

Biofonia

A citizen science service to monitor biodiversity

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Abstract

An increasing amount of both physical and mental layers keep distancing urban dwellers from the biophysical environment that we often call nature. Environmental psychologists have coined the term 'extinction of experience' to describe the decreasing amount of encounters urban dwellers have with the natural environment. With the depletion of these experiences we have less relation to the natural world. And what we cannot relate to, we find hard to value.

The intent has been to explore new ways urban dwelling adults could interact with the natural environment in order to help them relate to the abstract notion of biodiversity. The final concept is inspired by expert and user insights gathered through ethnographic research methods.

The resulting design concept is a service and product ecosystem that is based in the field of soundscape ecology.

Keywords: *biodiversity monitoring, soundscape ecology, soundscapes, biophony, citizen science, biodiversity loss, locally based monitoring.*

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Chapter 1

Introduction

In this section I lay out the foundations for the thesis. This starts with an introduction to the Anthropocene and arguably the driving force behind this era: human-nature disconnection. I then present the initial design opportunities identified within the subject area, along with the chosen target group, design approach, goal, and my personal interest in the topic.

How sad to think that nature speaks and mankind doesn't listen.

Victor Hugo, 1840

Background

BIODIVERSITY IN THE ANTHROPOCENE

Accumulating evidence on humanity's impact on the Earth's atmosphere, oceans and wildlife leaves us with little doubt that we have entered a new geological age, **the Anthropocene**, also known as the Human Age. For many it remains a conceptual predicament to imagine that in a single human lifetime — the new epoch's formal start date is likely to be the 1950s — anthropogenic impact has pushed the billions-years-old planet into an entirely new age (Waters et al., 2016).

The Anthropocene has developed a range of faces, one of which is global biodiversity loss. The World Wildlife Foundation (WWF) estimates that the number of wild animals on Earth is set to fall by two-thirds by 2020 (WWF Living Planet report, 2016). One of the main causes of biodiversity loss is the reduction of wilderness areas. Currently it is estimated that one-tenth of the world's wilderness areas have been lost over the past 25 years. If current trends continue, there could be no globally significant wild areas left in less than a century (Watson et al., 2016).

What is critical about this, is that with the depletion of species, the inextricably interconnected web of life becmes increasingly more fragile. The simple fact is, that after wilderness areas have been lost, they cannot be restored. They will come back as something else. How hospitable the new environment is for us and other species is difficult to speculate on (Watson et al., 2016).

These pieces of news call us to not only to re-examine the way we use land areas, but to rethink our value systems that concern the natural environment. If the relationship we have shaped with the environment remains unchanged, our own lifestyles will need to begin to change dramatically. It is crucial we understand that the way we view the natural environment will shape the future of ecosystems across the globe.

HUMAN-NATURE DISCONNECT

Psychologists have proposed that one of the reasons why we seem to be able to live in blissful peace while the natural environment around us is collapsing, is that we are disconnected from it, to the extent that it has become hard to relate to the fact that our very existence depends on it (Schultz et al., 2004).

With more than half of the human population living in urban areas — a trend that is expected to increase by more than two-thirds by 2050 (UN, 2014) — addressing the lack of human-nature interaction will become ever more important. Ecosychologists have proposed a theory called the *Human-Nature Disconnect*, which suggests that people living in urban areas have developed a sense of being separate from nature. Eventhough participants in studies on the topic understood that humans have their origins in nature, they did not view themselves to be part

of it. The theory also asserts that a disconnect from nature correlates with pro-environmental inaction (Scannell & Gifford, 2010).

One of the reasons for human-nature disconnection is our physical separation from the natural biophysical environment (Vining et al., 2008). In the late 90s a study was carried out to get insight into the types of spaces Westerners spend their daily lives in; 90 per cent of their time was spent indoors (Evans & McCoy, 1998). With a lack of contact and everyday closeness (location of residence) to what is perceived as nature, the relation we have to it subsides.

With the rapidly escalating anthropogenic phenomena of climate change and biodiversity loss, it has become of utmost urgency to provide people with ways to not only build relation to the natural world but to also provide people with agency in- and channels to mitigation efforts.

RELATION THROUGH EXPERIENCES

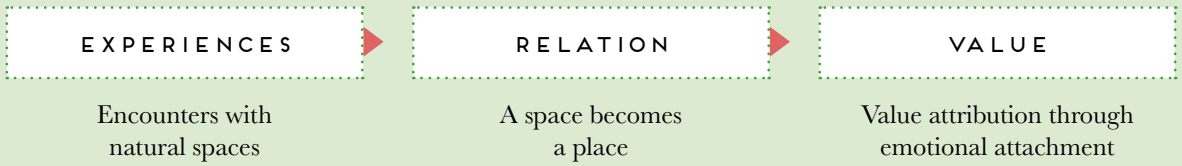
Over the past 50 years studies carried out in a variety of academic fields – such as psychology, education and environmental history – have stressed the importance of "nature encounters" and "nature experiences" as pathways to pro-environmental behaviour (Beery & Wolf-Waltz, 2014).

What has been broadly grouped as the *Environmental Connectedness Perspective* (Beery et al.) proposes that a 'connection' to nature has the potential of transforming an individual's level of environmental concern and pro-environmental behaviour.

Chawla and Derr (2012) define this environmental connectedness to lead to *a predisposition to take an interest in learning about the environment, feeling concern for it, and acting to conserve it, on the basis of formative experiences [in nature]*.

A way to understand the connectedness perspective is to see repetitive experiences in nature leading to the development of a relationship, whereby a space becomes a relational place. It has been suggested that place attachment to a specific natural location, as opposed to generalised nature, correlates with pro-environmental behaviour. Place attachment refers to the bonding that occurs between individuals and their meaningful environments (Scannell & Gifford, 2010).

Several studies exist that support the existence of a relationship between connectedness to nature and environmental action or behaviour. Mayer and Frantz (2004) synthesise the results of five different studies and conclude that there is a moderately strong positive relationship between human-nature connection and pro-environmental actions.



In order for us to appropriate value to the natural environment people need to feel relation to it. And to feel relation to it, they need experiences with it.



The design opportunity

At the moment the problem of human-nature disconnection is being addressed from a design point of view mostly from the field of the built environment, which primarily aims to incorporate more greenery in urban areas. However, few attempts have been made to promote the importance and awareness of natural landscapes that inhabit larger ecosystems.

INTERACTION DESIGN'S ROLE ON SUSTAINABILITY

Discussion on interaction design's role on sustainability is only at its infancy. Conversations have been started to explore how sustainable lifestyles and decision making could be supported through the design of technology. In the industrialised nations that contribute most heavily to global warming, information technologies are deeply embedded in people's everyday lives. These technologies could form an effective channel to influence mindsets.

A popular suggestion has been to intervene in individual lives by making abstract environmental data concrete for everyday life (Mankoff et al. 2007).

USING TECHNOLOGY TO TRAIN LONG LOST SENSES

In a similar vein of thought, this project aims to translate the abstract notion of biodiversity to a relatable concept, with the aid of technology available today or in the near future.

While we have gradually become increasingly urban, we have also become less attuned to detecting and understanding the changes and anomalies occurring in the natural environment. Could technology aid us in redeveloping an understanding of the environment without creating a new dependency on the technology itself? Could technology help us train our very own senses and abilities we have stopped using since we became urban?

The design opportunity this project is engaged in is the role technology could play in taking us closer to nature, and how it could help us understand it in order for us to better relate to it.

The target group

RE-PLANTING THE SEED

So far, designerly attempts to engage people with nature have mostly targeted younger generations. These compose to a large extent of digital platforms and services that aim to inspire young people to spend more time outdoors.

However, adults are equally distanced from the natural world, and their well-being is also compromised by the lack of interaction with nature. Only few examples can be found that aim to target urban adults.

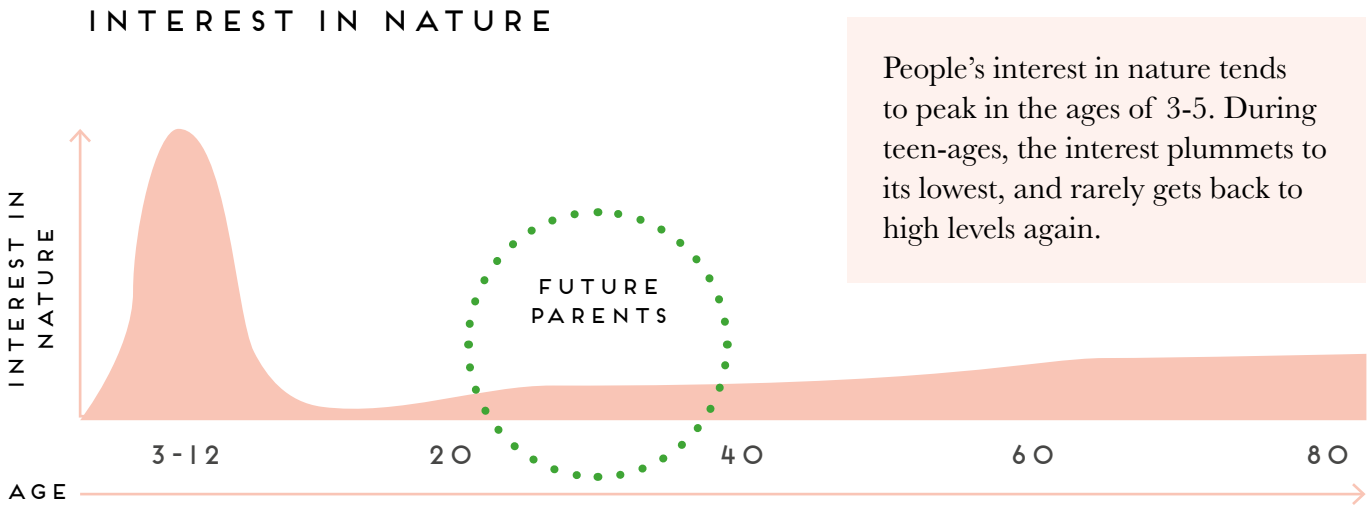
The importance of reaching parents or potential parents that then pass on renewed perspectives and values for nature is considerable. The lifestyles adults in western countries lead are often less accommodating to spending time outdoors than those of children, which is why finding alternative ways for adults to build relation to the natural world is needed.

THE *INTEREST IN NATURE* -CURVE

The choice to focus on people that were likely to become parents in the (near) future was made based on insights gathered from topic expert interviews.

Several experts that worked with environmental education were asked to draw on a time-line how they viewed the variation of interest in nature through ages. Curves drawn by experts at separate interviews were stunningly similar, working as validation for my preliminary hypothesis that people's curiosity towards nature drops at the onset of teenagehood.

While teenagers go through a steep decline in interest due to other interests taking over, the choice was made to focus on 20-40-year-olds. Bringing back pre-teen curiosity towards nature could have a considerable positive chain reaction for generations that follow.



People's interest in nature tends to peak in the ages of 3-5. During teen-ages, the interest plummets to its lowest, and rarely gets back to high levels again.

This graph is based on topic experts' opinions on people's interest in nature through ages. All experts were asked to draw a curve basing on their teaching experiences.

SEE FULL DESCRIPTION OF ACTIVITY ANALYSIS IN APPENDIX PAGE 60

The design approach

The project takes a user-centred approach to the problem of nature-human disconnection.

This project has been an opportunity for me to use design research methods to dive deep into both emotional, social and practical motivations and inhibitions people have concerning closeness to, or *connection* with the natural environment.

Insights gathered from field observations and qualitative research were used to inspire concepts that were tested and iterated on with experience prototypes.

The final design solution is the outcome of user insight inspired concepts that are then shaped by the technical and practical reality around them.

VISION OF OUTCOME

The goals for this project have been to create an outcome that:

1. enables city dwelling adults to **gain relation with the natural world**
2. helps users **learn about the environment**, and
3. is technically **feasible** to be implemented in the **near future**.

The first two goals are based on my understanding of what is needed for people to **increase the amount of value they attribute to the environment**, which has been the underlying goal for this project.

I have also taken this project as an exercise in creating a feasible outcome that takes into account the technological ramifications present today. Instead of being hampered by them, I have aimed to use them as opportunities for creative detours.

Personal interest

Since childhood, I had always dreamt of becoming an architect. I wanted to create homes that did not separate human life so strictly from other forms of life. I envisioned cities that did not fight against other species, but welcomed them, assuming them as something integral to their life and very survival.

I still carry this vision of a mutualistic utopia with me. And I did not end up becoming an architect. I became someone that is not bound to work with the physical world alone. With the prospect of giving shape to human behaviour through all things man-made, physical or not, I hope to have an even better chance in working towards that mutualistic ideal.

