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What motivates nature volunteers and how is the nature status on the areas they manage?

- A case study of Danish grazing organizations and open natural habitats

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Preface

This project came to life, in connection with the completion of my master thesis in biology (ecology) from the University of Copenhagen and a personal interest in behaviour and biological diversity. As human impact on nature expand and biodiversity decline, we need to find viable action making coexistence possible. I constructed an interdisciplinary study, concerned around vegetation status of open natural habitats and the motivation among nature volunteers. It is my hope to clarify motivation among people volunteering for nature and if possible connect it to the status of the areas they manage.

I would like to extend my greatest gratitude to members of Arrenaes grazing organization, Bondemosens grazing organization, Copenhagen grazing organization Dalbyhoj grazing organization, Furesoe grazing organization, Hjortespring nature conservation association, Hojmosen grazing organization, Jyllinge Holme sheep association, Kasted fen grazing and conservation organization, Kelleris grazing organization, Kodriverne, Konusserne, Munksoegaard grazing organization, Nivaa sheep breeding association, Petersminde grazing organization, Saerlose grassland forest boar and grazing organization, Slaglunde grazing organization, Slotsmosens grazing organization, Soellerod nature conservation- & grazing organization, Sondermarkens grazing organization, Soroe grazing organization, Svogerslev grazing organization, Taarnby conservation organization, The grazing organization of Avedoere salt meadow and Utterlev grazing organization participating in this project, without you this could not have been done. Thank you, for your enthusiasm toward the project, for information about your organizations, for transportation to Little island (Lilleø), for distribution and answers to the questionnaire and for answering all my additional questions.

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Abstract

Denmark has many open natural habitats, previously used as grazing patches for livestock. Many of the 40,000-50,000 species (Hvor mange arter findes i Danmark? 2018) in Denmark are connected to these habitats. Habitats which are in decline, resulting in approx. 20 % of the Danish species pool being threatened (2018) (Petersen et al. 2012). Grazing can maintain structure and composition within open natural habitats, which is essential for a variety of plants and animals.

Open natural habitats are especially threatened by fertilization, changes in management schemes and drainage. In Denmark, the management of open natural habitats is usually performed by the municipalities. Even though natural open habitats are heavily protected by law compared to e.g. forest habitats, it is still expensive to maintain biological quality in these habitats. In 2012, The Economic Councils (De økonomiske råd) estimated that a concrete effort for biodiversity in the open natural habitats would cost about 730 million DDK[1] (98 million EURO). Environmental stewardships and stewards have not received suitable attention in the battle against loss of biodiversity and natural habitats. In this project, the aim was to find what motivates volunteers in grazing organizations to contribute to nature, access the nature on the areas they manage and if possible to find a connection between their motivation and the status or potential of the nature they manage?

Notable differences in biological status were found at the organizations' areas at summer (May/June) and fall (September). About 2-3 organizations had good quality nature at their areas. Cattle-grazed areas had the best biological status (nature conservation status index) and diversity status (species index), and the diversity status significantly decreased as the registered species nitrogen preference increased. The members of the grazing organizations were motivated by five main factors; Social, Personal benefit, Nature value, Identification, and Instrumental. All equally important to the members, however, the social and nature value factor seemed most prominent among members managing areas with higher quality nature.

[1] The actions in open nature habitats include management of existing nature, increase of nature areas and reduction of nitrogen impact.

Resume

I Danmark er der meget lysåben natur, tidligere brugt som græsgange for husdyr. Mange af de 40.000-50.000 arter i Danmark er knyttet til lysåben natur. Omkring 20 % af den danske artspulje er truet i dag (2018) (Petersen et al. 2012), grundet tilbagegang i de lysåbne naturtyper. Græsning holder disse habitater åbne, vigtig for mange planter og dyr.

Den lysåbne natur er truet af omlægning i landbruget, tilførsel af næringsstoffer og dræning. Størstedelen af naturplejen i Danmark bliver udført af kommunerne og selvom de lysåbne habitater er omfattet af Naturbeskyttelsesloven, og generelt mere beskyttet end skov, er det stadig dyrt at vedligeholde disse habitater. I 2012 estimerede De økonomiske råd at en konkret indsats for biodiversiteten ville koste omkring 730 mio. DDK[2] (98 million EURO). Frivillige i naturen, har ikke modtaget meget opmærksomhed i kampen mod tab af biodiversitet og naturlige levesteder. Formålet med dette projekt var at vurdere den biologiske status hos 25 danske kogræsserforeninger og undersøge, hvad der motiverer deres medlemmer og, hvis muligt, finde en sammenhæng mellem medlemmernes motivation og status på de områder de plejer.

Efter to dataindsamlinger på foreningernes områder var der målbar forskel mellem sommer (maj/juni) og efterår (september). På deres samlede områder og ikke kun individuelle folde, havde 10% svarede til 2-3 foreninger god naturkvalitet. Kvæggræssede områder havde den højeste biologiske status (naturbeskyttelsesstatusindeks) og diversitetsstatus (artsindeks), og diversitetsstatus faldt signifikant, når planters nitrogen præference steg. Medlemmerne blev motiveret af fem hovedfaktorer; Social, Personlig fordel, Naturværdi, Identifikation og Instrumental. Alle lige vigtige for medlemmernes arrangement, mens social og naturværdi motiver syntes at være mest fremtrædende blandt medlemmer, der forvaltede områder med bedre naturværdi.

[2] Handlingen i de åbne naturtyper omfattede forvaltning af eksisterende natur, forøgelse af naturområder og reduktion af kvælstof.

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1 Introduction

The focus in nature management has always been on what humans can gain from nature or what nature can gain from human efforts. In Denmark, authorities, politicians and NGO's have been working hard to increase, the interest and support for voluntary work, some of this effort may have had a spillover effect on nature volunteering.

Volunteering is a global phenomenon and can be found all around the world (Grönlund 2011). The information on volunteering is still growing enormously. Research still mainly focus on motivation among volunteers within the social sector, or across sectors, on how managers get more volunteers involved in their organization or project (Dolnicar and Randle 2007). The interest of environmental volunteering is increasing, partly due to growing community concern and awareness of climate change, loss of natural habitats and biodiversity (Kragh 2016).

Denmark got its first Nature Conservation Law in 1917. Striving for better integration of nature management and nature protection it was replaced by the Nature Protection Law in 1992, combining the Nature Protection Law and the Nature Management law (Hjortsø, Busck, and Fabricius 2006). Denmark also joined the Convention on Biological Diversity (CBD), in 1992. CBD's milestone-concern, was to completely stop the decline of nature and diversity by 2020 (Petersen et al. 2012).

Species decline, and extinction continues despite endless efforts from governmental and non-governmental organizations. This results in approx. 20 % of the Danish species pool is threatened today (2018) (Petersen et al. 2012).

Many of the 40,000-50,000 species in Denmark (Hvor mange arter findes i Danmark? 2018) are connected to forest and open natural habitats, why they are crucial in conservation of the Danish diversity. The Danish forests are not as well protected as the open natural habitats. A suggestion to biodiversity forest was released by the University of Aahus, in spring (2018). Despite comprehensive protection, efforts are still needed to slow down the decline of species attached to open natural habitats. The effort in the open natural habitats are estimated to be much less cost effective compared to forest habitats (Petersen et al. 2012). The open natural habitats are threatened by modern agriculture and general cultivation of land. This creates uniform habitats, dominated by large herbs and nutrient-loving species. Poor diversity in the plant community reflects in the fauna community, adding to the loss of biodiversity. Open habitats need recurrent disturbances not to convert into forest or become dominated by large herbs. Grazing animals can help maintain open natural habitat, but grazing livestock is not cost efficient for farmers anymore. The management of open natural habitats is

usually performed by the municipalities, funded by the state in Denmark, making prioritizing the funds crucial, why any areas are insufficiently managed or unmanaged.

Environmental stewardship and stewards have not yet received suitable attention in the battle against loss of biodiversity and natural habitats. Understanding the complexity of the human-nature relationship and the motivation among people volunteering for nature, may contribute extra resources to the protection of nature and stop the decline of biodiversity.

In Denmark 39 % of the population volunteer (Wilson 2000). It is no longer only unions or organizations involving volunteers, but also stewardships initiated by enthusiasts on a local scale. This means more responsibility but also more freedom for the volunteers, as they plan and execute the activities. This slight change can contribute to creating a community-effect, locally resulting in more visible and concrete nature management (Hjortsø et al. 2006).

