biodiversity offers them or do not consciously value it. This is in line with Irvine et al. [87], who reported that biodiversity was not perceived by park visitors as important, yet it was actually one of the reasons why they visited green space. Moreover, the interviewees stated that Dutch laypeople have poor knowledge of native species, and several mentioned how the limited perceptions of biodiversity may lead people to normalize lower biodiversity levels than in the past. These findings corroborate previous studies that have reported low levels of awareness about native flora and fauna [58–61], and link to the shifting baseline syndrome [41,45–48].

In addition, the interviewees described ambivalent attitudes towards biodiversity, e.g., that many laypeople feel detached from biodiversity, using it predominantly as a décor to pose with for pictures or walk through. This links with Vining, Merrick, and Price [88], who reported that nature was generally viewed by participants as pristine areas untouched by humans. Several communicators noted that laypeople appreciate biodiversity mainly from a distance, which links with the “not in my backyard syndrome” [71]. However, it could also be that people are currently not aware of what they can do for biodiversity themselves [64,89].

### 4.2. Desired Role of Biodiversity in Dutch Laypeople's Lives

Drawing from their personal experiences, the communicators attached great importance to biodiversity. They thought it was a shame that currently many laypeople are unaware of it, motivating them in their profession. It was mentioned that every person has an innate love for nature that just needs to be reinforced, echoing the ‘biophilia hypothesis’ which states that humans have an attachment to nature rooted in their biology [90]. In line with this, the interviewees advocated expanding the role of biodiversity in laypeople's lives. Most importantly, they would like to grant people opportunities to open their eyes for biodiversity.

Most interviewees argued that the lay public should have some basic knowledge of biodiversity. Opinions differed with regard to the specific knowledge people should have (e.g., some prioritized broader concepts, while others emphasized the importance of facts such as species names). In particular it was emphasized that people should be familiar with local flora and fauna, which links with the thought that getting to know the local environment (e.g., the species living there) can provide people with a ‘sense of place and belonging’ [91–94].

The communicators provided different reasons why laypeople should learn about biodiversity. Some pointed out that knowledge can reduce risks from or fear of species, thereby enhancing a person's well-being in nature. Moreover, several interviewees argued that knowledge about biodiversity adds joy and depth to the experience of nature, in line with Fuller et al. [15], who demonstrated that psychological benefits of exposure to urban greenspace increased with higher levels of biodiversity. Knowing species was further compared to knowing the words of a language, linking with the idea that a person needs to know species names in order to talk confidently about nature [95].

In addition, it was mentioned that knowledge about biodiversity may provoke interest, and may stimulate people to become aware of what can be found in the immediate environment, thereby opening their eyes to the beauty and wonder of nature. The communicators argued that knowledge may ultimately trigger feelings of admiration and appreciation, consistent with studies that have concluded that knowledge about species can help shift people's perceptions and raise affinities towards them [54,96–98]. Furthermore, it was expressed that raising awareness about biodiversity could

help people at making informed decisions, ultimately contributing to pro-environmental attitudes and pro-environmental behavior, which links with the finding that people's willingness to pay for conservation of species tends to increase with knowledge about them [98–100].

Finally, a few interviewees noted that knowledge about biodiversity may occasionally detract from a person's experience of nature; e.g., noticing that a nature reserve is deteriorating may decrease the joy walking there. In light of this, several communicators noted that strategies aimed at building awareness about biodiversity should not overlook people's attitudes and behavior.

#### *4.3. Potential to Expand the Tole of Biodiversity in Dutch Laypeople's Lives*

The interviewees saw great potential in the Netherlands for people to learn about biodiversity. They described opportunities for expanding the role of biodiversity in laypeople's lives in three main areas: direct experiences, media and education. Interestingly, even though the Netherlands is a highly urbanized country, the communicators were confident that many opportunities exist for Dutch citizens to come into contact with biodiversity. Not only did some interviewees note that the Netherlands is a river delta rich in biodiversity, most of the communicators emphasized that flora and fauna can be readily found in cities, and some stated that biodiversity may even be higher there than in rural areas, where biodiversity has declined. In line with this, McKinney [101] has noted that moderately urbanized environments may have higher species richness than the native ecosystems they replaced.

Despite the opportunities however, obstacles to outdoor experiences with biodiversity were pointed out as well. Urban distractions such as traffic may lead people to overlook biodiversity, and high visitation numbers in nature reserves can detract from the experience of nature, in line with Staats and Hartig [102], who found that students preferred to spend time alone in nature to find mental restoration. Furthermore, it was mentioned that availability of and accessibility to greenspace differs between locations, and that children often have limited opportunities to freely explore their environment. This connects to Cox et al. [103], who surveyed urban residents in the UK, and reported that the majority of human-nature interactions were experienced by only one third of the population, and to Lerman and Warren [104], who suggested that city residents who live near the urban core will have fewer opportunities to experience biodiversity. This pattern is worrisome, as people who spend little time in nature are less likely to develop a strong connection to it [105] or to support conservation [69].