Chapter 2

Primary research

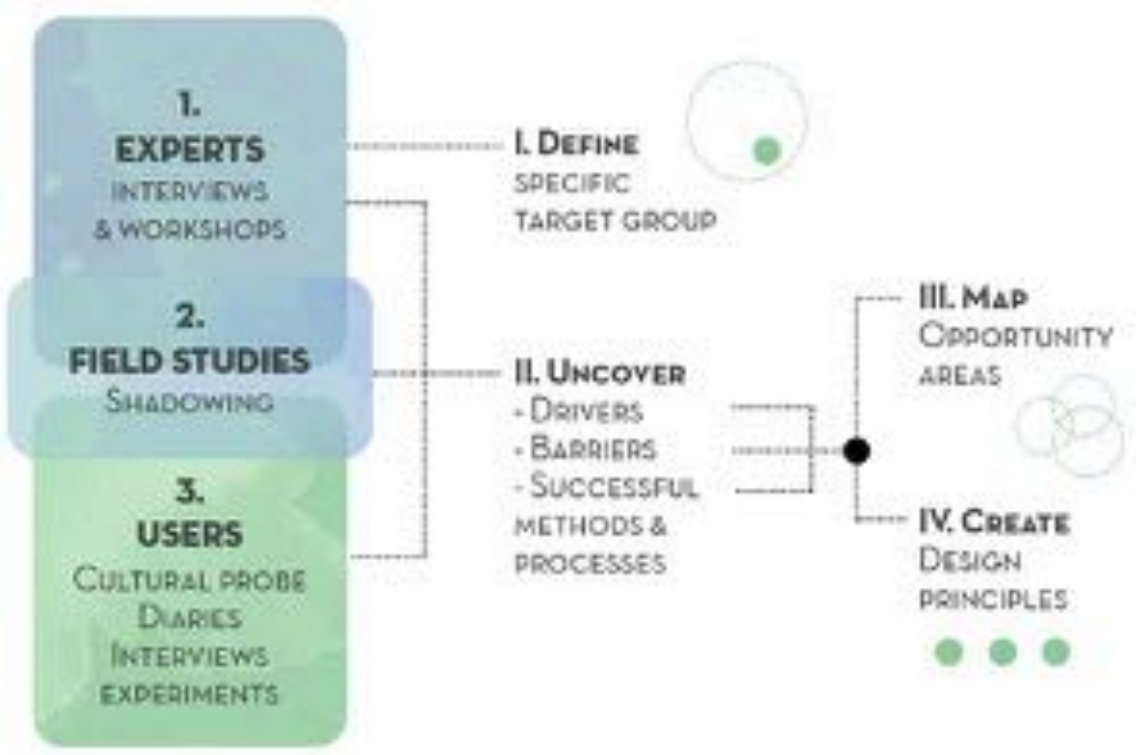
In this section I present the planning and results of primary qualitative research. The goals of this phase have been to validate initial direction; formulate a more specific design problem; and provide inspiration and design principles for the ideation phase.

I will give descriptions and main outcomes of key methods used in the process. This is followed by a deeper analysis of the key insights, which have been used to form theme areas under the categories of target perspective, barriers and drivers. The section ends with a presentation of the reframed problem and focus area.

The plan

The project was initiated with an exploratory research phase that aimed to identify potential design opportunities within the broader area of the human-nature disconnection discussion. The initial hypothesis of **spending more time outdoors** in order to feel better connected to nature guided much of the first stages of primary research.

The results of the research intended to act as inspiration for subsequent ideation and design work. Primary research was divided into three phases as illustrated below.



Topic experts



INTERVIEWS

Interviews were carried out face-to-face with 9 topic experts, to whom I also refer to as *Connectors* (people that work to connect people with the natural environment in one way or another). I also considered them as examples of people that were better connected than the average person due to their career choice, although this varied from person to person. By connectedness I refer to the way they view themselves in relation to nature.

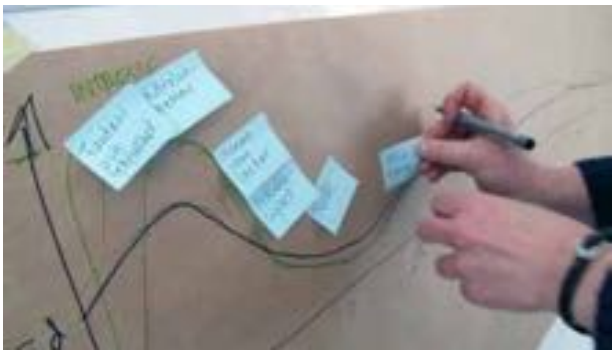
The interviews aimed to help understand what had inspired the interviewees to take up an interest in the environment, and which methods were successful in sparking interest in nature. They were also asked to draw their own personal perspectives on people's interest in nature and on the time they spend there.

MAIN OUTCOMES:

The interviews helped me choose a suitable target group to focus my subsequent research activities on (see page 7). All interviewees that were asked to visualise their perception on people's interest in nature through different ages depicted the fluctuation similarly. The main competing interests and age-related barriers were taken into account when choosing a suitable target group to focus on (see page 8).

I also gained inspiration from stories that interviewees told about the ways they became interested in nature. Several successful methods and processes for sparking and maintaining interest in nature were identified.

Also successful learning strategies were discovered (both from expert and non-experts interviews).



SEE ALL IDENTIFIED LEARNING STRATEGIES IN APPENDIX PAGE 61

Field studies



BIOLOGY CLASS

I observed a university lecturer give a guest lecture on Tropical Ecology to 16-year old high-school pupils at a local school.

MAIN OUTCOMES:

Even though the people observed did not belong to my target group, the type of questions the pupils asked the teacher validated an earlier finding made during earlier expert interviews. A great majority of the questions posed were numerical in nature (e.g. how many, how far something is) instead of 'why'-questions (e.g. why do corals live in such areas).

One of my expert interviewees had noticed this tendency of heavily numerical questions being the norm amongst city dwelling adults.

The type of questions we ask about a topic reflects the way we think about it. My hypothesis is that asking why-questions reflects a more explorative and connection-seeking attitude towards nature, which was what I then aimed to achieve in this project. The goal of nudging people to speculate and subsequently make hypotheses about the environment through why-questions was therefore formed.

ANIMAL TRACKING

I joined an animal tracking course held by two Ph.D. students in a local national park, when Umeå was in the midst of a snowy winter. The seven-hour skiing trip included 15 biology students at Umeå University.

MAIN OUTCOMES:

The observation provided rich insights on the direct experience people had with winter-time nature. Surprisingly, even though they were biology students, many were not used to the outdoor conditions.

This experience helped me validate my assumption that learning acts as an important component in helping people see the previously mundane environment as an interesting space to explore.

A CULTURAL PROBE: AN OUTDOOR CALENDAR



Since much of the debate around nature-human disconnection revolves around the idea that we do not spend much time outdoors, I wanted to probe this by following the outdoor related habits people had over a one-week period.

My participants belonged to my target group; 15 people between the ages of 22 and 35 marked both the amount of time and the type of activities they carried out outdoors during the 7-day period.

MAIN OUTCOMES:

The context of the study is likely to have influenced the result; the activity was carried out in February in Northern Sweden (Umeå) where the temperatures were often below zero.

However, even though the actual amount of time spent outdoors was influenced by the context, the experiment yielded valuable insights, since the task invited people also to reflect on their relationship with the outdoors.



The activity helped me gain an understanding of some of the biggest barriers and drivers people had with the notion of spending time outdoors, while also working as an excellent conversation starter for the interviews that followed.

User studies



INTERVIEWS AND ACTIVITIES

A task was given to inspire people to reflect on their relationship with the outdoor world and to get deeper meditated responses in the interview situation that followed.

Eight participants were asked to find photos or draw an image that represented their relationship with nature, both at present and when they were children. The participants were people that had been selected from the probe activity based on the varying degrees of interest for nature and amount of time spent outdoors they showed through the calendar activity.

This task was then followed by interviews. The initial questions were based on the nature-relationship image activity, after which the interview became more open and followed topics that emerged during the discussion.

Alongside the interviews, an online questionnaire was sent to bigger number of participants who were asked to select which of the three ways of viewing nature they identified the most with: nature as a space (1.) for activities, (2.) for reflection, (3.) to explore.

A third exercise probed the type of questions people have about nature. People were presented with photos and were told that they could ask anything they wanted about it. The intent was to use the type of questions they asked as ways to understand how they thought about nature (numerical vs. why-questions).

The goal of the interviews and activities was to uncover barriers, drivers and activities that related to the outdoor natural world. All interviews were recorded and transcribed for later analysis.

MAIN OUTCOMES:

The interviews were very successful in yielding insights on what had helped people feel connected to nature and what their main barriers were from spending more time outdoors. These then worked as key inspiration in the ideation phase.

Through the online questionnaire I was also able to frame the ideal perspective (towards nature) to aim towards with my design work.

Insights

All interview comments were transcribed and rearranged into insight themes. The themes were then divided into barriers, and drivers, some of which were further distilled into design opportunity areas. Later in this chapter I present a selection of key insights that helped refocus the problem area.

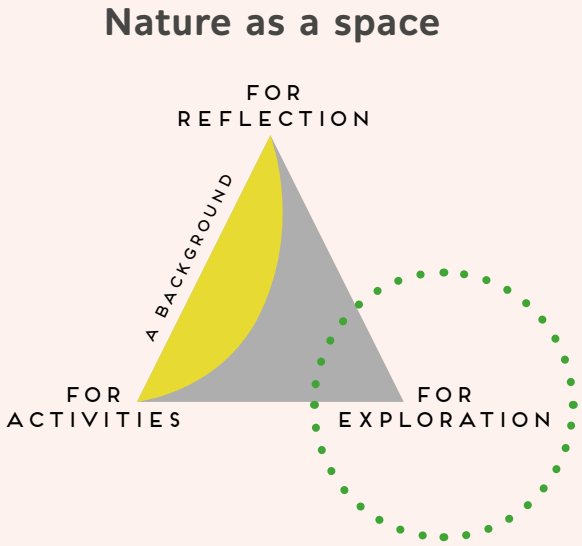
The target perspective

NATURE AS A SPACE TO EXPLORE

An analysis of the interviews and online questionnaire enabled me to create a framework for people's perspectives on *nature as a space*. With this, I was able to choose the focus and aim for the subsequent ideation phase.

Although more than half of the online questionnaire respondents identified best with 'nature as a space to explore,' none of them engaged with such activities on a regular basis at the moment of interviewing. This identification reflected their ideals, rather than the current reality. When asked about examples of experiences of exploring nature, interviewees could only recount memories that had taken place in their childhood. Out of all the interviewees only those that worked experts interviewees and one 'better connected' non-expert still explored nature for its own sake on a regular basis.

The above mentioned perspectives can be seen as a triangular spectrum between the three ways of viewing and using nature as a space. The yellow area refers to nature as a background only, which means that it nature's role is more irrelevant in the activity that is being carried out.



Conclusion: Based on this, it became my aim to situate my final design proposal on the right side of the triangle, which denotes nature as a space to explore. The refocused objective of the project was to explore ways nature could become a space to explore for its own sake.

SEE DESCRIPTIONS OF ALL THREE PERSPECTIVES IN APPENDIX PAGE 62

BARRIERS

Through expert and target user interviews three major barriers for engaging people with the outdoor natural world were identified.



Barrier 1

BATTLE AGAINST TIME

Across varying interest levels towards nature, all interviewees had this barrier in common. Since my target age group entailed people that were still building their careers — who in most cases prioritised work and/or studies over outdoor activities — this barrier was often the main barrier to spending more time in nature.

It's always the wrong moment to go out... when we're finally ready to go out, it starts raining.

- Female, 30

Conclusion: It quickly dawned to me that changing people's priorities was not in the scope of my thesis. Based on this, I decided to move away from nudging people to spend more time in the wilderness to seeking more urban alternatives to exploring nature.



Barrier 2

AN UNCOMFORTABLE WORLD

The outdoor calendar probe revealed that although many people liked the idea of spending more time outdoors, preparing to go out felt more like a chore that needed a considerable amount of effort. Since the research was carried out during winter, the cold weather was stated as one of the main reasons for not going out much.

When you get older, you're like "it's cold and dark and I wanna go home."

- Female, 24

It was clear that many even up in northern Sweden have little knowledge about how to dress up properly for the outdoors. For example, before the outdoor observation class the leaders had to educate people how to dress up for the excursion, since many, in their experience tend to turn up unprepared for the cold.

Conclusion: This insight also led me to reconsider the initial aim of creating an outdoor activity, and look at possibilities in an indoor context as well.

Barrier 3

CONSUMERIST EXPECTATIONS

We're used to getting nature served to us. If you go in nature, you don't often see animals, like in a film. Kids tend to be very disappointed when they don't see any big animals. People have very high expectations nowadays.

- Nature warden

This theme acts as a container for two barriers identified both in user and expert interviews. The finding applies mostly to people with a more urban upbringing.

1. The inanimate world of plants & rocks

Most non-expert interviewees found it hard to relate to non-animal life and inanimate elements in nature, such as plants and rocks. The longer term time-scales they operate in makes it hard for people to relate to them. Animals, on the other hand, were seen as more 'interactive' than plants and rocks, making it easier for people to sustain curiosity towards them.

If you're outside and you're looking at trees...I mean they're cool and all, but they're not doing much.

- Female, 24

Plants and rocks "were just there" and "did nothing". This need for instant reaction, or, interaction might be a result from our increasingly entertainment saturated surroundings, where everything is made to react instantly to our actions. We seem, to a large extent, to have lost patience for observation.

Although many of the interviewees were interested in biology and natural sciences, they found that outdoor nature itself was not very interesting to learn more about. People got most of their knowledge and were most inspired about nature via secondary outlets, such as museums, books, magazines and TV.

Also other people, such as guides and teachers work as better communicators of nature, especially on-site in nature.

2. The invisible animal kingdom

Expert interviews and user studies revealed that people that have an urban upbringing seem to have high expectations on what they expect to counter in the wild, being grown up with TV-programs that show wildlife up-close. The reality of seeing animals in the wild is far from what television has enabled people to experience, creating a gap between expectations and reality.

I wanted to see a herd of reindeer. I wanted to see them milling around and we never did. I mean, it wasn't Jurassic Park, they're not just gonna be walking through but I just really wanted to see one, you know.

- Female, 24

Conclusion: Both insight themes above worked as interesting opportunity areas that could be addressed from an (interaction) design perspective.

A key problem with the high expectations we have for nature is the fact that we want to see more, now. Could technology act as a mediator between our newly developed expectations and the slow and hidden life of the wilderness?

SEE OPPORTUNITIES DERIVED FROM BARRIERS IN APPENDIX PAGE 63

DRIVERS

Three themes are presented below that have been found to act as key elements in generating interest and emotional attachment to nature. These insights are based on accounts from both expert and non-expert interviewees.