Defining motivational drive and framework for volunteering within nature protection, conservation and management can help us understand what factors may lead to success and failures. The most prominent stewardships within nature management and conservation in Denmark, are grazing organizations (kogræsserforeninger) and haymaking associations (høsletforeninger), already active players in the conservational efforts to stop biodiversity decline in natural open habitats.

The aim of this project, was to find what motivates volunteers in grazing organizations to contribute to nature, access the nature on the areas they manage and if possible to find a connection between their motivation and the status or potential of the nature they manage.

2 Project boundaries and research questions

The non-governmental organizations and associations are on a march. They occupy niches as practical nature managers, on their own or others' areas, often with the help of volunteers (Hjortsø et al. 2006). This project will focus on voluntary grazing organizations, and the open natural habitats grassland, meadow, salt meadow and fen they manage. Why nature was defined in a narrow perspective, not involving, parks, agricultural fields or football fields.

Grazing organizations seem to be a Danish solution to the management of small nature areas (Wolf et al. 2005). Since the first grazing organization was established in the 1980's, the members have contributed to nature management. This project will only be concerned with grazing as nature management, trying to estimate status of the management at grazing organization mainly located on

Zealand[3]. Grazing organizations are voluntary organizations without agricultural interests, where voluntary members look after domestic grazers (Denmarks naturfredningsforening 2006). The Danish Society for Nature Conservation (Start et kogræsserlaug 2017) described this group, as people with a common interest in nature or *the meats way from field to dinner table*. Leaving the members with one of two motivations 1) a need to protect and manage nature or 2) an interest in animal welfare and a good piece of meat.

To evaluate the status of the open natural habitats, involved in this project, following questions were addressed.

- How does nature differ on the different investigated sites?
- How do the areas' properties affect the species (composition)and state of nature?
- Is the plant community affected by grazing?
- What kind of nature potential do the investigated sites hold?

Understanding motivation for people engaged in nature volunteering is important. Why this project was concerned with the people already involved, trying to understand their motivation and resources. To access the motivation the following questions were addressed.

- What kind of people volunteer for nature?
- What motivates people to volunteer for nature?
- How do the participants differ regarding motivation and attitude?
- Is this group of volunteers interested in a stewardship union?

The three first questions were addressed, to describe and understand the volunteers included in this project. The last question was investigated based on the information, that grazing organizations originally were meant to have e direct link to the Danish Society of Nature Conservation (DN), and therefore be part of a more union-like design.

The boundaries in this project did that the results obtained, apply within a limited geographical range, only for grazing organization and only for people already members. Why various aspect of nature volunteering was not addressed.

[3] Three on Funen and three in Jutland.

3 Background

This chapter provides knowledge about the major threat against open natural habitats, effects of grazing as nature management, general nature management in Denmark and an overview of species connected to the open natural habitats addressed in the project. Further it contains a background of volunteer theories both in general and within nature and environmental volunteering.

3.1 Nature

Open natural habitats were characteristic for the Danish nature, but grazing pastures were abandoned, with negative consequences for these habitats. Under-grazing is a major problem (English Nature 2005), with dire consequences. Under grazing does not only affect plant communities but also the insects, birds and other species, who makes natural open habitats diverse and unique.

3.1.2 Threats against nature (open natural habitats)

The cultivation of land by humans, affects all natural habitats. In Denmark the cession of management, invasive species, limited space, poor quality nature and cultivation, and thereby fertilization are the major threats to nature and biodiversity. The open natural habitats are especially threatened by fertilization, changes in management schemes, lack of space and drainage.

Fertilization and decline in old farming styles as haymaking and grazing with livestock, are especially a threat to open natural habitats. Most natural open habitats have been used as grazing pastures for hundreds of years. The use and history of these habitats have created stable and unique habitats for many species. It is easy to cultivate an area, but it may take more than 50 years to restore the unique flora and fauna, naturally occurring (SEGES Planter & Miljø 2016). Cultivation and fertilization create uniformity and overgrowth, where large herbs and nutrient loving species outcompete the more sensitive species. A habitat with a poor diversity in the plant community results in a habitat with similar low diversity in the fauna communities.

A lot of natural habitats are scattered as small isolated islands in an ocean of cultivated land. This isolation is primarily caused by humans expanding urban areas, fragmenting habitats, draining wetlands and performing agriculture and forestry. Fragmentation amplifies the pressure on small populations, where large coherent areas support more species, natural habitats and niches. Large areas are also less affected by edge effects, resulting in more species being able to live together, due to less competition for survival (Petersen et al. 2012) and better survival of small vulnerable populations (Ejrnæs, Nygaard, and Fredshavn 2009). Nature quality and diversity may increase as an effect of coherent natural habitats, as it becomes easier to spread and populate new areas. Large nature areas

are not enough, a diverse nature is also important. Diversity within and among habitats are the foundation for diversity among species. Poor nature condition leads to fewer niches and thereby fewer species and harder competition. Invasive species as e.g. *Solidago* (gyldenris) and *Heracleum persicum* (kæmpe bjørneklo) can advance the competition further. They are considered major concerns to natural open habitats, as they spread rapidly, outcompeting many native species.

3.1.3 Nature management in Denmark

Ecosystems are dynamic, why management directed to save one species may harm another. All species connected to open natural habitats dependent on rather nutrient poor conditions and some disturbances e.g. grazing. Nevertheless, there are essential exceptions, e.g. many insects cannot survive under a high grazing pressure, during summer as they depend on host plants and nectar sources. If all trees and shrubs were removed, to prevent secession and favour insects, many birds and fungi connected to native species as *Crataegus* (hvidtjørn), *Prunus* (kirsebær) and *Rosa* (rose) would suffer.

The public nature management in Denmark, makes special species provisions uncommon, due to prioritizing and streamlining of efforts. Areas within management schemes are prioritized as follows, 1) conservation, 2) reduction of damage, 3) restoration. This means some areas are passed by, because of too few resources or because they are not mapped, and their potential is unknown.

Nature management performed by volunteers often involve many parties (Hald 2016). However, nature managed in collaboration with volunteers, could minimize the projects or areas down prioritized or passed by in the public nature management.

Protection of the open natural habitats

All open natural habitats larger than 2500 m^2 are protected according to the Nature Protection Act §3, declaring that no changes in the condition of a habitat are allowed, without the proper dispensation (Bekendtgørelse af lov om naturbeskyttelse 2016). This law applies to streams, lakes, heaths, bogs, fens, marshes, salt meadows, meadows and biological enriched grasslands, except that lakes must be over 100^m2. In Denmark, it is the municipalities duty to make sure that this protection is complied and to make the necessary exemptions. The management of natural habitats are spread out; state-owned land is managed by the Nature Agency, while the private landowners and government employees take care of the rest. Are areas protected acc. to §3, do the municipalities have the management obligations connected to the areas, according to the Nature Conservation Act §52, paragraph 1, these responsibilities do not apply to streams. Private landowners of §3 areas are, unlike

the municipalities and state, not obliged to actively protect the condition of the protected habitat. Their only duty is, not to actively change the condition of the area (§ 3 team, Naturområdet, 2009).
As part of the Habitat Directive Denmark is also obligated to ensure favourable conservation status in habitat areas, which are included in the Natura 2000 network. The European Natura 2000 network is a nature, habitat and biodiversity protection cooperation, supposed to protect natural habitats, wild flora and fauna threatened, rare or native to the committed EU-countries.

3.1.4 Grazing as a management tool

Livestock grazing is essential for the management of many of Denmark's most important and recognizable natural habitats. Grazing supports the structure and composition within habitats which is essential for a variety of plants and animals. Farming with livestock has played a significant role in shaping and upholding these habitats. Farming with livestock has steadily since the 19th century, lost its economic and social viability. Replaced by high effective farming systems, with high input of energy and nutrients and a high product output.

Protection of vulnerable species and species diversity should be the goal of management of natural habitats. Management favouring vulnerable species often also benefit common species (SEGES Planter & Miljø 2016). Grazing with livestock plays a key role in maintaining a species-rich habitat by controlling dominating species and preventing the invasion of scrubs and trees. Livestock's selection of certain plant species in preference to others, plays an important role in shaping the structure and plants in a community (English Nature 2005). Grazing removes plant biomass more gradually than e.g. burning or cutting, giving mobile species a better chance to escape. In addition, grazing also it returns nutrients to the habitat.
Different livestock graze differently (Table 1), influencing their fitness as nature managers in different habitat types.

Sheep

Sheep came to Denmark at approximately the same time as the domesticated cattle but are not as widespread in nature management. Sheep are selective grazers, who graze close to the ground. Sheep prefer flower plants, fresh shoots and saplings in comparison to grasses. They do often eat some of the bitter plants avoided by both cattle and horses. Grazing with sheep often results in a more grass dominated habitat, with few herbs and trees, as sheep actively eats scrubs and smaller trees stopping the natural succession in natural open habitats. Guten and Gotland sheep or mixed breed are common

in nature management Among the approx. 200 sheep species in Denmark, they are robust breeds suitable for the task (Buttenschøn 2007).