Moreover, several communicators expressed that greenspace is expected to look tidy and not be of any nuisance, so as a result it is overregulated. It was argued that biodiversity should be integrated more into urban design, suggesting in line with previous research that urban planners, architects and housing corporations would benefit from education about biodiversity [17,106]. This could inspire them to combine 'messy' parts that have ecological functions with 'orderly frames' [107], so that both care for biodiversity and aesthetics are served, and people are more likely to accept the design [108]. Furthermore, misconceptions may be resolved; e.g., wrong assumptions that citizens would dislike cohabitation with flora and fauna [14,109]. Similarly, communication about the value of urban wastelands and ecological design choices (e.g., by explaining how the design benefits biodiversity such as birds or butterflies) may increase city residents' acceptance and help biodiversity conservation in the long run [110,111].

In addition to direct experiences of biodiversity, communicators highlighted the media as a pathway through which awareness about biodiversity can be raised. For instance, the media were pointed out as an effective and reliable starting point for experiencing biodiversity. Indeed, previous research has suggested that vicarious sources that portray biodiversity can partially substitute or supplement direct experiences [69,112], and as urbanization continues, the media may need to play an increasingly important part, as they have an extensive reach and can thereby shape many people's perceptions [40,113].

Still, despite the potential that was voiced, the media were not regarded as suitable replacement for outdoor nature experiences. It was noted that they involve the use of only a few senses, and may cause

people to develop distorted views of nature, so that actual experiences with biodiversity outdoors may appear dull and not rewarding. This might even lead people to think that ‘real nature’ is only found elsewhere [71,114]. Furthermore, some media that are popular among children in the Netherlands may unintentionally encourage people to interact with biodiversity in undesirable ways (e.g., by touching or catching), linking to Barney et al. [115]. Lastly, the communicators noted that charismatic and exotic species predominate in the media, a pattern that has been reported in other countries for various types of media [35,116–118]. Therefore, in order to realize the potential of the media, the communicators argued that the scope should be broadened to feature local, everyday flora and fauna more. This might be done by purposefully weaving less charismatic species into storylines [119]. The highly popular nature documentary series ‘Life in the Undergrowth’, which portrays invertebrates, demonstrates that with the right approach the scope in biodiversity can be broadened without negative effects on approval ratings or viewing figures [120].

Finally, education was mentioned by several interviewees as a key in growing biodiversity awareness. In particular, younger generations were seen as a suitable and strategic target group, a view shared by previous researchers [46,121–123]. For instance, it was pointed out that via children, parents may be stimulated to learn about biodiversity, in line with Diris and Lambrix [124]. It was argued that nature education should start early, in primary school, and continue into high school. However, while it was expressed that the Netherlands is a rich country, it was also noted that school budgets for nature education are limited. Furthermore, while outdoor school activities were highlighted as being very valuable, it was mentioned that barriers can prevent school children from going outdoors (e.g., limited greenspace in the vicinity schools, or safety concerns). Although curriculum demands might be an obstacle, some communicators argued that it could be helpful if nature education were more structured (e.g., by making visits to nature reserves compulsory).

Taken together, it was revealed that opportunities to expand the role of biodiversity in laypeople’s lives are perceived to be numerous, yet several challenges will need to be overcome. To help fulfill the existing potential, effective communication about biodiversity will be vital.

#### *4.4. Best Practices in Communicating Biodiversity amongst Dutch Biodiversity Communicators*

The interviews revealed that the biodiversity communicators carefully determine the subjects that they communicate. Importantly, the interviewees described a strategy of focusing on a limited number of examples, connecting to cognitive load theory [125,126], and to previous studies that have recommended to restrict the number of species in an identification task for children [127,128]. Moreover, they take care in choosing examples that will spark interest; e.g., topics that are new for the public and possibly even new to the communicator. Many communicators preferred to use native species in their communication, in particular common, everyday species such as city animals, plants and lichens, which can open people’s eyes for what can be found in their immediate surroundings, adding value to people’s daily nature experiences. On the other hand, some communicators stressed that there is no need to exclude exotic biodiversity; e.g., they described how exotic species can be strategically combined with local species.