Driver 1

EVERYTHING IS CONNECTED

Contrary to my expectations, it was seldom a singular interest (e.g. a specific species) that sustained an interest in nature. The more *connected* people had a shared interest for understanding how one element is the consequence of another, and how each in their turn plays a role in shaping other elements not only in their immediate vicinities, but also at great distances. It was the interactions, or connections between elements that people were most intrigued about.

What most of the 'connected' interviewees had in common, was that they understood the complex interconnectedness of our environment, and made no difference between the so called 'natural' and 'human' worlds. Value was given to nature since it was seen as an integral part of their own world, and not as a separate entity. *Name one thing here that's not part of nature*, a Ph.D. student in ecology asked the biology students in the classroom, referring to the forgotten origin of all things made by man.

Conclusion: I came upon the realisation that it was not so much about spending time outdoors that would help us become connected and value the natural environment. It was more about understanding how inextricably connected everything was.

Driver 2

MEMORIES AND PLACE ATTACHMENT

When interviewees were asked about their relationship with nature, city dwellers described it often as a non-specific space, to which they had no particular emotional connection. People with a more rural upbringing envisioned nature very much in connection to a specific location, often their childhood home.

Interviewees that came from a more rural upbringing tended to be emotionally very connected to the place where they had grown up and they had vivid memories about their childhood experiences near home when describing their thoughts about nature. They also tended to be more aware of the intricate interconnectedness of natural elements, and asked more 'why'-questions about nature pictures that were shown during the interview.

Conclusion: The role of a more specific location to which the person has strong relations to and memories of seems to play a significant role in building affection and concern towards the natural environment.

Driver 3

INDEPENDENT SPECULATION

Interviewees that spend time outdoors exploring the environment tend to enjoy moments when they do not know the answers for their questions. They thrill in hypothesising potential answers for what they see and use their imagination to build new dimensions in the spaces they are in. Through independent explorations they impose themselves to experiences that required them to hypothesise, test and learn from experiences.

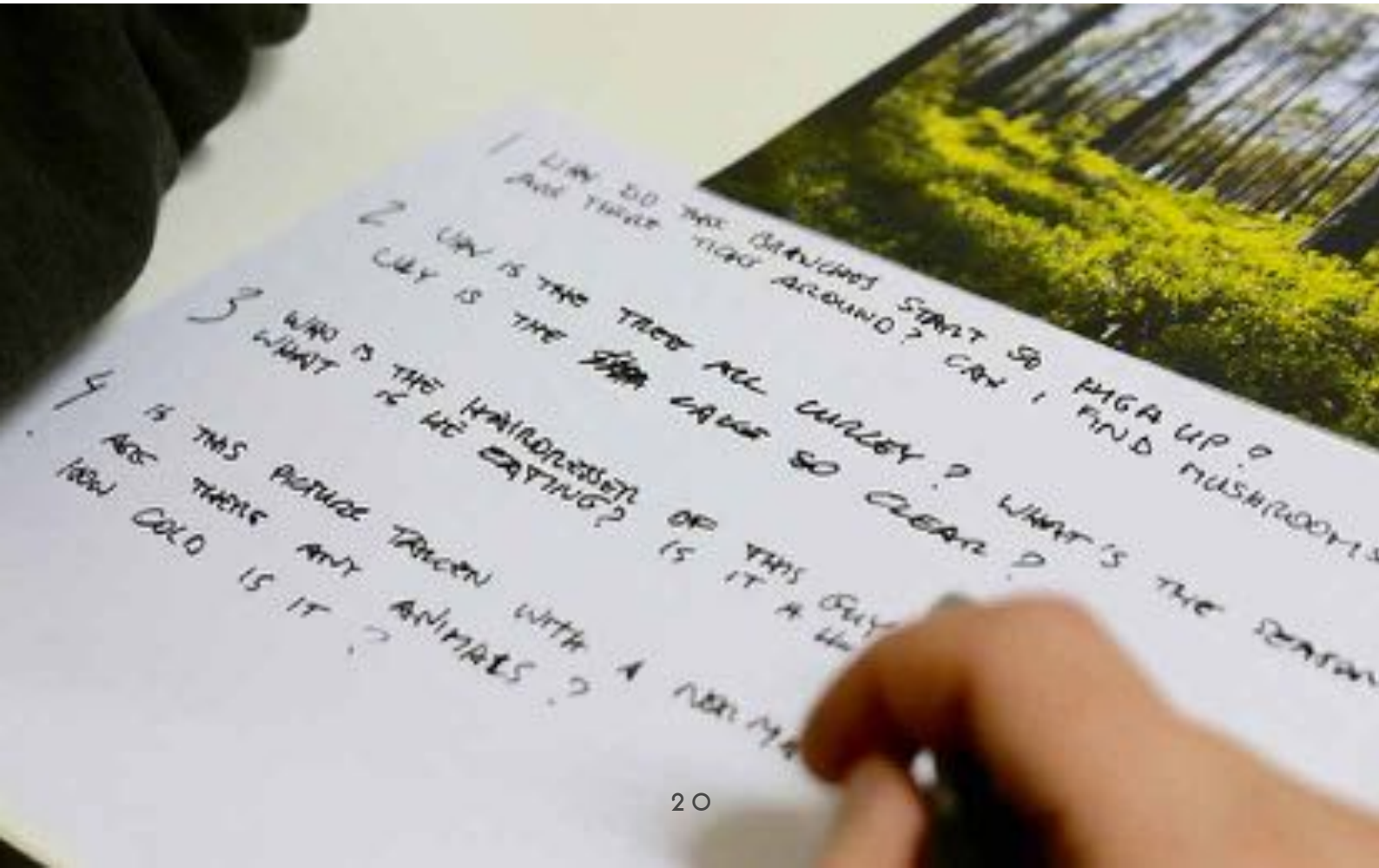
Questioning the surrounding environment clearly plays a role in generating interest towards it.

During interviews I asked people to look at pictures taken of an outdoor environment and asked them if they could ask anything about the pictured environment, what would they ask.

The questions posed could be divided into two groups: questions that seek quantifiable or numerical answers, such as distances and amounts, whilst the others were more speculative 'why'-questions, such as 'why is there a tree here?' People asking 'why' questions tended to belong to those that were either experts or people that had a more rural upbringing.

Conclusion: Based on these findings, one may argue that a lack of experiences with the natural world leads to having fewer, or less 'imaginative' questions about it, which then again leads to the lack of interest towards it.

As dicussed earlier (see p. 13) why-questions tend to inherently lead to speculating connections between the elements. This seems to form the core of 'exploring nature for its own sake,' the target persepective for the project (see p. 19). The problem remains, however, how to nudge people to ask 'why'-questions.



Driver 4

THERE IS STILL MUCH TO DISCOVER

Another element that many of the 'connected' had in common, was that they saw the environment as a vast unknown. They were more likely to think that there was still much that we did not know.

There's so much more to explore and to discover, which we don't know yet. We have no idea how things interact.
- Nature warden and ecologist

Then it's really cool, when you can convey that 'holy shit, I have no idea.' To make clear that there's lot of stuff that we don't know. They [the students] think it's cool.

- Lecturer in biology

Showing that there was still much that even scientists did not know could render the wilderness more exciting a space and invite people to start speculating about aspects in the natural environment.

Conclusion: The more we know, the more we realise how little we know. They key is to help people become curious and start asking questions.

Design principles

A further distillation was made to produce design principles to guide the subsequent phases of ideation and concept development. The principles are based on the drivers identified during primary research.



Help the person understand that there was much that we still do not know.



Help the person understand that every element is connected to each other.



Help the person to start asking questions about the environment.



Help the person follow and learn about the natural cycles of one single place.

Problem observation

When considering the insights gathered, the practical barriers — lack of time, and unpreparedness to outdoor conditions — the initial aim of nudging people to spend more time outdoors had to be revisited. One of the drivers – understanding how everything is connected to and within the natural environment – led me to conclude that the realisation of this was a key goal I wanted the target user to achieve. This also did not require the person to be physically outdoors repeated times, which proved to be difficult due people's general the lack of time.

The emotional connection one makes to a single location was also an important aspect to keep in mind. Interview insights showed that transforming nature from an abstract and unspecified space to a specific place holds an important role in the formation of an emotional connection. Also, understanding that there is much to discover, and leaving space for independent speculation, were elements that worked well to move the person towards building an emotional affinity and relation to the space.

One of the most interesting findings for me was the consumerist expectations many had for the natural world. Based on interview insights I argue that city dwellers have lost a great deal of patience for the observation of the slower paced natural world, which is needed to begin to try to understand it.

Expert interviewees suggested that one of the reasons for this could be increasing technology and entertainment saturation. We no longer experience boredom, which used to push us to look for excitement ourselves. Now it's being served to us, and little effort is required from our side to seek it. As a result, the slow paced, immobile and seemingly non-interactive nature doesn't fare well in comparison with other entertainment. This rather modern condition seemed like an apt area to extract design opportunities from.

Redefined problem area

I created opportunity areas for each barrier identified (see appendix p. 63). Keeping in mind my personal interest in the role that technology could play in helping us engage with nature, I decided to focus on the theme of *Consumerist expectations*, where technology has often played quite an opposite role. Inspired by interviewee comments of the low-engagement level nature is seen to pose, I wanted to explore if technology could help provide more interactions with nature, or help us perceive natural environments from new perspectives.

The next step was to choose between the two sub-categories: (1.) *The inanimate world of plants and rocks*, and (2.) *The invisible animal kingdom*.

THE INVISIBLE ANIMAL KINGDOM

Through interviews it became apparent that people are more likely to show curiosity towards animals than plants. Since interviewees found animals much easier to relate to and to which build an emotional connection, the theme fit better with my ultimate goal of helping people build an emotional connection to nature and attribute more value to it. This led me to decide to explore the *Invisible animal kingdom* -theme further.

SEE ALL OPPORTUNITY AREAS IN APPENDIX PAGE 63

The essence of the problem lied in the fact that since we are accustomed to seeing animals close-up in nature programs in TV, we have developed high expectations for our own outdoor nature experiences. When these expectations are not matched, we are likely to become disappointed. However, although wildlife areas are seemingly devoid of animal life, it remains important for us to understand its presence.

The guiding question became the following:

> How might we begin to perceive the invisible animal kingdom?

BRIEF REFORMULATION IN SUMMARY

SECONDARY RESEARCH

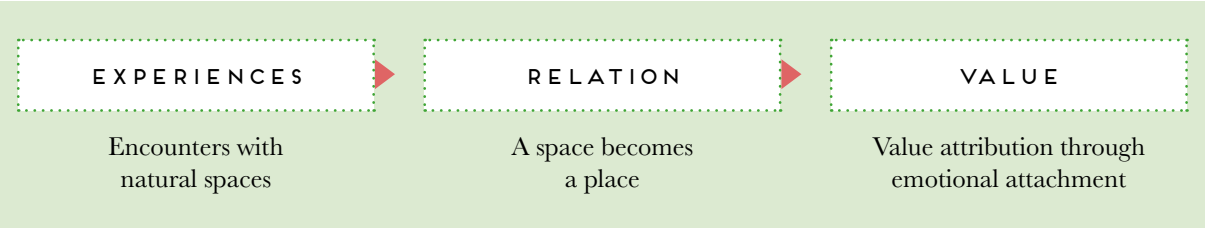
PRIMARY RESEARCH

IDEATION & CONCEPT DEVELOPMENT

1. The partition point

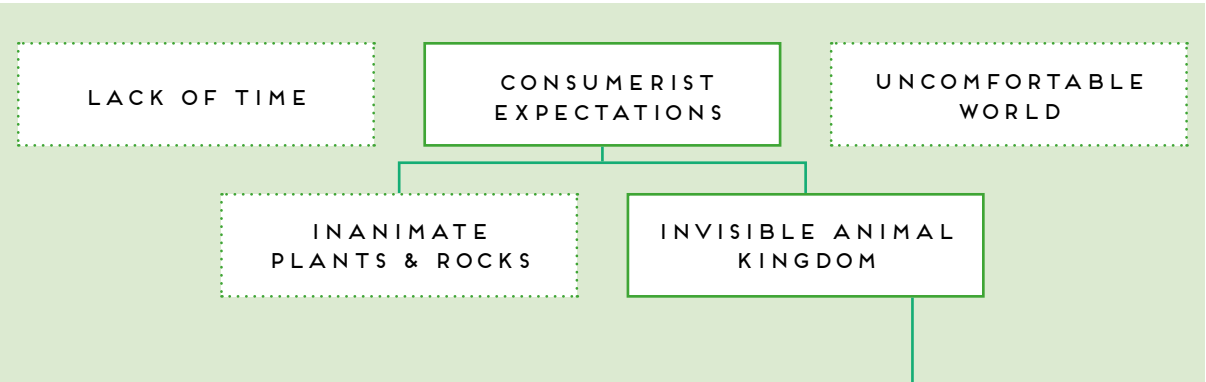
How could we attribute more value to the natural world?

In order for us to attribute value to the natural environment people need to feel relation to it. And to feel relation to it, they need experiences with it.



2. Hypothesis & research question

We need to spend more time in nature. But why don't we?



3. Reformulated brief

How could we help people perceive the invisible animal kingdom?

Additional insight

We need to understand that everything is connected.

SEE KEY COMMENTS FOR WHY WE DON'T SPEND TIME IN NATURE IN APPENDIX PAGE 64

Chapter 3

Concept development

Before moving into ideation, the re-focused problem definition – ***How might we begin to perceive the invisible animal kingdom?*** – needed a narrower frame through which to look at it. I decided to open my research up for external inspiration, to find specific areas I could better hook my question to. Here I present the key sources of inspiration: ideas from literature and the media, and a co-creation workshop focused on the sense of hearing. This is then followed with a description of two experience prototypes that followed, along with their key findings and evaluation.