Horses

Horses are selective grazers, grazing close to the ground like sheep. Horses prefer grasses why they often discard flower plants. Horses have a very clear distinction between favoured and unfavoured grazing areas, the first with very low vegetation and the latter with higher ungrazed vegetation. Horses are not effective to remove trees and scrubs. As nature managers horses need to be robust and hardy e.g. the konik horses, which are used few places around Denmark for example at Kasted fen.

Cattle

Cattle are the preferred animal in nature management, mainly due to its way of grazing and because it is the most common suited livestock in Denmark. Cattle are unselective grazers and they are unable to graze extremely close to the ground as sheep and horses. Cattle prefer grasses compared with herbs, it represents 72 % of their consumption. Hardy plants as scrubs and trees are only grassed in small amounts, why they seldom can prevent invasion of trees and scrubs in a habitat.

The most common breeds used in nature management, in Denmark, are Angus Aberdeen, Herford, Scottish highland and Galloway, as they are suited for the cold Danish weather. Further are Aberdeen Angus especially suited for more wet grazing pastures because they have broader hoofs (Buttenschøn 2007).

Table 1: A summary of the three most applied livestock within nature management: Sheep, cattle and horses and their grazing mode.

Livestock type	Grazing mode	References
Sheep	Selective grazers, grazing close to the ground, preferring fresh shoots, flower plants and saplings. Do not graze longer vegetation as grasses. Effective against hardy plants as scrubs and trees.	English Nature 2005, Buttenschøn 2007
Horses	Selective grazers, leaves some pastures untouched, can browse saplings under woody species, can control scrubs and trees.	English Nature 2005, Buttenschøn 2007
Cattle	Unspecialized grazers, not grazing close to the ground. Prefer grasses and do not target fresh shoots and flower plants. Large trampling effect.	English Nature 2005, Buttenschøn 2007

When managing for biodiversity or conservation purposes, in natural open habitats it should be aimed to reduce dominant species and promote germination and spread of key species. Grazing with animals can promote this , as the key species are often weak competitors for light (Bakker 1989; Hald and Vinther 2000). The type of grazer is not the only consideration when managing a habitat, the grazing pressure also plays a key role. Overgrazing reduces the number of flowering plants, and thereby affect insect populations depending on these flowers. Moderate grazing offers advantages to short-lived plants, grasses and rosette plants (Stammel, Kiehl, and Pfadenhauer 2003; Kahmen, Poschlod, and

Schreiber 2002). The best grazing scheme would be year-round grazing at low grazing pressure, to especially favour flowering plants. When year-round grazing is not possible, a mid-summer break can contribute to the diversity of flower plants (SEGES Planter & Miljø 2016).

Over time grazing animals can remove nutrients if supplementary feeding is avoided. This is a slow process as the animals also return nutrients to the systems through dung (Ejrnæs, Nygaard, and Fredshavn 2009). Grazing affects the species composition, seed dispersal and nutrient availability. Depending on habitat type and soil moisture, the trampling effect also differs. Plants in more damp habitats are more affected by trampling from livestock. In all habitat, trampling creates gaps in the vegetation allowing saplings to establish. When choosing a grazer for an organization, managed by volunteers, cattle and sheep are favourites. They are gentle and easy to handle, even for amateurs – even though all animal care takes practice. The number of animals should vary depending on species and food quality of the area, but a rule of thumb is 1-2 cattle pr. Ha (Danmarks naturfredningsforening 2006), to avoid overgrazing.

3.1.5 Soil and grazing effects

Species composition and potential in open natural habitats are affected by soil composition and properties. Open habitats with sandy or gravely soils are often more drained and thereby more nutrient poor, especially affecting plant communities on heaths and grasslands. The presence of limestone and chalk is important for some rare species connected to grasslands, such as orchids. In meadows and fens, the presence of peat and gyttja[4] is a sign of water saturation and thereby anaerobic conditions, important for many fen and meadow species. However, it is important to recognize that the presence of peat and gyttja does not equalize water saturation, as many areas are artificially drained (Danmarks Arealinformation 2010).

Total organic carbon (TOM) is the carbon stored in soil organic matter (SOM). Grasslands often have a high content of SOM. This supplies the plant community with nutrients, limits soil erosion and increases water holding capacity (Conant, Paustian, and Elliott 2001). SOM is a key factor for functions and sustainability of grassland ecosystems. Organic carbon inters systems through decomposition, animal residues, soil biota and living and dead microorganisms. Soil organic matter varies in different environments and depends on management schemes. In general soil organic matter, increases with annual rainfall, with lower annual mean temperature, with higher clay content in the soil and at an intermediate grazing pressure (Natural England 2010). Soil carbon is important

[4] Sediment rich in organic matter.

especially for plant communities, as it is an expression for soil activity; mineralization and decompositions rates and how much nutrients are available to the plants.

Soil nitrogen is often bound in organic compounds, only escaping through loss of biomass, denitrification, ammonia evaporation or leaching. Nitrogen is often the limiting factor in uncultivated ecosystems, why nature management tries removing nitrogen, to restore this natural limitation.

The soil nutrient pool and cycling are affected by grazing. Grazing removes nutrient but returns some through faeces and urine, up to 90% are returned (Buttenschøn 2007). The amount and placement of nutrients are not the same, contributing to the creation of mosaic habitats. Grazing can reduce the available nutrient pool above and below ground, not only by biomass removal but by shifts in the botanical composition from edible, decomposable species to inedible, resistant species (Bokdam 2003).

In 2016, Niu et. al. found that grazing overall increased the species diversity but decreased above-ground biomass and nutrient concentration in soil and roots. The C/N ratio for leaves and roots increased at dry sites but decreased at wet sites. Grazing changed the plants' digestibility, diversity and nutrient concentration. A review by Conant et. al from 2001, of 115 studies with more than 300 data points, deduced that all management methods investigated including grazing increased mean soil C. This provided evidence that grazing does, in fact, affect the organic carbon in soil. They concluded that especially grasslands can act as a carbon sink.

Apart from nitrogen and soil C, soil pH plays a key role in the composition of a plant community. Soil pH determine the nutrient availability and species are often adapted to a certain pH range. In acidic soils (low pH) many micro-nutrients e.g. aluminium-, chrome and iron ions become available and more susceptible to leaching. Many of the species specialized to acidic soils have low growth rate or are dependent on mycorrhiza for N-fixation. The mineralization of nutrients is often slow in the acidic soil as many soil microbes do not thrive in the acidic environment. Alkaline soils (high pH) also demand special adaptions from the plant community, as for acidic adapted plants, plants on calcareous soil has a slow growth rate and are adapted to nutrient-poor conditions e.g. low amounts of phosphor (Buttenschøn 2007).

3.1.6 The open natural habitats and diversity

Open natural habitats are home for many species, especially vulnerable and rare species. Every eight rare Danish plant species and 63% of red-listed species are connected to open natural habitats (Ellemann et. al. 2001). Open natural habitats are not easy to separate from one another, often with

overlapping vegetation or transition zones. Below is an overview of the natural habitats of interest in this project and the natural occurring biodiversity belonging in the habitats.

Grassland

Grasslands are species rich habitats with many broad-leaved herb and grass species, but the herb vegetation is what defines them. Some of the common broad-leaved herbs are e.g. *Campanula rotundifolia* (liden klokke), *Galium verum* (gul snerre) and *Centaurea jacea* (alm. knopurt), which attracts butterflies and are host plants for insect larvae. The most common grasses are e.g. *Agrostis capillaris* (alm. hvene), *Anthoxanthum odoratum* (vellugtende gulaks), *Festuca ovina* (fåre-svingel) and *Danthonia decumbens* (tandbælg). *Festuca rubra* (rød svingel), *Dactylis glomerata ssp. Glomerata* (alm. hundegræs), *Poa pratensis* (eng-rapgræs) and *Deschampsia flexuosa* (bølget bunke), these are also found in other natural habitats. Grassland can quickly be dominated by woody species, some grazing tolerant plants replacing the fast-growing trees species are *Crataegus* (hvidtjørn), *Rosa* (rose), *Rubus* (blåbær) and *Cytisus scoparius* (gyvel).