Furthermore, the biodiversity communicators described how they aim to strike a chord with the public; e.g., by using enthusiasm and positive messages. They purposefully connect to the interests and the knowledge level of their target group; e.g., they carefully choose wording and a strategic opening, so that messages are better understood and more readily received. This links with past studies that have clearly demonstrated that existing perceptions influence subsequent learning [129,130]. Tailoring messages to the perspectives of audiences is a well-known communication strategy, yet research has suggested that in practice messages regularly mismatch perceptions in the public [89,131–133]. The examples described by the interviewees support the idea that getting to know intended audiences (e.g., via assessments or dialogue) is vital for strengthening communication and reaching broader audiences [130,134–136].

Finally, the interviewees mentioned creative forms to translate biodiversity to a broad audience, such as metaphors, mnemonics and games, which according to past studies add to people's learning process. For instance, it has been demonstrated that good mnemonics linking the name of a species to its morphology produce higher retention rates than pictorial determination keys, making them an effective teaching method in education alongside field work [137].

#### 4.5. Limitations

We will note a few limitations related to this study. First of all, in this paper we have used the term biodiversity in line with the definition of the Convention of Biological Diversity [26], yet we did not provide the interviewees with this definition. Instead, we asked the participants to express their view on the concept. Although only a few noted genetic diversity and some seemed to use the term biodiversity as a synonym for 'nature', all interviewees did mention variety of life forms, in line with the official definition.

Secondly, as in most qualitative research, the study represents the social reality of a selective number of interviewees, so caution should be exercised in generalizing the results and extrapolating them to other settings. Still, we believe that our study provides valuable insights applicable to wider contexts, as the perceptions of the communicators described in this paper seemed to be mostly directed towards urbanized environments in general instead of the specific Dutch context. Moreover, most core perceptions and themes will have been covered due to the purposive sampling method we used, and the current setup proved to be successful in identifying 'black swans': observations that do not fit the expected patterns [76]. For instance, while we did expect the interviewees to describe why knowledge about biodiversity would be valuable, the communicators also described how under some circumstances knowledge can detract from nature experience.

Finally, some views expressed by the interviewees do not seem to match learning theory. Some quotations suggest linear relationships between knowledge, attitudes, and behavior, even though studies have pointed out that in reality such relationships are complex, showing the limitations of knowledge-deficit models [138,139]. For communicators it is important to be aware of this when disseminating information about biodiversity to the public. In addition, some questions remain. For instance, future research could elucidate the relative potential of different types of media, outdoor experiences, and educational programs, and could explore ways to confront the challenges raised by the interviewees. Furthermore, it would be valuable to include extra target groups in future research to supplement the current study. For instance, it would be interesting to involve both urban planners and the general public, as they may perceive the existing potential differently than biodiversity communicators.

## 5. Conclusions

Before biodiversity can contribute to sustainability, it will have to be conserved, and awareness and support for its protection therefore needs to be raised. This is becoming increasingly important, due to the widening gap between people and nature [41,42,47,140]. As an increasing number of people are living their lives at a growing distance from nature, biodiversity conservation will depend more and more on urbanites and the role that biodiversity plays in their lives [65].

We explored how biodiversity communicators perceive the need and potential for expanding the role of biodiversity in laypeople's lives in the Netherlands. Overall, Dutch laypeople were perceived to have a limited perception of biodiversity, and the communicators felt motivated to expand it. Most importantly, the interviewees argued that people should get the chance to 'open their eyes' for biodiversity, which would ultimately benefit both themselves and biodiversity. Despite being highly urbanized, The Netherlands was deemed to hold much potential for engaging people with biodiversity, offering a positive message in the increasingly urban world.

Based on our study, success will depend on pathways that offer people ways to interact with biodiversity in both direct and indirect ways. First, citizens should have sufficient opportunities to

experience biodiversity directly. This highlights the need of future urban design where people and biodiversity share the landscape, and shows the importance of education and communication about the values of greenspace and biodiversity in cities, targeted at urban planners, architects, housing corporations, as well as the general public. In addition, teachers should be offered materials and tools to do outdoor projects in the vicinity of their schools (e.g., about lichens or street weeds). Secondly, indirect experiences with biodiversity should be facilitated via the media and in education. The current bias towards exotic species could be counterbalanced by replacing, or supplementing exotic species with local, everyday species that people can encounter in their daily lives. Finally, our study underlines the importance of carefully designed communication that matches the public. This highlights the need to get to know intended audiences (e.g., via assessments and dialogue), helping communicators to reach out successfully to laypeople about biodiversity.

All in all, this study highlights opportunities to connect people with biodiversity, also in highly urbanized countries. The perceptions of the communicators may empower and motivate other professionals, which can help open people's eyes for biodiversity and build broad-based support for conservation.

**Supplementary Materials:** The following are available online at <http://www.mdpi.com/2071-1050/12/7/2768/s1>, 'Suppl\_1\_Consent Form', and 'Suppl\_2\_Interview Guide'.

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