Inspiration



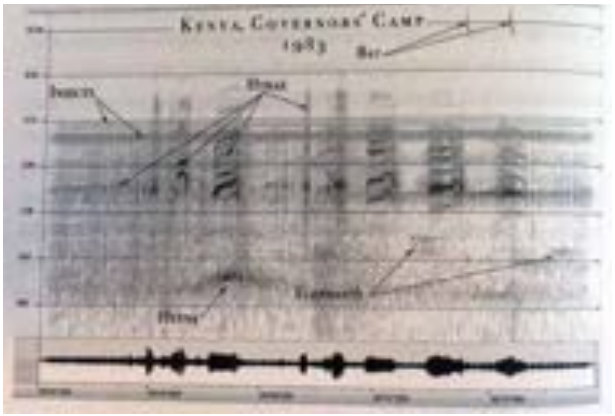
During my research I had become particularly interested in the role auditory sense played in our experiences with nature. One of my interviewees remembered her time as a child in the Amazon rainforest. While in bed in the darkness of the night, she began to imagine the invisible creatures she heard around her. It was not so much the sounds themselves, but rather the imagined world that was born from them that remained in her memory.

Another interviewee described her yearn to go to the forest with her son to do nothing but to listen. She had discovered this to be her only way to show her son that animals were indeed there; they just couldn't see them.

Inspired by these accounts, I began to research sound's role in shaping our understanding of the natural world.

SOUNDSCAPE ECOLOGY

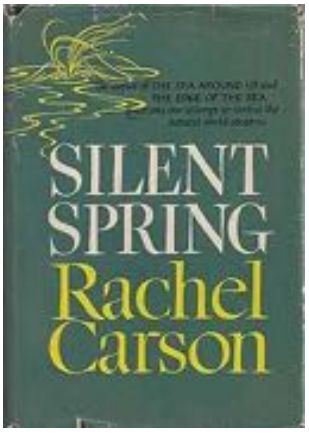
Bernie Krause, often referred to as one the founding fathers of soundscape ecology, gave an inspirational talk about how much sounds in nature can tell about the life that so often remains hidden from us. In his talk he recounts how soundscapes are used to measure overall biodiversity of locations across the world. Soundscapes prove to be more accurate than visually made estimates of sites (yearly comparisons made with photographs), since much of the life simply cannot be seen.



Spectrogram of Sounds at Masai Mara. From Krause, the Great Animal Orchestra.

I also revisited a book that I had read as a teenager, called Silent Spring (Carson, 1962), which recounts the time when the detrimental effects of DDT had not been publicly established.

Rachel Carson recounts a spring that woke up the people by its silence, all while no visual changes had taken place in the natural environment. The disappearance of birds then lead investigations to discover the environmental havoc DDT had brought. Carson was first to articulate the idea of an inextricable link between the quality of a habitat and its soundscape.



Ideation

CO-CREATION WORKSHOP

Inspired by the field of soundscape ecology, I began the ideation phase by holding a workshop with design students on the notion of listening to nature. While holding the question of 'perceiving the invisible animal kingdom' in focus, participants were asked to explore how the modality of hearing could be used in engaging people with the natural environment.

SEE PERSONAS AND WORKSHOP QUESTIONS IN APPENDIX PAGE 65

METHOD

I created four personas that were based on and exemplified some of the key barriers my interviewees had. The 11 workshop participants were divided into four groups according to the persona each found most interesting.

After grouping, three questions were presented, each of which participants discussed for 20 minutes within the assigned group. At the end of each task they presented their design solution to the rest of the workshop participants.



Initial concepts

I ideated further on concepts that had been presented at the workshop, and arrived at four concepts. All involve recording and listening to nature's soundscapes (see the appendix p. 67). Two concepts were then selected based on advisor feedback for experience prototyping.

Concept 1

CATCHING SOUNDS



The concept promotes the idea of being outside to brush up patience and listening skills.

HOW IT WORKS:

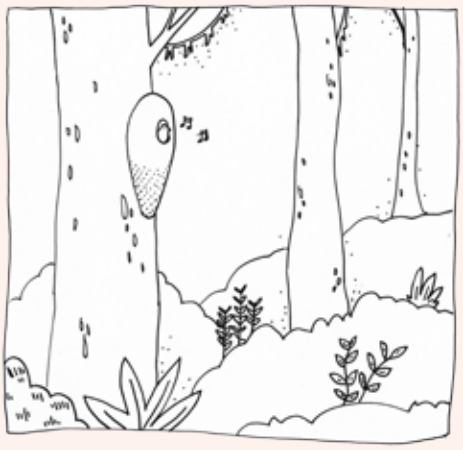
The concept is centred around a mobile application that encourages people to go out to collect sounds of local fauna. In addition to recording the sound, they can take photos of the animals, which are saved in a library. The sound catchers do not get the answers immediately, but are encouraged to interpret the sounds by themselves through a guided search through a larger database.

INTENT:

The concept encourages people to go outdoors to understand more about the animal life in their local neighbourhood. They are also encouraged to slow down and listen to the environment, which is something many city dwellers rarely do anymore.

Concept 2

NATURE CALLING



This concept based on the idea of place attachment and personal connection.

HOW IT WORKS:

The person chooses a location that has personal importance, and which they would like to follow from wherever they are.

They receive a connected and microphone embedding birdhouse (*The Collector*), which they place on the site of their choice. A single-purpose speaker (*The Biophone*) that only streams the site's soundscape enables them to listen real-time to the chosen spot.

INTENT:

The idea behind this is that they develop an understanding of the species that live around this location, and their variation through the seasons and years.

If they follow the place over the course of years, they would ideally develop an understanding of biodiversity change at the location.

SEE OTHER TWO INITIAL CONCEPTS IN APPENDIX PAGE 67

Experience prototyping

Prototype 1

CATCHING SOUNDS



METHOD

I asked a number of people to record sounds of whatever they considered 'nature' or 'natural sounds' with their mobile phones both in city environments and natural environments.

The recordings were carried out both in urban and more remote natural areas.



PROTOTYPING GOALS

It was important to validate the hypothesis that recording sounds helps become more aware of the soundscape.

I was also interested in understanding how difficult it was to go out, find and record "nature" sounds, and what people understood as nature sounds to begin with.

KEY FINDINGS

Finding 1

A chore to do

Although recording the sounds varied in difficulty for the participants, the overall concept was not easy to adopt. One participant that went on a hiking trip found it very hard to find sounds even though they were in a forest area for two days. The activity felt more of a chore, than a pleasant mindfulness and patience exercise.

Another participant had the task at the back of her mind for a longer period of time until she finally found the time to carry out the task of recording. Although the recording situation itself was pleasant, the need to carry out the activity presented an added mental weight.

Finding 2

Never listening again

After a month of the recording experiment I asked the participants if they had to listened to the sounds again. Listening to the sounds was a key part of the concept, since the intent of the concept was not only to capture sounds, but to understand the local fauna by interpreting the recordings. However none of the recordings were ever listened to again.

Finding 3

Sound quality

All sounds were recorded with mobile phones and were of relatively poor quality. Often one would hear the sound the devices themselves made by shifting the phone in their hands or footsteps, leaving the target sounds to a distant background. The sounds would barely match to the sounds experienced on-site due to the poor recording technology. In order to collect good quality recordings of animal sounds specialist equipment would be needed.

Finding 4

Lack of time

As findings during the primary research phase showed, also in this concept it emerged that people often would not have time to make recordings outdoors. Although one of the participants showed interest in continuing the activity, another participant found it hard to establish a habit of recording sounds.



Prototype 2

NATURE CALLING



METHOD

For this concept I built two birdhouses (that represented the Collector) for people to bring out to a place of their own choice. The prototype kit was given in the form of a gift, which they were asked to place in a place of their own choice either to mark a special occasion, or to a place that was already important to them.

After setting up the birdhouses they were given probes that represented the Biophone, to use for four days. The probes contained sounds that aimed to give them an impression of the location where they left their birdhouses in.

I also asked them to keep a diary to which they could record their thoughts. The experiment was ended with an interview.



PROTOTYPING GOALS

I was primarily interested in finding out at what occasions people would listen to the site's soundscapes, and what the act of listening to the soundscape would make people think about the site.

KEY FINDINGS

Finding 1

Hearing biodiversity decline

One of the main problems was the fact that hearing the biodiversity around your dear place slowly die might be upsetting, and something you might not want to listen to. And realistically, diminishing biodiversity is what you would hear in most places. As the other participant puts it:

Is it something I want to realise? If I take it this way, I might get depressed. Because it's rare that something is evolving in a good way. It's most likely the opposite. It's pretty sad when you realise that the place you love is dying.

- Male, 28

What could not be tested:

Long-term monitoring

Since my attempt to emulate years passing by failed, it seemed impossible to feign a multi-year experience of following the soundscape of the location. What would be important to test is the user's interest towards the location over years. This is an important aspect, since it enables people to build a good understanding of the seasonal and yearly species and overall biodiversity variation of the place.

I would need to find my routine. And it would take time to find that routine. Maybe you can help with that?

- Male, 28

Finding 2

Setting up

Since both participants had little experience with setting up the birdhouses, they would have liked to have had more advise on where to place them. Information could have been provided on what constitutes a safe place for instalment, both for the birds and the electronics, and information on the kinds of places birds tend to prefer. Also tips on sonically interesting locations would have been well appreciated.

I had joined one of the birdhouse set-ups and it was very difficult to find a place with sounds. Even though we were in a forest, relatively far from human population, we had to give up with finding a sonically interesting place since it was getting dark, and we had to place it just somewhere. It was just quiet everywhere. It almost felt like we had come too late, considering what the concept was trying to achieve.

Problems that needed to be resolved

Designing the end

After the experience prototype ended, I organised a feedback session with product design students to discuss about the product aspects of the Collector. The following problems arose:

1. End-of-life

It was very important for me to design the end-of-life for the devices. Having electronic waste left in natural environments would be contrary to the goals of the project.

The concept also had some other technical challenges to be considered:

2. Power

3. Connectivity

4. Materials, durability for years

5. Animal tampering

SEE MORE INSIGHTS
IN APPENDIX PAGE 68

Evaluation



NATURE CALLING

+ Soundscape awareness
+ Good sound quality
+ Fits urban lifestyle
+ Place attachment
- Indoor activity



CATCHING SOUNDS

+ Soundscape awareness
- Never listening again
- Time consuming
- Sound quality

CHOOSING A CONCEPT

The two concepts were evaluated basing on insights gathered from the two experience prototypes.

The decision was made to move forward with the Nature calling -concept. The rationale behind the decision was largely based on the shortcomings of the *Capturing sounds*-concept.

The major barriers to the Capturing sounds -concept were two-fold: (1.) the **lack of time** that prevented people from engaging with the concept and, more importantly, (2.) the fact that participants **never listened to the sounds again**. An additional problem arose from the fact that the recording itself had to be carefully done to obtain good quality sounds, weighing against the concept.

The *Nature Calling*-concept, however, resonated much better with the participants. The concept suited the target group better since continuous effort was not needed to record the sounds, which was instead taken care of by the monitoring device, which would also record higher quality sound.

The participants set up the recording birdhouse themselves, in a spot of their choice, which was important (instead of having someone else put it up) to develop place attachment. The listening device, the Biophone helped the participants gain easy access to the sounds, which is key to developing an understanding of the location.

On the other hand, the main shortcoming of the *Nature Calling*-concept was that it did not encourage people to spend more time outdoors. This had been my initial aim, which was based on foundational research that suggests that we need more experiences with the natural world in order to build relation to it, and eventually attribute (more) value to it.

However, primary research showed that time posed a considerable barrier for people to spend more time outdoors. People simply prioritise other activities above spending time outdoors. Instead, what I found more important was that people become more curious nature and start exploring nature. The underlying aim became understanding the interconnectedness of elements both within the natural world and between the natural and human built worlds. This did not necessarily require being outdoors.

MEETING THE DESIGN PRINCIPLES

The concept was also evaluated against the design principles set at the end of foundational research.

 SHOW THAT THERE IS STILL MUCH TO DISCOVER	 HELP CONNECT THE DOTS	 NUDGE TOWARDS INDEPENDENT SPECULATION	 HELP FORM PLACE ATTACHMENT
Nature Calling invites the listener to learn about nature and animal life through soundscapes, which is likely to be a less trodden way to explore nature for the person.	This principle remained largely unment. The listener listens and collects sounds, but no help is given to understand them.	The concept relies heavily on this principle, but a good balance needs to be created along with the second principle.	The Nature Calling concept is strongly based on this principle, since the listener is invited to pick one location for the birdhouse.

Whilst the concept followed most of the design principles to an acceptable extent, the principle *Help connect the dots* remained unadressed. The concept clearly lacked an element that helped the person understand the soundscapes and their relation to ecology and how everything is connected. The remaining principle is considered and addressed in the following chapter (p. 36).

DESIGN GUIDELINES

To guide the subsequent phase of concept refinement I created a new set of design guidelines based on the Nature Calling experience prototype results.

The guidelines act as additional level of design requirements and wishes above the design principles set at the end of primary research. More specifically, they reflect the shortcomings of the chosen concept at this stage, which needed to be addressed.

We will go more in-depth into these guidelines in the next chapter (p.38-42).



GIVE A SENSE OF AGENCY AND HOPE



HELP ESTABLISH RITUALS TO LISTEN



DESIGN AN END-OF-LIFE



GIVE GUIDANCE ??

Chapter 4

Concept refinement

This section describes my process of refining the Nature Calling -concept. I will describe the main challenges identified through research and experience prototyping and how they were used to improve or change aspects of the concept.

Plan for concept refinement

Although the concept resonated well with experience prototype participants, key aspects had been identified that needed to be addressed.