One third (32 %) of the Danish plant species are connected to grasslands. Grasslands are often rich on heat loving insects as butterflies, grasshoppers, cicadas, hover flies and different kind of beetles Many species are connected to the dung of the grazing animals or are pollinators for the flower plants e.g. 55% of the Danish butterfly populations are dependent on grassland habitats. Many birds and small mammals use the grassland vegetation as foraging and nesting sites. Grasslands are also important habitats to amphibians, especially the rarer heath dependent species as e.g. the endangered *Bombina* (klokkefrø) (Ellemann et al. 2001). This niche is also important in the life cycle of e.g. *Triturus vulgaris* (lille vandsalamander) and *Pelobates fuscus* (løgfrø). Fungi are also connected to grasslands the most common are species of *Hygrocybe* (vokshat).

Grasslands over 2500 m^2 can be protected according to the Nature Conservation Act §3, or as calcareous or acidic grasslands according to EU habitat directive, as 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates and 6230 Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe).

All grassland habitats are home range for dry and light loving species. Acidic grasslands (6230) is common across the country, often in hilly nutrient poor terrain. Only a few species are connected directly to acidic grasslands. Some of the most common species at acidic grasslands are e.g. *Rumex acetosa* (alm. syre) and *Deschampsia flexuosa* (bølget bunke). Many insects are depending on this habitat, it is host for many butterfly populations, which needs warm sun-exposed pastures with low

vegetation. Among endangered is *Maculinea arion* (sortplettet blåfugl), which caterpillars feed on Thymus (timian) species, primarily found on acidic grasslands.

Calcareous grasslands (6210) occur where the soil contains calcium carbonate, increasing soil pH to between 6 and 8. Calcareous grasslands are like acidic common across the country, most common in North and West Zealand, East and North Jutland and the northern parts of Funen. Calcareous grasslands are the most species-rich grasslands in Denmark, often with rare species. Constant species are e.g. *Festuca rubra* (rød svingel), *Dactylis glomerata ssp. Glomerata* (alm. hundegræs), *Campanula rotundifolia* (liden klokke), *Galium verum* (gul snerre), *Centaurea jacea* (alm. knopurt) and *Medicago lupulina* (humle sneglebælg). Rare orchid species are tied to more calcium-rich soils, and are very sensitive to disturbances, due to tight links to pollinating insects and need for mycorrhizal fungi, for growth and germination. Due to its more species-rich nature, this habitat is important for birds. Birds of prey use it as hunting grounds in the breeding season, among threatened species are e.g. *Pernis apivorus* (hvepsevåge). (Buttenschøn 2007; Ejrnæs, Nygaardand Fredshavn, 2009).

Salt Meadows

Salt meadow habitats are defined as salt influenced areas mostly along the coastline. The vegetation is a combination of salt and moist tolerant grass, sedge and herb species. Salt meadows can be Atlantic salt meadows or inland salt meadows, with more meadow-like vegetation and reedbeds. Inland salt meadows are often influenced by air born salt or salt from the ground, instead of salt from the ocean (Vestergaard 2000a).

In Denmark salt meadows are found along the coastline, except the west coast. Inland salt meadows often act as transition zones to some of the drier and less salt influenced habitats. Inland salt meadows have meadow and grassland species, *Festuca rubra* (rød svingel), *Festuca ovina* (fåre-svingel), *Agrostis capillaris* (alm. hvene) and *Holcus lanatus* (fløjlsgræs), but also more salt tolerant species as *Plantago maritima* (strand vejbred) *and Armeria maritima* (engelskgræs) (Vestergaard 2000b). In the Atlantic salt meadows, the salt tolerant species are more significant, these communities include species as *Plantago maritima* (strand vejbred), *Puccinellia maritima* (strand-annelgræs), *Festuca rubra* (rød svingel), *Juncus Gerardi* (harril), *Salicornia europaea* (salturt) and *Glaux maritima* (sandkryb).

Salt meadows and mashes are important habitats for many bird species, common and endangered. In spring and autumn migrations they are the main food resource for wildfowl birds, such as *Branta bernicla* (knortegås) (Doody 2008). Additional salt meadows functions as breeding sites for wader

birds e.g. *Charadrius alexandrinus* (hvidbrystet præstekrave) and *Vanellus* (vibe). Salt meadows present important refuges for amphibians, especially vulnerable to competition and predation. All native Danish amphibians can inhabit salt meadows, and many are connected to inland salt meadows with rich insect fauna and breeding opportunities (Ellemann et al. 2001).Among protected species is *Bufo calam* (strandtudse), which breeds in warm salt-rich pools forming in the meadows.

Both salt meadows and inland salt meadow are protected acc. §3 and the EU habitat directive, code 1330 Atlantic salt meadow and 1340 Inland salt meadow.

Meadows and fens

Meadows and fens vary a lot in species composition, depending on soil acidity (pH), soil moisture and nutrient availability. Some species are highly adapted to water saturated and anoxic soil, e.g. *Phragmites* (tagrør) and *Eriophorum* (kæruld) species. Among the more common and not as specialized species are *Holcus lanatus* (fløjlsgræs), *Juncus effuses* (lysesiv), *Carex nigra* (alm. star), *Filipendula ulmaria* (alm. mjødurt) and *Poa trivialis* (alm. rapgræs). Meadow and fen habitats have dynamic plant communities that can convert with overgrowth or swamping. The meadows are completely dependent on management to avoid displacement in the competitive conditions, of the plant community. Many different animals are connected to these habitats, as butterflies, dragonflies, grasshoppers, spiders and snails. Meadows are also important for bird life. Birds use this open natural habitat for nesting, foraging and breeding, among the more common species are e.g. *Vanellus* (vibe), *Limosa* (kobbersneppe) and *Calidris alpine* (alm. ryle). Some of the rarer species are *Crex* (engsnarre) and *Ciconia* (hvid stork) (Ellemann et al. 2001).

The hydrology is important in fens and meadows. They are both defined as areas with high soil water content. Meadows are open natural habitats with moist soils dominated by herbs and fens are permanently wet habitats.

Nutrient-poor meadows are less wet than fens and often function as transition zones between wet and dry habitats. The most common species are *Potentilla erecta* (tormentil), *Molinia caerulea* (blåtop), *Galium uliginosum* (sumpsnerre), *Lotus pedunculatus var. pedunculatus* (sump-kællingetand) and *Succisa pratensis* (djævelsbid). In the more calcareous of these habitats species as *Prunella vulgaris* (alm. brunelle), *Juncus articulates* (glanskapslet siv) and *Briza media* (hjertegræs) are common. The calcareous version is most common in North and East Zealand, where the more acidic is mainly found in Jutland.

Alkaline fens develop on calcareous wet soil. Alkaline fens do not have high species richness compared to other fen habitats, but rare plant and fungi species are connected to the habitat. The most constant species in fens are *Cirsium palustre* (kær-tidsel), *Carex nigra* (alm. star), *Festuca rubra* (rød svingel), *Holcus lanatus* (fløjlsgræs) and *Galium palustre* (ager-tidsel). Some of the more characteristic species are *Lychnis flos-cuculi* (trævlekorne) and *Galium uliginosum* (sumpsnerre). If fens are not grazed, they easily become dominated by *Carex nigra* (alm. star), *Salix cinereal* (grå-pil) and *Phragmites australis* (tagrør).

Wet meadows are one of the most common open natural habitats in Denmark. They are relative species rich open natural habitats, on weakly alkaline soil. They have relatively high nutrient availability compared to fens and nutrient poor meadows, resulting in a lack in the most nutrient vulnerable species. Wet meadows are often more affected by human activities, drainage or fertilization. The most common species belonging in this habitat are e.g. *Poa trivialis* (alm. rapgræs), *Ranunculus repens* (lav ranunkel), *Deschampsia cespitosa* (mose bunke), *Equisetum palustre* (kær padderok), *Cirsium palustre* (kær-tidsel), *Epilobium parviflorum* (dunet dueurt), *Myosotis scorpioides* (eng-forglemmigej), *Juncus effuses* (lysesiv) and *Urtica dioica* (stor nælde). Wet meadows are common across the country, but most frequent in the eastern parts of Denmark. This habitat is frequently found near fens or as transition zones between wet and dryer habitats. Wet meadows are protected acc. To the Nature Conservation Act §3, as meadow or fen. Moist meadows are however not protected according to EU's habitat directives.