The concept refinement phase was based largely on addressing the remaining design principle (*Help connect the dots*) and the newly formulated design guidelines (p.33).



Hypotheses from foundational research

DESIGN PRINCIPLES



SHOW THAT THERE IS STILL MUCH TO DISCOVER



HELP CONNECT THE DOTS



NUDGE TOWARDS INDEPENDENT SPECULATION



HELP FORM PLACE ATTACHMENT

Insights from experience prototyping

DESIGN GUIDELINES



GIVE A SENSE OF AGENCY AND HOPE



HELP ESTABLISH RITUALS TO LISTEN



DESIGN AN END-OF-LIFE



GIVE GUIDANCE FOR AN INFORMED START

Meeting the last remaining principle

HELP CONNECT THE DOTS

To meet the principle ***Help connect the dots***, an online platform, The Mesh, is added to the concept. While the platform serves as a database and library for the soundscape data, its core role is to provide a space where listeners can interpret soundscape data together with experts. by providing information about other participants' current and past species observations, the platform aims to help build a holistic understanding of the site throughout a larger period of time.

Through expert feedback, requirements were identified for the proper validation of species recognition for the use of scientific research. The listener's role became that of a citizen scientist, who traditionally assists scientists in scientific research activities by either gathering or interpreting scientific data (in this case both).

CITIZEN SCIENCE

In essence, Citizen Science refers to the involvement of non-professionals in scientific work and works to complement traditional projects in academia.

According to the Green Paper on Citizen Science (Socientize, 2013) Citizen Science refers to the general public engagement in scientific research activities when citizens actively contribute to science either with their intellectual effort or surrounding knowledge or with their tools and resources.

Citizen Science enables the fruitful exchange of information between the sound collecting non-professional, and the scientist, who can in return for the data help interpret and validate the soundscape data.

Principles to satisfy scientific standards according to Silvertown (2009):

- data must be verified
- standardised methods must be used
- assumptions about data and research design must be made explicit
- hypothesis should precede a Citizen Science activity
- feedback (on contribution) should be provided

Since the concept enables the person to gather soundscape data, which is valuable also for scientific use, the idea of Citizen Science was implemented into the design.



Requirements and for the interface were identified through paper prototyping.

SEE MESH PROTOTYPING IN APPENDIX PAGE 71

CONCEPT OVERVIEW

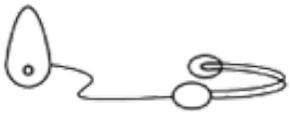
The concept is composed of three parts: **the Collector**, **the Biophone**, and **the Mesh**.



THE COLLECTOR

Sound collecting birdhouse - placed anywhere you hold dear.

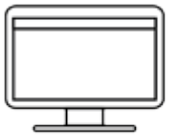
Customisable - different sizes of holes for different birds.



THE BIOPHONE

Streams soundscape from the Collector.

Only interaction: a button for marking sounds for later reference.



THE MESH

The space for species recognition together with scientists and experts that follow the same region where the Collector is placed.

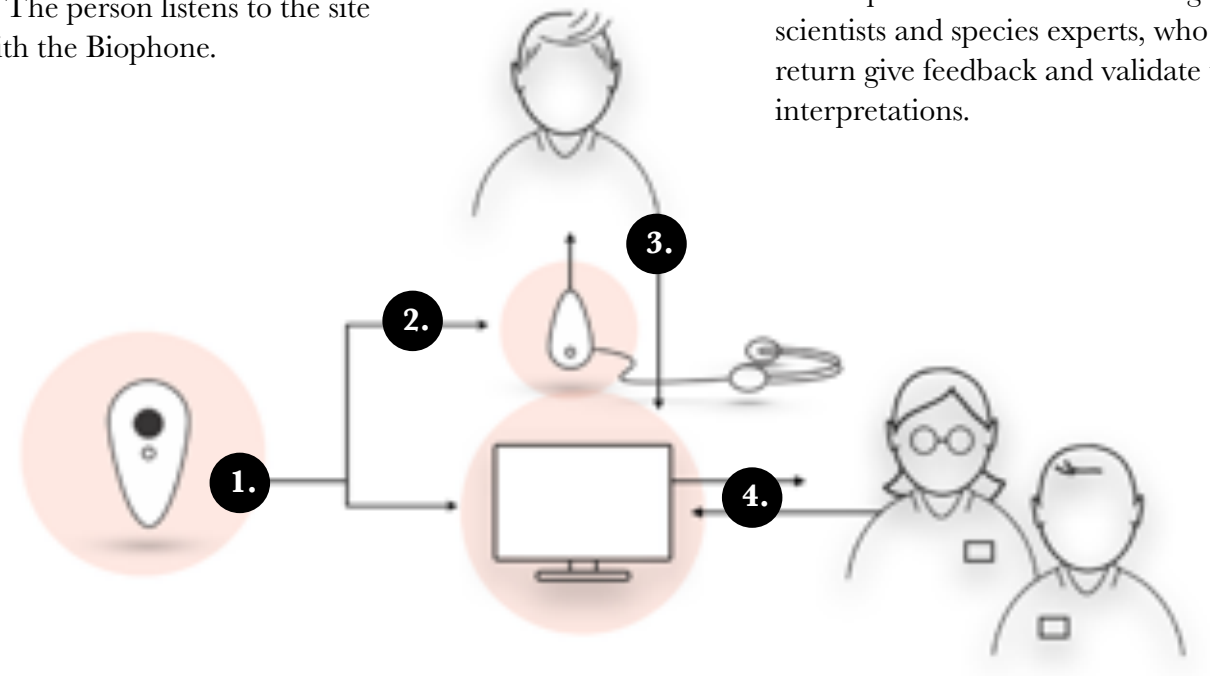
SYSTEM OVERVIEW

1. The Collector streams soundscape data to the Biophone and the Mesh, where it is saved.

2. The person listens to the site with the Biophone.

3. The Mesh is used to interpret the collected soundscape data with the help of experts, who then make the final validation of the finding.

4. Both the raw and interpreted data is then passed on to collaborating scientists and species experts, who in return give feedback and validate the interpretations.



Meeting the design guidelines



Meeting guideline no. 1

GIVE A SENSE OF HOPE AND AGENCY

One of my key insights – (on the sadness of) *listening to biodiversity decrease* – reminds us that it is important to not only spread awareness of what is happening; people also need to be given hope and perhaps even more importantly, a sense of agency in addressing biodiversity loss.

During my project I kept my eyes and ears open for potential sources of inspiration. And at this point, two of them came back to my mind. The first came in the form of a TED-talk, in which George Monbiot (2013) introduced the concept of *rewilding*. Rewilding refers to the idea of increasing biodiversity in areas that have become barren by giving them protection status.

The second was a recently published book written by Edward E.O. Wilson, *Half-Earth* (2016), in which the eminent biologist argues that we need to allocate half of Earth's land and sea areas protection status, in order to avoid a mass extinction, which has been predicted to wipe out two-thirds of wild animals living today by 2020 (WWF, 2016). According to his calculations this increase of inviolable natural reserves would give us a reasonable chance of saving around 80 per cent of species still alive today.

However, even though Wilson prepares his case meticulously, the main obstacle to the idea of expanding nature reserves is the lack of funding mechanisms or agreements (The Guardian, 2016), to which he proposes no solutions.

The pieces fit together well: my concept could provide the financial support that these areas need, whilst giving the participants agency in efforts to stem biodiversity loss.

SOLUTION

Although it would have been ideal for people to listen to life at a place that is important to them, it is difficult to avoid the unfortunate fact of listening to biodiversity decline. In order for people to listen to, and even more importantly, to enable them to contribute to efforts against biodiversity loss, a compromise had to be made.

I decided to reposition my concept to help build and maintain rewilding or nature reserve areas. Such locations are in an urgent need of not only financial but also social support.

This repositioning also helps address issues of maintenance, connectivity, along with the eventual retrieval of the device (in order to avoid pollution of natural areas).

An organisation needed to be devised to serve as an umbrella structure that would connect laymen interested in halting biodiversity loss to private nature reserves around the world. I decided to name the organisation providing the service Biofonia, which is the Finnish translation of the English word Biophony, which refers to the soundscape created by animals and insects.

Re-visiting design principle 4 & meeting guideline no. 4

HELP FORM PLACE ATTACHMENT + GIVE GUIDANCE FOR AN INFORMED START



Since the concept was changed in terms of location - now being limited to nature reserves instead of a place that one holds dear, the principle of place attachment had to be re-visited.

With the repositioning of the concept into a less personal nature reserve context, place attachment became harder to achieve.

Since both of the experience prototype participants chose to place their Collectors into places they did not know before-hand, they had difficulties in knowing the locations birds liked to be in. They would have liked to have advice on places that birds liked, and on places that in general were sonically interesting. Since the nature reserve would be likely to be entirely new a location for the listener, the start of the relationship with the site needed expert support.

SOLUTION

The listener is given a guided hike in the nature reserve at the very start of the service. In small groups, listeners are taken for a hike that fits their condition and wishes, spanning from a day trip to a multi-day hike. They get an introduction to the area by a naturalist and soundscape ecologist, who also introduces them to the science of soundscape ecology and its importance in research activities. The listener is also given expert advice on sonically interesting sites that align with their species preferences.

Through experiencing and learning about the park first-hand, the user ideally forms an attachment to the site, which is then reinforced by the direct connection provided by the Biophone.

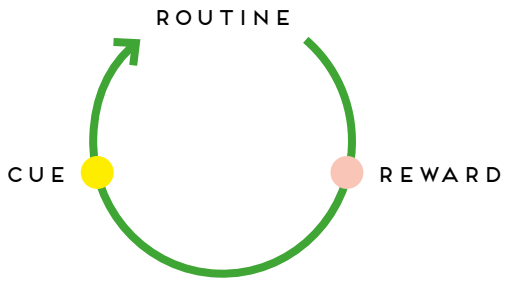
Meeting guideline no. 3

HELP ESTABLISH RITUALS TO LISTEN

Establishing a listening habit is key for the success of this concept, and should be made as easy as possible for the listener.

In the prototyping phase participants were asked to listen to the site using the Biophone prototype. However, the listening could be done only through headphones and provided no signs of the site's activity otherwise. A key insight from the experience prototype was that it is important that the Biophone reminds the listener about the activity that goes on at the site even when they are not listening.

When considering habits, and the habit loop in particular, I became interested in the role of the initial cue. Also a reward needed to be found to close the cycle.



In parallel, I was struggling with a technical problem. I was exchanging emails with technical experts at Umeå University and the Polar Research Secretariat to understand how the concept could be made into reality.

A critical problem lied in the large data weight of a constant stream from a remote area with no electricity. Since it was highly energy intensive to feed auditory data continuously to the cloud, I concluded that to reduce this, data should be sent only in bulks a limited number of times per day. However, it was also important that the person could listen to the direct stream at any time.

SOLUTION

My solution was to add light interaction on the *Biophone* that would indicate the level of sonic activity on-site.

Apart from solving the energy and data weight issue, adding light interaction helped me in my work towards shaping a two-way relationship between the site (via the Biophone) and the listener, while helping create the start of a habit loop.

While the light interaction acted as the cue, and the listening as the routine, the Mesh provided the site for the reward to take place. The listener's discoveries and interpretations are rewarded by visual confirmations of their contributions to science and rewilding efforts.

Also the way the stream connection was opened needed to be considered. After a few iterations I settled with the simple interaction of opening a lid.

It was important for the Biophone to look like a visually pleasing object that fit within the home environment. People should be able to place it in a location where they already have existing habits. The Biophone should be able to live next to those habits, whether it iss on the bedside table where it is listened to before sleeping or in the kitchen where it is listened to while having breakfast.

Meeting guideline no. 4

DESIGN AN END-OF-LIFE

Since I firmly believe that every object's design should include the design of their end, it was key that any electronic contents of the Collector would be taken care of at the end of their use.

In the initial concept, the Collector is meant to be placed at a (private) site that the person holds dear. However, this does not ensure that the Collector is retrieved at the end of its use, i.e. when the site is not being listened to anymore.

Incidentally, this design requirement aligns perfectly with the solution given to the first design requirement (*Give a sense of hope and agency*). Having the placement of the Collector limited to a nature reserve – along with park staff and an organisation that provides a service – provided a solution the problem, while at the same resolving issues of connectivity and power.

SOLUTION

The service provided by park staff makes sure the Collector is maintained during- and eventually retrieved at the end of the service subscription. The park also takes care of providing and maintaining the connectivity and power required for recording and streaming the soundscape.

At the end of the subscription the Collector is retrieved and replaced with a placate with the listener's name. The Biophone can be kept to listen to recordings made until the end of subscription, to listen to a new site, or returned in exchange for a deposit made at the start of the service.



Testing the Biophone's light interaction.

Expert feedback on final concept

TWEAKING THE COLLECTOR

Conversations with bird enthusiasts resulted in the identification of several problematics with the idea of having birds housed in the Collector:

Limited set-up locations

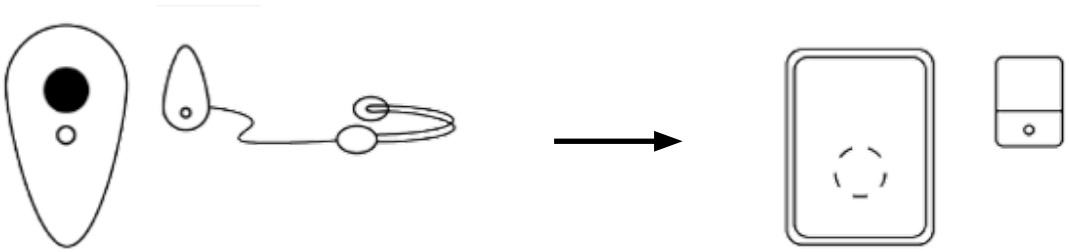
- Suitable birdhouse locations tend to be further away from predators and ground - limiting the range of species heard.
- Birds tend to fend off others from their territory - again, limiting the range of species heard.