Moist meadows are often moderate nutrient rich and drained habitats, where cultivated grasses and clovers are sowed. The most common species are *Lolium perenne* (alm. rajgræs), *Poa pratensis* (rapgræs), *Holcus lanatus* (fløjlsgræs), *Trifolium repens* (hvid kløver) and *Trifolium pratense* (rød kløver). More characteristic species often used as indicators are e.g. *Hypochoeris radicata* (alm. kongepen), *Leontodon autumnalis* (høstborst), *Plantago lanceolate* (lancet-vejbred), *Achillea millefolium* (alm. røllike), *Agrostis capillaris* (alm. hvene) and *Cynosurus cristatus* (alm. kamgræs). Among species often used to distinguish grassland from meadows are e.g. *Deschampsia cespitos* (mose bunke), *Agrostis stolonifera* (kryb hvene) and *Juncus effuses* (lysesiv) As for wet meadow, this habitat is often seen as transition zones between other habitats. Moist meadows are common in all of Denmark and are often located on former alkaline fens (7230) or Molina meadows (6410). Moist meadows are protected acc. §3, but not according to the EU habitat directive. The least cultivated can with effort return to former glory either as habitat type 6410 or 7230, habitat types protected according to EU habitat directives. These EU protected areas do contain more diversity, e.g. Molina meadows

(6410) are home to the endangered butterfly *Maculinea alcon* (ensianblåfugl) and their food plant *Gentiana pneumonanthe* (klokkeensian) (Galvánek and Janák 2008).

3.1.7 Summary

The natural open habitats grasslands, meadows, salt meadows and fens are very characteristic for the Danish nature and contains much biodiversity. They are threatened by cession in old farming schemes, cultivation and fertilization. Livestock grazing is essential for the management of many of the open natural habitats.

All open natural habitats with an area larger than 2500 m^2 can be protected according to the Nature Protection Act §3, some can additionally be protected through the European Natura 2000 network, which strives to protect natural habitats' wild flora and fauna, threatened, rare or native. The state, municipalities and private landowners are obligated in different ways to accommodate the nature conservation commitments.

Protection of vulnerable species and species diversity should be the goal of management of natural habitats. Grazing with livestock plays a key role in maintaining a species-rich habitat by control of more fast growing and nutrient-loving species which would otherwise dominate. Grasslands, meadows, fens and salt meadow are all unique habitats home for many common and rare species of plants, insects, birds and mammals. The diversity of these habitats is essential for the Danish biodiversity.

3.2 Volunteering and motivation

Millions of people worldwide invest their time in voluntary work. Engaging in volunteering can be described as a combination of external factors, e.g. changes in work situation or an invitation from a friend and internal motives e.g. personal values, beliefs and ethics (Rømer and Koefoed 2011). Volunteering is affected by its many definitions. Cuskelly and Harrington (1997) defined volunteering as an altruistic service/task-based activity, which often involved obligation (Caissie and Halpenny 2003). This issued the ongoing debate, if volunteering was work or leisure. In modern times, it has been acknowledged that volunteering, not only is an altruistic act, but the volunteer also benefits from the activities. The idea of *pure* volunteers has mostly been abandoned, opening research questions about volunteer motivation (Musick & Wilson 2008; Jensen 1988; Stukas et al. 2009; Kragh 2017a).

Initial research and theories on volunteer motivation, were based on employment theories and advanced within the social sector in the 1960s and 1970s (Kragh 2016). Today (2018), volunteer motivation research is still mainly focused on the social sector, but slowly advance to other sectors.

There is no explicit definition of volunteering within nature management. Therefore, volunteering in this project is defined as: Any activity in which time and/or money are given freely, to benefit other people or a cause. Mainly inspired by a general definition made by Wilson in 2000 who stated that volunteerism was an activity in which time was given freely to benefit a person, group or organization (Wilson 2000, p. 215). As this definition does not exclude the volunteers from gaining from the activity.

3.2.1 Volunteering around the world and in Denmark

Many places around the world have traditions of nature and environmental stewardships and volunteering. In countries where the state or the public authorities does not manage nature, it is common to involve volunteers in nature management. In countries such as England, Canada, USA and Australia nature volunteer programs secure management of natural habitats and the informal education of members (Fabricius 2006; Measham and Barnett 2008).

Many different tasks are managed by volunteers. Five main categories define the work of nature and environmental volunteers 1) management, 2) monitoring, 3) protection, 4) communication and 5) administration.

Most experiences from foreign programs are culturally conditioned, as they are part of the context in which they originate and can therefore cannot be directly transferred to Danish conditions (Fabricius 2006).

Denmark has a long tradition of an active association life and for the involvement of citizens in political processes. Just think about how landowners, church councils, sports associations or union movements have affected the political decision making at a local level (Friluftsrådet 2013). The voluntary community in Denmark, is a mix of nation-wide organizations, funds and public authorities (state, municipalities etc.).

In Denmark, there is a strong tradition for the state to handle tasks, both in nature and in the health section. Throughout the 1980s and 1990s, the state has assigned more significance to the work of volunteers granting support by project funding. Nature initiatives have not too same extent as e.g.

social initiatives been accompanied by voluntary work and funding (Hjortsø, Busck, and Fabricius 2006).

About 39% of the Danish population volunteer (Fakta og tal om danskernes frivillige arbejde 2017). The 9 %, of all volunteers are involved in political and NGO volunteering, in accordance with The Danish Volunteer Report 2016-2018 only about 1 % volunteer for nature. However, 30% expresses a wish to volunteer for nature (Hjortsø et al. 2006).

Nature and environmental issues are often conversation topics in the public debate, but less seldom a priority in the public economy. In 2016 1 % of the Danish state budget was dedicated to environmental issues (miljøbeskyttelse), (OFFENTLIGE UDGIFTER BUDGETTERET TIL 1.103 MIA. I 2016 2017). Focus and involvement in nature protection and restoration are more prominent, in many other countries. It is not that Danish citizens are not involved in nature restoration, protection and management, it is just not visible, mainly due to lack of documentation and communication on the area. In Denmark tasks connected to nature volunteering, is 1) nature conservation (management, conservation, restoration and establishment), 2) monitoring and 3) communication. The focus has mainly been on the two latter. As nature management has been and still mostly are, perceived as a state or municipality matter. The Danish state provides funding to the municipalities' nature management, conservation efforts, outdoor-life and nature restoration. Part of the funding is acquired by "third man" project, which for examples funds shrub clearings, fencing of animals and pond and lake restorations (Hjortsø et al. 2006). Volunteering for nature is not yet systematized in national programs or a part of nation-wide activities. It is based on locale initiatives, some are associated with the Danish Society for Nature Conservation (DN) others with locale enthusiasts in collaboration with the local community or the municipality. Collaboration between the volunteers and the public authorities provide opportunities to gain qualitative and more variated nature management, often of small nature areas, which easily can be lost in the bigger picture, in fact. one of the Outdoors Council (Friluftrådet) goals is to increase, the number of volunteers working with nature, fivefold, by 2020 (Friluftsrådet 2013).

3.2.2 Studying and understanding volunteer motivation

Human actions basically derive from a desire to fulfil several needs and finally become *a complete human being* (Knowles 1972). To truly understand the underlying motivation, a common definition of motivation is necessary. Motivation means cause or reason in Latin and is the reasons behind actions either conscious or unconscious.

Volunteering may appear similar on the surface but can be driven by completely different underlying motivational processes. Active participation in volunteer projects are shaped by the fulfilment of your motivations (Bruyere and Rappe 2007), for example, if you volunteer to expand your network, meeting new people is important.

There are many theories and approaches in investigation of volunteer. Two types of motivation were defined when trying to understand motivational motives, intrinsic and extrinsic motivation. Intrinsic motivation is associated with action expected to bring personal pleasure or satisfaction (Ryan and Deci 2000; Tabernero and Hernández 2011).The participation in a grazing organization may fulfil intrinsic motives through redemption of beliefs, values, moral or ethics regarding nature protection or animal welfare. People can be motivated by intrinsic factors because they feel responsibility for a land area (Berkes 1999; Ryan, Erickson, and De Young 2003) or are concerned about future or current generations (Bourdeau 2004). Extrinsic motivation was associated with the expected outcome or achievement. In a nature volunteer context, it could be lost cost through money and time or gained outcome through meat or better nature (Bennett et al. 2018).

Intrinsic and extrinsic motivation can provide energy, influence and explain choices made by volunteers (Stern, Dietz, and Kalof 1993; Tabernero and Hernández 2011; Asah and Blahna 2012; Asah, Lenentine, and Blahna 2014; Krasny et al. 2014).

Understanding human behaviour

Understand the basic behaviour of humans is the first step in understanding motivation. *The theory of reasoned action* is commonly used by social psychologist, trying to understand human behaviour. The theory is an extension of *the theory of planned behaviour* (Ajzen and Madden 1986; Ajzen 1991). The assumptions of this theory were 1) people evaluate the consequences of performing a behaviour before engaging and 2) people make quite rational decisions based on what they know (correct or not) (St. John, Edwards-Jones, and Jones 2010).

Warburton and Terry (2000) provided the initial support for the application of *the theory of planned behaviour* within volunteer theory (Warburton and Terry 2000). Through a combination of attitudes, subjective norms and supposed behavioural control (Table 2), it accesses motivation (Dolnicar and Randle 2007).

Table 2:The factors of the theory of planned behaviour.

Factors	Definition
Attitude	A persons overall negative or positive attitude toward the behaviour of interest.
Subjective norm	The supposed social pressure to perform or not to perform a behaviour.
Supposed behavioural control	A person's ability to perform a behaviour and to what degree the individual supposes that the behaviour is under volitional control.

Attitude; was based on the idea, that an individual always performs an overall evaluation of the execution of a certain behaviour. This evaluation can either be positive or negative (Albarracin et al. 2005). Attitude was directed toward a behaviour and not a person, institute or object. For example, if an organization ask you to donate money to save endangered species, you may already have a negative attitude. This is not because you don't appreciate the organization's work or think that the species should go extinct, but because you don't like giving away money. If you were asked to collect money for the same cause, your attitude may have been another.

Subjective norm; was the social pressure to perform or not perform a behaviour (Ajzen 1985). What we think others will think of us if we do or do not perform behaviour. It is rooted in the term social norm, which is a shared understanding (in a group or society) of what is obligatory, acceptable or forbidden (Ostrom 2000).

Supposed behavioural control; was based on an individual's ability (ease or difficulty) to perform a behaviour. It also includes perceived control, where individuals believe there are factors present, that may hinder or facilitate the performance of a certain behaviour (St. John et al. 2010).

3.2.3 Studying volunteer motivation

Creating a unified theory for volunteer motivation is a significant challenge (Hustinx, Cnaan, and Handy 2010). Today many separate theories still exist.

Taking an individual-level approach in understanding motivation, there are two predominating perspectives 1) assuming complexity in the make-up of a person and treating the context as background or 2) assuming simplicity in the make-up of a person and treating the context, in which a person works, as complex. The first perspective is seeking motives and meanings behind volunteering. The second perspective is based on the allocation of energy, weighing cost and benefits. The second perspective closely links to *the exchange theory. The exchange theory* predicts that people with more resources are more likely to volunteer. Within this approach, the volunteer weighs the cost and benefit in relation to own resources. Other competing approaches suggest that people always will put their own interest first and that identity and self-image is important (Wilson 2000).

Dominating approaches in the study of volunteering

Social value and resource theories are some of the most prominent approaches used when studying volunteering. Social theories focus on the importance of social context, networks, roles and integration. Prosocial and value theories concentrate on the individual's beliefs and attitude toward social responsibility and altruistic behaviour. Resource theories stress the importance of human capital and economic factors (Einolf and Chambré 2011).

The social approach

The social approach to investigating motivation, revolves around the volunteer's life situation and focus on structural and social explanations (Hjortsø et al. 2006). The theory distinguishes between three main motivation categories 1) normative, 2) instrumental and 3) structural (Table 3).

Normative motives were based on social commitment, altruism and the desire to do something good for others. Many charity workers find their motivation in the normative motives - through the mantra *you should*. These motives are often rooted in personal values and ethics. For example, building of nest boxes for birds, to ensure better survival of the species, because it is good if more bird species survive as it increases biodiversity (and *because you should).*

Instrumental motives were based on the desire to obtain benefit or reward. The motivation is rooted in a desire for recognition, rewards or benefits – these can be of social. physical, psychological character, for example, social benefits can be social relations and interactions or recognition in one's social network. For these motivations, it is not the voluntary cause or work there are motivating, it is the benefits related to it.

Structural motives were historical or cultural conditioned, focusing on a political, social or societal situation. For example, volunteering for a cause is something you do, because you always did, the initial cause or reasoning have been forgotten (Hjortsø et al. 2006).

The functional approach

The functional approach was first introduced by Katz in 1960. It investigated the social and personal processes of initiating, directing and sustaining actions and was often used within both the environmental and physiological science (Bruyere and Rappe 2007). Decision making was a rational process within the functional approach, some argue that volunteer behaviour was led by the cognitive evaluation of the benefits linked to volunteering (Greenslade and White 2005). Basically, the approach suggests that people participate in voluntary work for different reasons.

Using the functional approach Clay et. al. identified six functions of volunteering; understanding, social, values, protective, enhancement and career (Bruyere and Rappe 2007). They called them the *Volunteer Functions Inventory* (VFI). This index has since been used many times when investigating volunteer motivation (Bruyere and Rappe 2007; Selinske et al. 2015; Clary et al. 1998).

The Volunteer Functions Inventory (VFI)

Understanding: was based on the idea of personal development. It is concerned with a person's opportunity to understand and learn knowledge, but also the opportunity to acquire new skills.

Social: was based on the idea to strengthen or build new and old social ties. It also included acceptance within or appliance to the social norms of the society, one's network or important others (Chacón et al. 2011). For example, the opportunity to be with friends through the volunteer work or to engage in nature conservation activities, because it is regarded favourably or expected by important others (Hjortsø et al. 2006; Greenslade and White 2005).

Values: was the expression of ideals, representing a person's ethics and morals. For example, if you are strongly against pollution of nature, you would properly engage in activities as protesting or beach cleaning to express these values. Or if you think it is unethical for children to get a poor start in life, you may donate both money and time to UNICEF.

Protective: was the opportunity to reduce negative feelings, such as quilt and loneliness. For example, being a part of an environmental organization, because you feel guilty about the impact humans has on the Earth or being part of an organization serving food for the homeless to feel needed and be surrounded by people, as an attempt to escape loneliness.

Enhancement: was based on the self-centred idea, that you volunteer for yourself (Hjortsø et al. 2006; Greenslade and White 2005). The voluntary work provides an opportunity for personal development., increased insight or personal development, this is often related to the volunteer cause.

Career was based on the idea, that you through voluntary work can get relevant career related experiences. For example, if you work as an event coordinator, it could be beneficial to engage in the planning of a volunteer event, to gain skills, in planning, coordination and organizing an event for many people.

Table 3: Motivational factors within the social and functional approach.

Motivation factor	Definition
Normative motives	A social commitment and the desire to do something good for others.
Instrumental motives	A desire to obtain greater benefit and a reward, this being a physical product, recognition, social relations or greater satisfaction.
Structural motives	Cultural or historical conditioned, with focus on the current political, social or societal situation.
Understanding	The opportunity to get new knowledge and/or skills.
Social	The opportunity to get new or enhance old social relations.
Values	The opportunity for an individual to express personal values.
Protective	The opportunity to reduce negative feelings, such as quilt.
Enhancement	The opportunity to develop personally, volunteering basically for yourself and no one else.
Career	The opportunity to get career relevant experience.

3.2.4 What have been found in studying volunteer motivation

The resource theory suggested what kind of people would volunteer the most. In accordance with the theory, you were more likely to volunteer if you already have the skills or resources that promoted your involvement. In fact, volunteering becomes more attractive to the resource-rich, because they may already have the capital or knowledge required for doing the work (Einolf and Chambré 2011).

Previously studies of volunteering, showed that people who volunteer often were well-educated, wealthier and healthier, than people which did not volunteer (Choi 2003; Erlinghagen and Hank 2006; Wymer 1999). They were associated with the labour market and had a large social network (Principi et al. 2016).

Demographics

Demographics affects the volunteers' motivation. Age, gender, education, children, friends and social connections, are some of the main demographics affecting volunteering (Table 4).

Human capital changes throughout life and so does motivation for participating in voluntary work. Aging can redefine social roles and physical ability imposing constraints or opportunities. Volunteering occurs at all ages; but certain life stages are particularly associated with volunteering. The highest rates of volunteering were found among middle age people (Measham and Barnett 2008). Often older volunteers have lower levels of social capital, expressed through a lower educational level, poor health and being widowed, divorced or single. These factors were highly associated with volunteering for personal (enhancement) or social reasons (Clary et al. 1998). People in older life stages (over 60) has recently become likelier to volunteer and continue volunteering into an older age (Einolf and Chambré 2011).

Gender influence the gradient of voluntary involvement (Bussel and Forbes 2002), in North America, females volunteer slightly more than males. People in Europe do not express this trend in gender related volunteering, as females volunteer more in some countries and vice versa. Males and females contribute the same number of hours to volunteering but the ratio of males to females differ with life stage. A universal pattern is that females volunteer more when they are young and males volunteer more when they become older (Wilson 2000).