Maintenance issues

- The birdhouse needs to be cleaned after the bird family has left, otherwise no new birds will want to lay their eggs there
- Human involvement should be limited during nesting periods - what if equipment needs maintenance or battery change?

SOLUTION

Since I wanted to create a concept that would be implementable within the near future I decided to simplify the device to an environmental monitoring device only.



SEE EXAMPLES OF FORM EXPLORATION IN APPENDIX PAGE 70

Chapter 5

The final concept

In this section I present the final concept
and what it aims to achieve.



Concept description

BIOFONIA - LISTENING TO THE INVISIBLE

Biofonia is a service and product ecosystem that connects people to unique locations within nature reserves, through which they can learn the natural cycles wildlife has. Through the act of listening, people gain an understanding of the species that inhabit the area and what their daily and seasonal cycles are. The ultimate aim, however, is to help us learn to recognise how everything, in the end, is connected.

A SENSE OF AGENCY & HOPE

In a time when biodiversity loss is one of the most pressing problems facing us, it is not only important that we become aware of it, but we also need to provide people with means to help mitigate it.

Biofonia works with entities that drive the creation of new protected areas, and acts as a bridge to citizens interested in supporting them. People contribute to the establishment of a protected area by setting up sound recording devices, Collectors, in the area. The data these sound recording devices capture is valuable to track the success of the project; soundscape data is used to identify species inhabiting the site and make estimates of overall biodiversity in the area. This information can also be used to communicate the importance of the nature reserve when applying for additional funding for its preservation and maintenance.

People also pay a small fee for the maintenance of the Collector, and thus help fund the nature reserve employees.

UNDERSTANDING BIODIVERSITY

Through our increasingly nomadic lifestyles, we are losing the sense of the natural cycles other species around us have. Moving within and between urban worlds, we are no longer aware of the species that are local to our surroundings and remain blissfully ignorant of their gradual reduction or complete demise.

Biofonia aims to help people create a connection to a single location, learn which species inhabit the space, and at which seasons of the year they tend to come and go. Through the understanding of the cycles of life within a single location, with time, we will learn to recognise when something is out of sync. What does it mean when a particular species arrives much later than usually, or perhaps, does not arrive at all? On the other hand, what does it mean when an entirely new species arrives to the area?

In order to provide a supported learning process, Biofonia connects the users to collaborating scientific communities and nature reserves around the world. An online platform, the Mesh, serves both as a learning platform and as a connection point between users, scientists, and nature reserve staff.

Concept components





Concept components

THE MESH

1. BUILDING A COMMUNITY

One of the key aspects of the service is the maintenance of a common space for the exchange of knowledge between the listeners, scientists and staff of the nature reserve. The platform contains a forum, where listeners can engage with other participants, nature area staff or scientists.

2. ENGAGING WITH SOUNDSCAPES

The online platform acts as a storage for all the audio data collected by the patron's Collector. The platform provides the listener with an easy way to access previously collected data, which can be easily copied and pasted into the community forum for recognition help and or general sharing.

3. LEARNING TO INTERPRET

One of the aims of the concept is to help listeners learn to interpret and recognise species sounds. Whilst the system automatically detects species already recognised and validated by the user, it does not provide automatic recognition of new species. This is both in order to build reliable data for scientists, and to provide the listener with a learning experience.

However, to aid recognition, the system helps the listener by making a distinction between already recognised sounds, and those yet to be identified. The platform then guides people to post audio clips on boards to get expert advise on their interpretation and eventual validation.

SEE KEY SCREENS IN APPENDIX
PAGES 74-76

THE COLLECTOR AND THE SERVICE

The Collector is an environmental monitoring device that records the surrounding soundscape in a nature reserve of the patron's choice. The patron can listen to the captured soundscape real-time either online on the Mesh or with the Biophone.

The Collector is a key element in Biofonia's service and is included in the subscription, the length of which the patron can decide. The subscription can vary between 3-5 years or more.

The patron can have the Collector delivered directly to the nature reserve that they have chosen to support. The reserve area has staff trained in soundscape ecology, who provide a guidance service for people to set up their Collectors in the reserve. At the start of the service, the patrons arrive to the reserve, where they are taken to a guided hike for the setting up of the Collector. When the patron has chosen the location the guide will make an analysis of the site for later reference. After the hike, the patrons are given an introduction to soundscape ecology and are taught how sounds are interpreted on the Mesh.

Throughout the service, the park staff give updates on the Mesh to all participants. The updates can vary from news about environmental conditions to overall biodiversity changes, new species, or seasonal updates. The staff will also answer to questions asked by patrons on the Mesh and help recognise and validate species local to the reserve.

The staff will also take care of the Collector's overall maintenance, such as change of batteries or other replacements. At the end of the patron's subscription the Collector is retrieved by the staff and replaced by a placate with the patron's name.

TECHNICAL ASPECTS

The environmental monitoring device captures the soundscape of the location with a binaural 3D microphone, which is then recorded in a SD card. All the audio data is uploaded to the cloud only once a day, to maximise battery life. The soundscape's level of gain is streamed continuously to the Biophone, translating to light (more on this on p. 50). When the patron decides to put the Biophone on (by lifting its lid), the Collector will begin streaming the real-time audio.

Content of the Collector:

- A GSM chip for remote instruments
- Data logger
- Processing unit
- SD Card
- Binaural (3D) microphone
- Wireless transmitter
- Optional sensors
- Batteries





Concept components

THE BIOPHONE

In order for the listener to establish a long-term relationship with the location that is being listened to, the patron is provided with a listening device called the Biophone.

The Biophone aims to help the listener establish a habit around listening to the site. Since it is likely that the site has longer periods of silence, the Biophone helps the person to build an awareness of heightened sonic activity, through the use of light. The light that is displayed on the biophone is a direct translation of the soundscape's real-time gain.

Since sonic activity tends take place around the same times every day, depending on the season, the light aims to reinforce the building of an understanding of daily and seasonal biophony* variation.

The Biophone's other key role is to support long-term monitoring by providing a physical memorabilia of the site and quick access to the soundscape of the location.

By pressing the button on the Biophone the streamed audio data can be marked for later reference on the Mesh. This allows them to more easily locate the exact sound clip at a later time.

* Biophony - the totality of sounds produced by animals and insects at a given location.



User journey

ONLINE

I. SUBSCRIPTION TO SERVICE



1. Selection of:
   - Nature reserve and length of subscription
   - Collector type and additional sensors
   - Soundscape hike type
2. Submitting order

A thank you letter and information about *Soundscape and Collector set up* hike.

3. Choosing best hiking time from options provided by nature reserve.

Collector is received at home or directly at the reserve according to preferences.

NATURE RESERVE

II. GETTING INTO ACTION



1. Arrival at nature reserve.
2. Meeting with guide and group for *Soundscape and Collector set up*- hike.

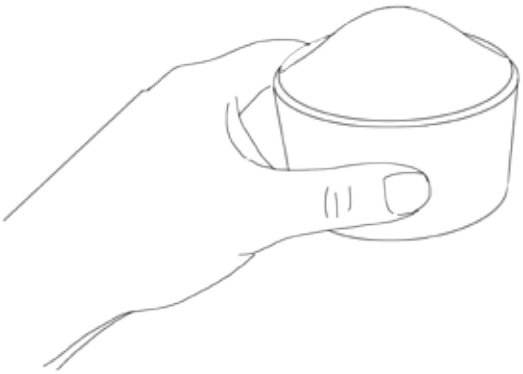
HIKE

- Learning about the nature reserve from the guide.
- Choosing a location for the Collector based on sonic preferences.
- Learning about site from guide while an ecological assessment of the area is made.

3. Learning how to use the Mesh to interpret soundscapes with the guide and the group.

III. DAILY USAGE: LISTENING AND INTERPRETING

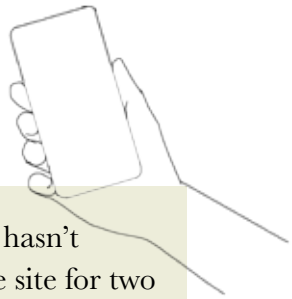
Biophone arrives by mail.



1. Listening to soundscape with the Biophone.
2. Marking sounds for later reference on the Mesh.
3. Using the Mesh to

- Recognise sounds.
- Collect a personal library of sounds.
- Ask help from scientists, nature reserve workers and other listeners to recognise species.
- Request validation of species recognition from scientists and nature reserve workers.

IV. CALLS & NOTIFICATIONS



When Collector malfunctioning occurs or battery is ending listener will be notified that park rangers will fix the problem.

If cleaning is needed, the listener is notified after park rangers have cleaned the Collector.

If the person hasn't listened to the site for two weeks the Collector will call him during a moment of heightened activity.

V. END OF SUBSCRIPTION

The Collector is retrieved from the site by park staff. A placate with the listener's name is left on the tree to honor their contribution.

The listener is thanked for their participation with a thank you letter including an analysis of the overall biodiversity variation at the site.

1. The listener has access to all audio data captured thus far, which can be played with biophone according to own preferences.
2. The same biophone can be used to follow and support a new location.

SEE FULL SERVICE BLUEPRINT IN THE END OF THE APPENDIX.

Exhibition

The concept was presented and exhibited at UID Talks '16. The exhibition stand included the physical models of the Biophone and the Collector, along with a poster and a video describing the service.

The Biophone showed the light interaction and played recorded nature soundscape when the lid was lifted. Unfortunately, due to technical difficulties these functionalities failed to last throughout the exhibition.

The item that attracted most attention was the Biophone. Many of the viewers felt drawn to the idea of having a direct connection to nature, which they could access with a single lifting of the glass lid. The simplicity of interaction with the Biophone was one of the key attractions of the device, which ended up taking a central role in communicating the concept.

The idea of listening to a single location resonated well with people, although many exhibition visitors wished they could listen to a place that is already known to them (as presented in the initial concept). Overall people were attracted to the idea of paying more attention to listening, as opposed to relying only on visual scenery.



Reflection

THE SCOPE AND GOAL

The reason that initially drove me to study design, was the possibility of shaping human behaviours to more mutualistic ones with the biophysical environment that they take place in.

The project started with the goal of influencing city dwellers' value system. One quickly realises that this task is not only a very ambitious one, but also a very abstract one. The core problem with focusing on value change alone is that its success is very difficult to measure. How will I ever know if people have truly started giving nature more value? Secondly, even if people's value system has changed, does it matter if they keep doing things as they did previously? Having the target of creating a concept that is **ready to be implemented** to an existing context held an important role in helping me rethink an appropriate end goal. When stakeholders —albeit fictional— were added to the equation, the importance of having a measurable outcome became clear.

In the final concept, the measurable outcome is the following: the impact users have in helping create and sustain nature protection areas is evident both in financial terms (money to support nature reserve) and by the amount of raw and interpreted data (which is used to validate success of the reserve and apply for more funding).

Since the importance of such a measurable goal was something that I realised only later in the project, I was lucky to have carried out secondary research in parallel to user research. I had exposed myself to a number of seemingly disparate ideas, which then could be connected together in previously unthought ways, which ended up providing value in unison. This made me realise the importance of not developing tunnel vision for the perceived core problem, and instead, keep exploring neighbouring topics that might initially seem distant to the task at hand.

Perhaps, after all, creativity is the ability to connect elements that have never before been combined in ways that provide value.

THE CONCEPT

One of my core goals has been to create a concpet that could be materialised in the near future. From a technological perspective, the vision is not far-fetched. The Biofonia ecosystem as it is, could be implemented in the near future. What remains to be explored further is the differences that remain between different land areas with varying degrees of protection status, and their potential ownership or use for an entity such as the fictional Biofonia organisation.

Although conceptual work holds a key role — by showing what could be — in pushing technology further, few entities can afford to invest in expensive solutions. Many of the most pressing problems facing us require us to act now, and we may not afford the time nor have the money to meet the needs more conceptual solutions require. Instead, we must come up with solutions that are feasible with the tools that we have today.

Although I am a proponent of improving existing technology and developing wholly new technologies, I believe that much can be done by rethinking the applications of the technologies that we already have in our use.

THE DESIGNER'S ROLE

The jump from humanities to interaction design has proven to be a much bigger leap than expected. In humanities, or academia in general, we are trained to justify our arguments strictly on peer-reviewed opinions and results. Rationality and objectivity are key. However, in design, many decisions have to be made without similar supported justifications.

When one is producing something new, it is hard to justify every single decision with well-researched arguments. This lead to problems in knowing the appropriate amounts of critique I should administer on my own design choices. I realised that in design, the true impact of the work will be only based on speculation. Even with rigorous user research, it is hard to predict the effect the design has until the it reaches its intended audience and context. And since the audience and context are organic, which not only change continuously but also shape the design solution itself, it is impossible to have a true understanding of its eventual impact.

In design, we often find ourselves in unchartered waters, exploring the new and unknown, where no right answers exist. We find ourselves having to make decisions that we can base only on our personal observations and subjective interpretations. We can produce something that best matches our observations and interpretations of the context and users, but we should not think that our work stops there.

Perhaps, our role is to create skeletons of concepts that people can appropriate in their own ways to their lives. We should accept that every person will use our products in different ways, in their unique contexts. And we should design for such openness.

Acknowledgement

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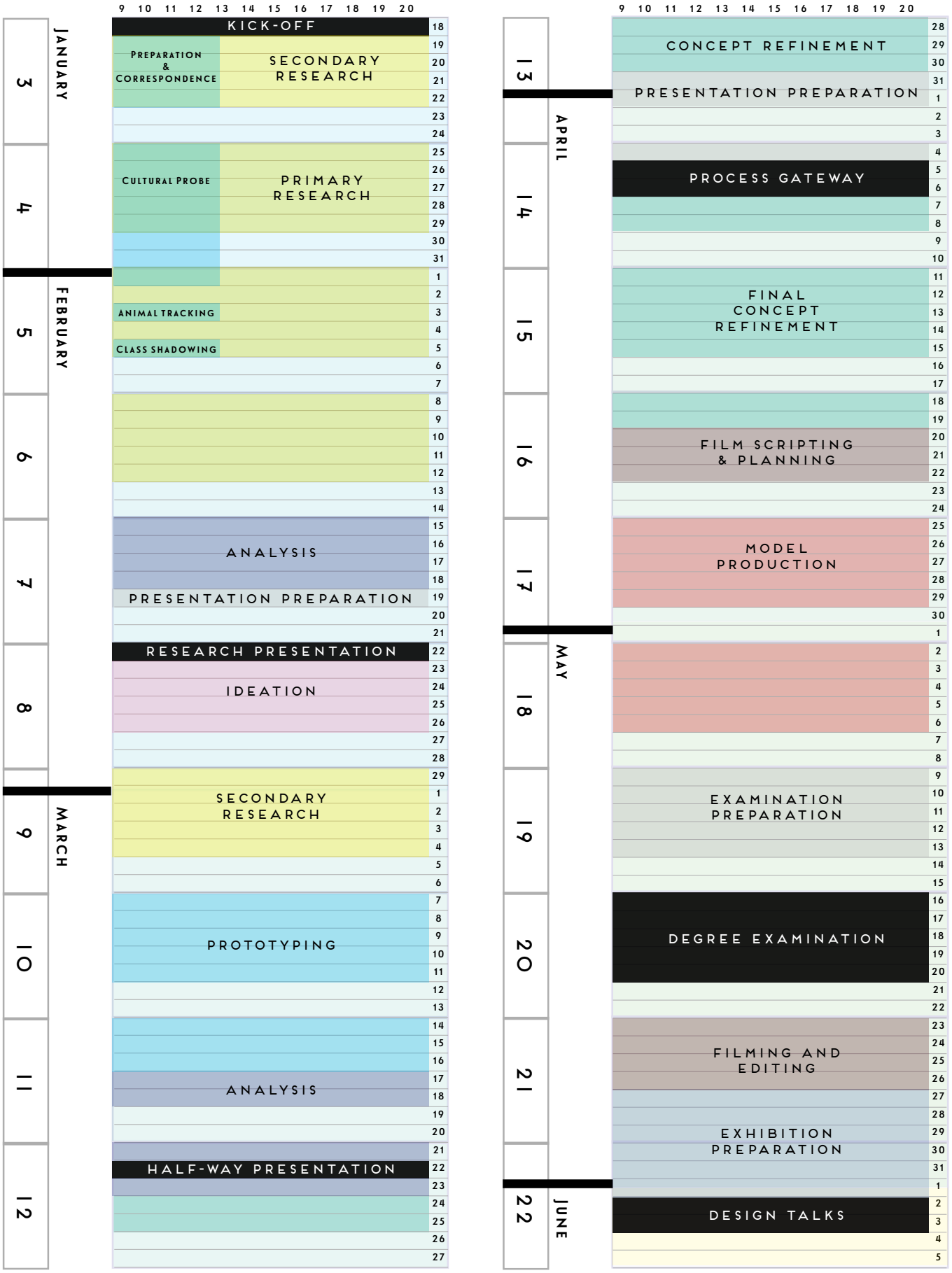
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6. Appendix

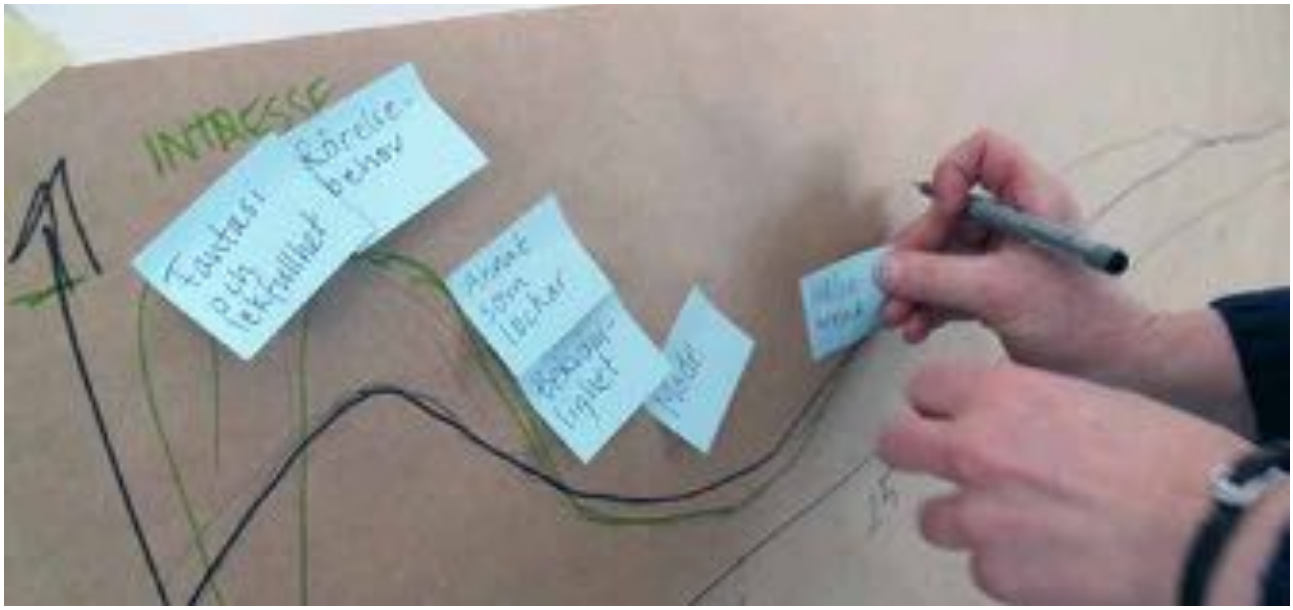
Timeplan


9 10 11 12 13 14 15 16 17 18 19 20
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
3
4
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21
22
KICK-OFF
PREPARATION & CORRESPONDENCE
SECONDARY RESEARCH
CULTURAL PROBE
PRIMARY RESEARCH
ANIMAL TRACKING
CLASS SHADOWING
ANALYSIS
PRESENTATION PREPARATION
RESEARCH PRESENTATION
IDEATION
SECONDARY RESEARCH
PROTOTYPING
ANALYSIS
HALF-WAY PRESENTATION
CONCEPT REFINEMENT
PRESENTATION PREPARATION
PROCESS GATEWAY
FINAL CONCEPT REFINEMENT
FILM SCRIPTING & PLANNING
MODEL PRODUCTION
EXAMINATION PREPARATION
DEGREE EXAMINATION
FILMING AND EDITING
EXHIBITION PREPARATION
DESIGN TALKS

Expert research activity

Qualitative research methods

INTEREST IN NATURE - TIMELINE



The results of the mapping exercise that aimed to help me make an informed decision on which age group to focus on, proved to be very consistent throughout all expert interviews. All interviewees that took part in the mapping exercise - all of which had different teaching experiences - drew a very similar curve. The amount of time spent outdoors had a strong correlation with overall interest towards nature throughout all age groups.

According to the experts' experience, by far the highest interest towards nature was displayed in childhood, before the teenage years, the peak period being between the years 3-5. Interest tends to drop to its minimum at the dawn of teenage years, after which it never really tends to revive to its childhood levels. Interest tends to increase with age again, but only moderately. It must be noted, however, that the estimates based mostly on class room observations, which means that the curve is a generalised image, which ignores potential individual changes throughout life.

The reasons as to why children display such high interest towards nature at a young age could be many, according to the experts. Most believed it was closely coupled with the fact that children tend to be curious about everything. Teenage years, however bring new, more social interests in the game, overtaking most of their attention. This interest is never really revived to similar heights again, due to other interests, priorities and obligations people assume at adulthood. Interest can be regained through hobbies or when people gain more free time.

Based on this, I decided to focus on people between the ages of 25-35 since they are at an age where family planning is becoming a relevant issue.

User insight

Research analysis

LEARNING STRATEGIES

Through interviews both with experts and other interviewees the following learning strategies emerged to be not only the most successful ones on their own, but also acted often well in combination with each other.

Step 1

Let me observe you

Observation is often the first step for people in getting acquainted with a new area or topic. For most connectors or topic experts their first contact in learning about the biophysical world were their parents, and watching what they did. Fewer, though some, learnt by observing on their own.

Step 2

Give me an activity

People that had grown up in rural areas had picked up a habit of spending time outdoors engaged in an activity. This area is a spectrum between the previously mentioned nature as a space to explore and nature as a space for outdoor activities. These activities ranged from bird watching to plant pressing and hiking.

Step 3

Don't give me the answer

Through independent explorations people would impose themselves to experiences that required them to hypothesise, test and learn from experiences.

Step 3

Let me explore on my own

It was important for people to establish independent habits outdoors early in life, in order to build self-confidence and independence. Through independent explorations people would impose themselves experiences that require them to hypothesise test and learn from experiences.

User insight

Research analysis

PERSPECTIVES ON NATURE AS A SPACE

Based on the interviews carried out, both with experts and users, I formulated the following broader categories to describe people's relationships and views of nature.

1. NATURE AS A SPACE FOR ACTIVITIES

Through interviews it emerged that some people, mostly through hobbies and a general interest towards sports, viewed nature as a space for activities. Two differing perspectives were identified within the category: while one group viewed nature more as a background for activities - which was usually sports or some other activity - another group viewed nature as a space for activities as an extension to their overall interest in spending time in nature. The activity acted more as a pretext for being outdoors, whereas for the first group, the activity was the main driver, which happened to take place outdoors.

2. NATURE AS A SPACE FOR REFLECTION ("ME-TIME")

People that had spent considerable time outdoors as children had developed habits of spending time in nature for personal reflection. Many of them had particular locations or routes that they would go to for contemplation, usually on their own. Most people that had grown up in urban environments had not established such habits.

3. NATURE AS A SPACE TO EXPLORE

Interviewees that had grown up in rural areas or had otherwise spent considerable amounts of time outdoors were more likely to regard nature as a space to explore. However, none of the user study participants had engaged in activities that they regarded as 'exploring nature' during the past few years (on average for more than three years).'

Also an online questionnaire was sent to a number of participants where they were asked to select which of the three ways of viewing nature they identified the most with: 1. nature as a space 1. for activities, 2. for reflection, 3. to explore). Although more than half of the participants identified best with 'nature as a space to explore', none of them had engaged with such activities on a regular basis. This rather reflected their ideals, though in reality all the experiences of exploring nature were memories that had taken place in their childhood only. Out of all the interviewees only those that worked with nature ("nature experts/the connectors") still explored nature for its own sake.

Opportunity areas

Perspective

NATURE AS A SPACE TO EXPLORE

How might we help people see new dimensions in nature?

How could we make it easier for people to see the connections in nature?

Theme

AN UNCOMFORTABLE WORLD

How could we better prepare people to spend time in the outdoors?

How could we lower people's threshold of stepping outside?

Theme

CONSUMERIST EXPECTATIONS

We are becoming increasingly media saturated and this is also changing the first-hand experiences we have with the world. How could we make these first-hand experiences more engaging and interesting for a finicky new audience?

INVISIBLE ANIMAL KINGDOM

How could invisible (animal) nature be made more engaging and interesting for people?

How could technology be used in a non-disruptive manner to make nature more engaging and interesting for people?

INANIMATE WORLD OF PLANTS AND ROCKS

How could inert (vegetative and geological) nature be made more engaging and interesting for people?

How could we use technology to help people understand plants in a new way?

Key comments

Why we don't spend time in nature

- *Non-expert interviewee*
- *Expert interviewee*

LACK OF TIME

I know it helps, but the idea of going out in the middle of a weekday seems...If I go out for two hours it feels like a waste of time.

The three main things sthat are stopping me from going to nature? Time, time, and time. Just time. Just obligation for something else. When I go out now, it's because of obligation. Time has become a constraint.

CONSUMERIST EXPECTATIONS

We're used to getting nature served to us. If you go in nature, you don't often see, like in film. So e.g. we went out to hike and the kids were disappointed of not seeing any big animals. People have very high expectations nowadays.

Plants are a bit tougher, especially if they're not very colourful and pretty. And geology is hard to make interesting. It's just rocks. It's interesting but it's hard to make it interesting.

At least birds move and they have personality as opposed to trees and rocks where you're like "I can be wowed by the majesty of the landscape like this this canyon was carved over the course of a million years" but once that spectacle's gone you like it's a big hole in the ground and it's not going anywhere! But yeah moving stuff, as simple as that.

If you're outside and you're looking at trees I mean they're cool and all but they're not really doing very much.

I wanted to see a herd of reindeer. I wanted to see them milling around and we never did. I mean, it wasn't Jurassic Park, they're not just gonna be walking through but I just really wanted to see one, you know.

UNCOMFORTABLE WORLD

It's always the wrong moment to go out... two hours when we're ready to go out, it starts raining.

So many people much feel uncomfortable going to the nature if you've never been there before. It must be frightening.

When you get older, you're like "it's cold and dark and I wanna go home."

You'd be surprised how many biology students don't know how to dress up for going out on the field.

Co-creation workshop

Method

WORKSHOP QUESTIONS

Program

0. Topic introduction

1. Select persona

2. Individual ideation around the broader theme

3. Ideation in groups of 2-3

4. Present group concept

How could we help people become better aware of the sixth extinction and that it takes place also in their local natural areas? Biodiversity is in a steep decline. Scientists around the world are currently monitoring the sixth extinction, predicted to be the most devastating extinction event since the asteroid impact that wiped out the dinosaurs. This time around, the cataclysm is us.