Level of education has been said, to be the most constant predictor of volunteering. The volunteers educational level boosts their volunteering, first as a side-effect to a larger network (Wilson 2000; Measham and Barnett 2008) and second, because well educated people are more likely to be aware of problems needing attention. The influence of education varies depending on the voluntary case.

Having children, especially children living at home can constrain or catalyse volunteering. The effect dependent on the art of the volunteer work, civil status, work situation, age of child and parents. Parents were more likely to volunteer if they have children living at home., but parents with young children volunteer fewer hours (Wilson 2000).

Friends, social roles and social networks are key factors in a person's life, influencing behaviour and opportunities. Having friends involved in volunteering has a positive effect on your own volunteer involvement (Einolf and Chambré 2011). Other social connection can also initiate, demand or prohibit voluntary engagement. Volunteering can be a natural extension of work and family obligations or activities (Choi et al. 2007). It can for some work as a compensation, for lack of fulfilment of other roles (Staines 1980). In 2000, the research of social resources significance to volunteering was initiated. Social ties produce trust and make it easier to step forward and donate time (Wilson 2000). Social ties do not only make volunteering easier, it does also encourage relations, which can function as "side payments" to overcome free rider problems. Social ties assist in defining the volunteer role and thus make it easier to perform. Further, most of the volunteers have been encouraged personally to join a cause, why the social ties were already important (Hjortsø et al. 2006).

Table 4: A summary of the demographic findings within volunteer research.

Factor	Findings	Reference
Human capital	Changes through life, affecting individuals' motivation to volunteer.	Clary et al. 1998
Age	Low social capital, through lower education, poorer health. More prone to volunteer for social reasons.	Clary et al. 1998
	Age above 60 increases the chance of volunteering.	Einolf and Chambré 2011
Gender	Males and female generally volunteer the same number of hours.	Wilson 2000
	Worldwide females volunteer slightly more than male.	Bussel & Forbes 2002, Papadakis, Griffin, and Frater 2004
	In Europe, males do not volunteer more than female and vice versa.	Wilson 2000
	Life stage (young and old) affects the female to male ratio.	Wilson 2000
Education	Most influential predictor of volunteering, through a larger network, more awareness and resources.	Wilson 2000
Children	Parents with children, living at home, was likely to volunteer.	Wilson 2000
	People with young children volunteer fewer hours.	Wilson 2000
Friends and social roles	Having friends involved in volunteering positively affects your own involvement.	Wymer 1999, Einolf and Chambré 2011
Social ties	Social ties produce trust and trust makes it easier to step forward and donate time.	Wilson 2000

Motivation

Motivation and attitude affect the commitment and involvement in a volunteer project or organization. Motivation cannot be taken out of context, as the context can be part of the motivation.

In a study involving 1151 volunteers Chacón et. al. found, that values were the most prominent predictor for motivation, 48% of their participants expressed values motives, explaining their commitment by personal ethics and morals (Chacón et al. 2011). Other studies confirmed values as the most important motivation independent of age (Dávila and Díaz-Morales 2009). For example, all nature volunteers and stewards, independently organization and volunteer tasks, initiated their volunteering with the intention of helping nature (Alender 2015). A study by Dávila and Díaz-Morales (2009) showed that motivation changed with age, where understanding and career motives become less important with age (Dávila and Díaz-Morales 2009; Alender 2015). Meaningful goals become important later in life, especially generative goals where "taking responsibility for future generations" becomes a stronger motivator. Career was overall the least important motivation for volunteering in all life stages.

Across studies males and female assigned the same importance to social, value and enhancement related motives, assigning them as the key factors. Career, protective and understanding related

motives were by both genders scored the least important. Females tend to assign more importance to all motives (Papadakis et al. 2004), for many nature volunteers, there were no differences between gender (Alender 2015).

Nature volunteers and motivation

Environmental stewardships have been studied many times in different contexts, forests (Adhikari, Williams, and Lovett 2007; Messier et al. 2015), freshwater (Kreutzwiser et al. 2011), grasslands and rangelands (Appiah-Opoku 2007; Sayre et al. 2013; Henderson, Reed, and Davis 2014). Many of these studies did not investigate motivation among members, with exception of Selinske et. al. (2015).

The social science focused on the benefit, for the volunteer, where the environmental science focused on the outcomes for nature (Kragh 2017). Volunteers of nature are not only motivated for environmental reasons, but also by the personal benefits they gain from the outdoor- and social activities.

Environmental outcomes have often been the primary motivator for participants restoring degraded habitats, preserving wilderness areas or improving natural resources (Schroeder 2000). Humans ability to envision the future was, in nature management, a strong driver. The volunteers can imagine what their efforts will mean for the nature in the future. The environmental motivations were often linked to or associated with a desired social outcome, either being social or fulfilling economic, health, physical or cultural needs (Bennett et al. 2018).

H. W Schroder (2000) found several factors motivating nature volunteers, e.g. A sense of urgency towards the fragile design of nature. People motivated by this, feels something valuable was slipping away and will be lost for good, unless actions were taken to prevent it. Nature volunteers strongly believe they can make a real difference. Through active involvement in nature care, they can change the development and achieve a better outcome for the future. As all other volunteers, nature volunteers like a visible outcome. For example, seeing the progress in the habitat they help manage, restore or conserve brings great satisfaction. A study by Grese et al. (2000) (Schroeder 2000) contributed to understanding the motivation among environmental stewards. Besides nature values, they also found a *spirituality factor*, including the joy of the outdoors, a sense of community and a self-declared "friendship with nature"-feeling.

In 2001 Ryan et. al. evaluated the relationship between volunteer commitment and motivations in an outdoor setting. They identified five motivational functions of volunteering; 1) Learning: using the volunteer opportunity to learn new things about the environment, 2) Helping the environment: an

opportunity to do something good for the environment, 3) Social: meeting new people or see family and old friends, 4) Reflection: using the volunteer experience to reflect 5) Project organization: the opportunity to work at a well-organized project, where time was used efficiently (Ryan et. al. 2001). In 2003, Gooch elaborated the theory on environmental volunteers, when she found that place or local environment attachment was the motivating factor for her group of volunteers.

Again in 2012 Asah and Blahna found motivational factors aligning with previous studies, in an urban conservational context. They found, environment concern and place attachment to be the most important motivators. They also found the need to contribute to the local community, the need for social interaction and enhancement opportunities including ego defence (protective) to be influential and lastly the opportunity to learn or improve career. They had a factor called *escape and exercise* which combined a need to get away from the trivia of everyday life with a need for exercise.
In 2012 the research of motivation developed further, when Jacobsen et. al. (2012) was the first to combine demographic information with motivation. They found, among other, that years of volunteering was negatively correlated with the advancement of career and positively correlated with helping the environment. In 2015 Alender investigated motivation and demographics in a citizen science context. As many others, she found motivation factors strongly associable with the *VFI*. Environmental values still seem to be the strongest motivator for nature volunteers. She found it to be closely followed by *protective* motives, defined more specific as a chance to get outside and connect with nature and *understanding* (learning or contributing to knowledge). Also, in 2015 Selinske et at. investigated the motivation, satisfaction and preservation of landowners in a private land conservation program in Africa. They found that environmental or conservational values were the strongest motivator, closely followed by place attachment (as the participants often lived on the land they helped conserve). They also investigated the satisfaction with the conservational stewardship program and found that satisfaction was strongly linked to learning motivation.

3.2.5 Summary

Volunteering is more prominent around the world, compared to Denmark. This can be explained by the fact, that the Danish state manages many of the tasks elsewhere solved by volunteers. 39 % of the Danish population volunteer but only 1 % volunteer for nature.

Many theories have been used trying to understand the behaviour of motivations behind volunteering, most prominent is *the theory of planned behaviour and functional approach*.

When studying volunteering in general, studies showed that people who volunteer often were associated with the labour market and had a large social network. They were also well-educated, wealthier and healthier, than people which did not volunteer. Demographics found to affect volunteering were age, gender, education, children and social relations and ties. The most precise predictor was said to be education.

Nature volunteers all seemed to share a strong concern for the condition of nature, as environmental, conservational and nature values often were the most prominent motivators. However, volunteers also participated for personal benefits e.g. gain through outdoor experiences or the social opportunities of the environmental activities (O'Brien, Townsend, and Ebden 2008). Learning and social motivation were also often expressed among nature volunteers. In general, all found motivations can somehow be linked back to the theories presented in *3.2 Volunteering and motivation*. Apart from these motivational factors, nature volunteers were motivated by being outdoors or having an attachment to the area, environment or place they manage.