How might we use stories to help people see new dimensions in nature? Because of their knowledge experts look at the natural environment with different eyes. The more one learns about the topic in hand, the more questions arise, and the deeper their interest and curiosity towards it gets.

How might we help people realise that there is still much that is not known in the natural world? How could we help people understand what is known and what is not? Could we encourage people to contribute to science by discovering natural elements?

Discuss

How might help people reconnect with the natural world through its sounds?
Go through the ideas you've generated with your group and pick an idea to build up on. Use the timeline given to build a concept. Time: 20 minutes

How could we begin to capture our moments with nature for future memories?
What if we began to capture moments, not only visual ones, but auditory ones to remember times that have passed. How would we access these memories? Implement this into your concept. Time: 1 min 30 seconds x 3

Method

PERSONAS

I developed personas based on my interviewees to use as a basis for the ideation, and small groups were formed around each of the four conglomerate fictional characters.



MARK 34

A father without answers

Mark is the father of three-year-old Cathy. He grew up in a big city and has never considered himself a "nature-person." However, he would like his daughter to have a closer relationship with nature than he ever had. But he is finding it hard to answer the many questions she has about anything related to the natural world. It is always tempting to just reach out to the phone and google for the answer. But it somehow takes the magic of it all away.



FIONA 25

"Real nature just sits there"

Fiona grew up with National Geographic magazines and David Attenborough. She loved learning about new discoveries in science, about the strange plants found in different parts of the world, and curious creatures that most of us will never see in real life. She still loves going to the Natural History museum, especially to see creatures such as the magnificent whales which now hang above her during her visits. Real nature, however, is a bit boring. It doesn't do much. Animals are always hiding, while plants and rocks, well, they just sit there and do nothing, quite frankly.



MATILDA 30

The professional that lost her roots

Matilda is a successful financial analyst working in London. Although she is satisfied with the professional success she has reached at this point, the stress is beginning to wear her out.

She grew up in a small village in northern Sweden, where she spent much of her free time outdoors, hiking and birdwatching with her family. It's more than just a few years since she last went birdwatching. But she doesn't really know anyone that hikes or does birdwatching in London. Still following the careerpath she's been on for years, she keeps prioritising work over a plain walk outside.



LINDA 26

The girl that was never connected

Linda grew up in a big city and spent most of her free time practising indoor hobbies, taekwondo and piano. In her teens she became interested in snowboarding and cycling, which had her spending much more time outdoors. Now in her mid-twenties, she spends some time with her hobbies outdoors, but she has little inside in nature itself, it acts more as a background for activities.

Initial concepts

Concept 3

COMMUNITY LISTENING

The third concept is based on more communal, shared sound collection sites. These microphones could be set in biophonically interesting areas for example by the municipality. People could also leave their stories in the site, and listen to those of others. People could listen to the sites from home from a web platform or an app.



Concept 4

SOUND TAGS

The last concept is a more ephemeral one. Sound tags could be attached in different locations to build an understanding of soundscapes at different areas. They would be more short-term, from a week to a couple of months at most, compared to the birdhouses that are supposed to be left there for years.



Experience prototype: insights

Concept 2

NATURE CALLING

ADMITTING DEFEAT?

One of the interviewees felt that this device acted as a representation of having become fully urban.

Am I lacking it [nature] so bad that I have to listen to it like this? It made me almost feel like I was lacking it. If you find this product, it means you've gone to find it. It means you've accepted that you're lacking. It's like two steps: first you admit that you're lacking it, second you do something about it. Maybe it takes more effort to get one of these that just going into nature.

But, it makes sense for a place where I don't go often, a place that's far away, a place that I want to remember. Maybe a place that you'll see only once.

He then draws a parallel to National Parks:

You tend to take something. Like a rock. Maybe it's stealing. But then it's like a door to that place.

ON ALERTS AND NOTIFICATIONS

Maybe you could receive an alert when something juicy is happening? When something is going on you don't have time to postpone, it's now or never. So you have to be there or you'll miss it.

Maybe I could receive a call from nature? This could be when I wake up, and when I'm going to bed. Maybe I can even receive a text message from the bird? It would help to have a relationship. So it's not just one-way.

THE BIOPHONE

The wooden "sound box" that represented the biophone worked well as a connector to the location of the birdhouse.

When I would pick up the box, I would be thinking about this place, before listening to it.

However, after realising that the sounds weren't actually from the place the feeling would quickly disappear. *I couldn't make myself think that it was the same place. Maybe because I know those sounds a bit too much, I couldn't trick myself. I couldn't pretend.*

PICKING THE PLACE AND SETTING UP THE BIRDHOUSE YOURSELF

It seemed important for the people to pick the location and install the birdhouse themselves. *I think it's really important how you go to this place. This is where you create the memory, the connection, the feeling. This is the right moment.*

This interviewee did not have a previous connection to the location. He emphasised that the entire experience, both before and after it made up the memory. Even though setting up the birdhouse was only one point in the overall experience, the sound box became to represent the entire experience.

[It's] like a postcard to it. I've got this access to it now all the time. It would always be like this day when I remember it.

LISTENING

Since the location of the birdhouse was quiet when it was set up, the interviewee expected similar silence from the box. *I thought I would have to make an effort, to zoom with my ear to get a clue of what I was hearing. This would push me to want to learn about it.*

This comment made me think about the differences between listening to a curated and polished nature sounds such as those found on youtube or noisli, and between real, often silent soundscapes. Would the person have the patience to wait for something to happen? Would they leave the sounds on the background to see if something was happening? Should they be notified when something was happening? Or would this merely take away the much needed exercise we need for our long lost patience? Could the absence of 'helping' notifications train us to slow down and listen to silence?

"I listen because I want to cut myself from the world. Maybe you listen to it because you're tired, bored, or you're just curious about something."

"Then I thought I'd start to listen at different hours, to understand it at different times of the day."

LEARNING ABOUT WHAT IS HEARD

The two participants were divided on the learning aspect; whilst one was open to it, the other saw it killing the emotional aspect of it.

It would be a good thing for children or something. If I had this option, I don't know if I'd use it, if it would de-valuate the idea. For me the essence is the dream or memory behind it.

BANK OF SOUNDS

"It would be nice to create a bank of sounds. It could also be used in research. But I don't feel that this should be the primary objective. Only when you're ready, you go for it. I don't know if I would buy it with this thing in my mind. Because it means that I start with a pessimist approach. And I think it's a really beautiful and poetic thing."

TECHNICAL DIFFICULTIES

CONNECTIVITY AND POWERING

At the moment cell phone coverage (3G or 4G mobile internet) exists to varying extents in nature conservation areas. Locations where the monitoring device is placed could be limited to these areas. The major problem that remains, however, is powering the connected device. In my initial concept data was streamed continuously, whether the person was listening to it or not. However this would be very energy intensive. Existing soundscape monitoring devices send data via wireless networks only around once a week, allowing the batteries to last for years.

I resolved to tweak the idea of streaming data continuously, to streaming only the amount of amplitude to the biophone. With only the gain of the soundscape transmitted, the listener would have a visual alert of heightened activity, and could then choose to listen in, opening the heavier data stream. A logger can be programmed to upload the full auditory data once a day or once a week, depending on the bandwidth available.

WEATHERPROOFING AND MAINTENANCE

Since it was crucial for my concept that the listener could follow a single location for an extended period of time, five years at least, I needed to find out if how long environmental monitoring devices lasted in the field. Following an email exchange with research engineers at the Swedish Polar Research Secretariat and Abisko National Park it became clear that a five-year or more years out in the field should not be an issue. Depending on the material and set-up, such a device can last for five years or more, with only a single change of batteries and a few field visits.

Form development

The Collector

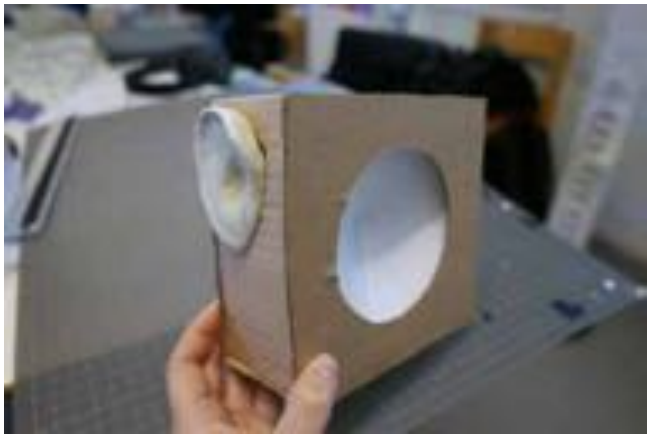
CARDBOARD MOCKUPS







Since the birdhouse idea was discarded the form needed to be revised accordingly.



UI development

The Mesh

USER TESTING WITH WIREFRAMES

I created wireframes of the Mesh, which were tested with users by a paper prototype. The goal of the test was to validate the design direction, along with core functionalities and flow of the website.





Final form

The Biophone



Final form

The Collector



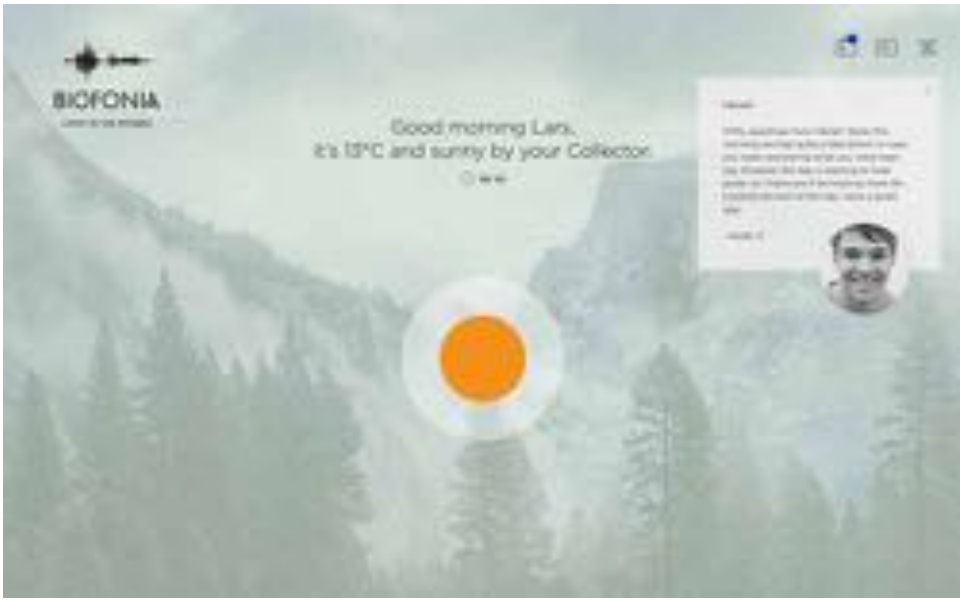
Final screens

The Mesh

LANDING PAGE

The user is greeted by a message from a park keeper with news form the site.

The direct sound stream is opened by clicking the orange circle.

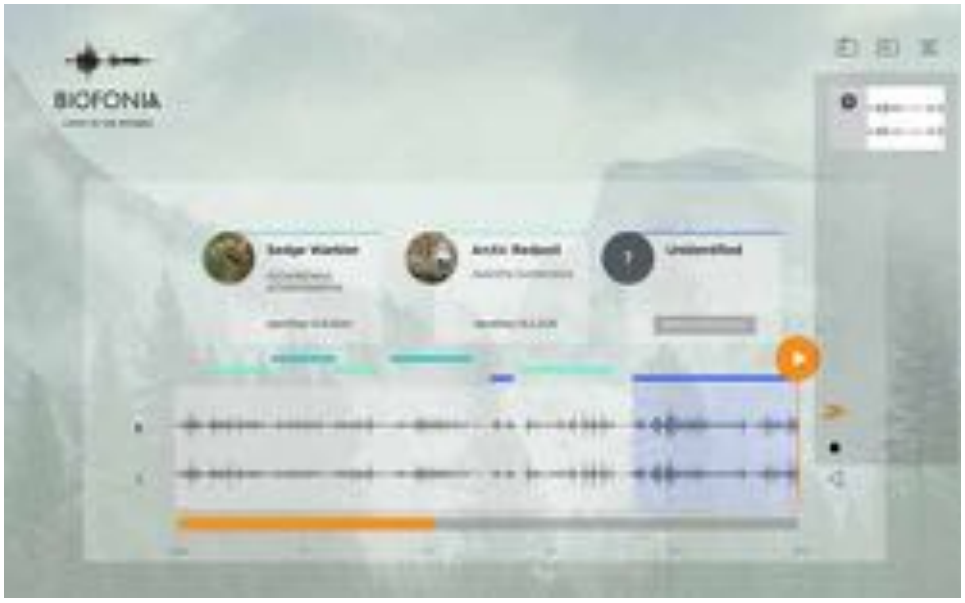


AUTO-RECOGNITION

The Mesh reads the sound stream and detects all previously recognised species.

The user needs to personally recognise each species before the system adopts them to auto-recognition.





SAVING CLIPS

The user can re-listen and save parts of the soundscape in their sound library for recognition.

The colour above the sound marks the presence of different species.



FORUM

The Mesh gives access to both to the chosen nature reserve and global discussion boards, where listeners can exchange information with scientists and park staff.



EXPERT ADVICE AND VALIDATION

The user can post their unidentified species sound clip on the relevant board where experts give advice and validate identifications.

OWN POSTS

The user's own posts are marked with a different colour.



REQUEST FOR IDENTIFICATION HELP

All the sound clips are tagged with location data, which helps experts in helping identify the species.



GETTING THE BIGGER PICTURE

The user can see also other sites where the same species has been heard within the park.



BIOFONIA

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