4 Methods and data analysis

4.1 The organizations and study areas

Prior to project start, grazing organizations were randomly selected using a *Nature management map*, constructed by The Danish Society for Nature Conservation (Naturplejekortet. 2017). All responding organizations were asked to, participate in a questionnaire-round among their members and a flora investigation of their area(s). The organizations responding positively was accepted into the project. 25 organizations were finally selected.

The participating organizations (Figure 1) were spread across Denmark, dominating locations on Zealand's north-eastern part, with few organizations located on Funen and in Jutland. Referring to the *Nature management map* a dominance of organizations were seen on the east cost of Zealand and Funen and around Vejle in Jutland. The participating organizations were not geographically representative, but they represented the same trend seen in the *Nature management map.*

Figure 1:The location of the 25 participating organizations. 1: Dalbyhoj grazing organization (DH), 2: Bondemosens grazing organization (BM), 3; Arrenaes grazing organization (AN), 4 Copenhagen grazing organization (CPH), 5: Furesoe grazing organization (FS), 6: Hjortespring nature conservation association (HS), 7: Hojmosen grazing organization (HM), 8: Jyllinge Holme sheep association (JH), 9: Kasted fen grazing and conservation organization (KF), 10: Kelleris grazing organization (KR), 11: Kodriverne (KD), 12: Konusserne (KN), 13: Munksoegaard grazing organization (MSG), 14: Nivaa sheep breeding association (NSBA), 15: Petersminde grazing organization (PM), 16: Saerlose grassland forest boar and grazing organization (SG), 17:Slaglunde grazing organization (SL) 18: Slotsmosens grazing organization (SLM), 19: Soellerod nature conservation- & grazing organization (SOR), 20: Sondermarkens grazing organization (SOM), 21: Soroe grazing organization (SR), 22: Svogerslev grazing organization (SVL), 23: Taarnby conservation organization (TB), 24:The grazing organization of Avedoere salt meadow (AS), 25: Utterslev grazing organization (UT). The island of Bornholm was not included, as no organization were located there.

All organizations were started as an initiative to manage a certain area. The formation of grazing organization is often encouraged or kick-started by the municipality, local department of The Danish Society for Nature Conservation or a local enthusiast (Danmarks naturfredningsforening 2006). After formation, the organizations are self-driven often in collaboration with the owner of the area they manage.

Most organizations were formed after the turn of the century around larger cities, such as Copenhagen. The managed areas are most likely under 10 Ha and owned by the municipality, covered fully or partly by a conservation order e.g. §3. The owners often already had an obligation to manage the area, e.g. state-owned §3 areas are protected by law to be managed, to avoid overgrow by trees and scrubs.

All organizations had a similar purpose ranging from promoting biodiversity, create good conditions for endangered habitats and/or endangered species (Hjortespring grazing organization) to nature conservation in the Nivaa valley (ådal) and the dissemination of sheep and their significance in nature management (Nivaa sheep breeding association). Most of the organizations had a dual-purpose: 1) To manage and conserve nature and 2) to produce ecological and ethical responsible meat. The first dual-purpose, concerning both meat and nature management, belonged to an only-grazing organization, founded in Sengelose in 1991 (Hjortsø et al. 2006). A few of the organizations were committed to communicating about the animals' values as nature managers, biodiversity or the foods way from field-to-table. (Soroe-, Kelleris-, Copenhagen grazing organization and Nivaa sheep breading association).

Most grazing organizations practise summer grazing between May and September, with leased or brought (The grazing organization of Avedoere salt meadow) animals. However, some grazing organizations have year-round grazing (Munksoegaard grazing organization). When choosing this possibility, rules are different and there are fewer animal breeds to choose from, as they must be suited to the Danish winter (Danmarks naturfredningsforening 2006). The members handle the daily supervision. The organizations with summer gazing get the opportunity to buy meat from *their animals* at the end of the summer. All organizations independent of animal-model get their animals from a farmer, the animals used for grazing are often heifers or steers, but sometimes also cattle with calves or bulls.

The 25 participating organizations' similarities and differences regarding foundation year, conservation orders, ownership of their area, facilities, economical support, number of members and animals and species of the animals, can be seen in ,Table 5.

*Table 5: The basic information for the 25 grazing organizations, incl. Name of organization, year of foundation, area size, land owner, economic support, advice contact, animal, number f animals***.*

Organization	Foundation year	Area size** (Ha)	Land owner	Conservation order	Economic support/funding (EU, Ha etc.)	Does the owner provide facilities (fencing, water, power etc.)	Advise contact	Number of members	Animal	Number of Animals
Arrenaes grazing organization (AN)	2013	8.5	The Danish Nature Agency	General conservation order and §3 protection; grassland (partly)	Support pr. Hectare and EU subsidies	Fencing and water	Agrovi	50	Cattle	12
Bondemosens grazing organization (BM)	2002	7.7	Nyborg municipality	§3 protection; fen	Support pr. He and grazing subsidies	Fencing and power	None	40	Cattle	10
Copenhagen grazing organization (CPH)	2014	25	Copenhagen municipality	§3 protection; fen (North enclosure)	None	Fencing	None	144	Cattle	17
Dalbyhoj grazing organization (DH)	2008	7.5	Kerteminde municipality and Odense harbour	§3 Protection; grassland	None	Fencing	None	34	Cattle	9
Furesoe grazing organization (FS)	2002	7	Private	Conservation order (new), §3 protection; fen (partly)	None	none	None	25-30 households	Cattle	6 + calves
Hjortespring nature conservation association (HS)	2002	8.1	Herlev municipality	General conservation order. FTF enclosure partly §3 protected; fen	None	Fencing, power and water	None	48 households	Cattle & sheep****	9 cattle, 14 lambs, and 12 sheep
Hojmosen grazing organization (HM)	2016	4	Copenhagen municipality	General conservation order. §3 protection; meadow	Other	A club house shared with the football club	None	80	Cattle	4
Jyllinge Holme sheep association (JH)	1990	11	The church and Roskilde municipality	Natura 2000 : Semi-natural dry grasslands and shrubland (6210) and Atlantic salt meadow (1330), and §3 protection	Grazing subsidies, agricultural subsidies	Fencing	None	20	Sheep	36 sheep, 1 ram and lambs
Kasted fen grazing and conservation organization (KF)	2008	9.1	Aarhus municipality and private	Enclosure 1+ New: §3 protection fen (partly). Enclosure 2; §3 protection, meadow enclosure 3 §3 protection; fen and meadow	Grazing subsidies	Fencing and water	None - resources within the organization	85	Cattle	15
Kelleris grazing organization (KR)	2013	8	The Danish Nature Agency	General protection order	None	Water & shelter	None	21 households	Cattle & sheep****	8-10
Kodriverne (KD)	2008	8	The Danish Nature Agency	§3 protection; fen and meadow	None	Fencing, water, power and shelter	None	approx. 50	Cattle	8
Konusserne (KN)	2008	2	Private	§3 protection fen and grassland	None	None*	None	9 households (2 inactive)	Cattle	2

Munksoegaard grazing organization (MSG)	2001	18.8	Munksoegaard and Roskilde municipality	Enclosure F, §3 protection; fen and meadow.	Grazing subsidies	Fencing, power and water	None	5	Cattle	10
Nivaa sheep breeding association (NSBA)	1991	3	Den Hageske Stiftelse	§3 protection; meadow and grassland (small parts near the edges)	Other	None	Sheep breeders and experts	98	Sheep	14
Petersminde grazing organization (PM)	2015	4	Vejle municipality	§3 protection; grassland	None	Fencing	None	13	Cattle	4
Saerlose grassland forest boar and grazing organization (SG)	2016	2.3	private	§3 protection: Grassland. Natura 2000, Asperulo-Fagetum beech forests (9130), a small part.	None	Fencing, water and power	Anna Bodil Hald, (one time)	14	Cattle	2
Slaglunde grazing organization (SL)	2006	5.5	Egedal municipality	§3 protection; meadow	None	None	None	7+	Cattle	10
Slotsmosens grazing organization (SLM)	1996	4	Frederikssund municipality	§3 protection: Fen. Part of the enclosure	None	Power and materials for fencing	None	16	Cattle	4
Soellerod nature conservation- & grazing organization (SOR)	1999	3.2	Jaegersborg forest district	General conservation order, Part of Soellerod National park	None	Fencing, power and water	None	32	Cattle	8
Sondermarkens grazing organization (SOM)	2009	12	Vejle municipality	None	None	Fencing and power	None	30	Cattle	3
Soroe grazing organization (SR)	2006	20.6	Stiftelsen Soroe Akademi	General conservation order, §3 protection meadow for Banefolden (BFO) and Bagflommen (BFL) §3 protection grassland Flommen (FL) §3 meadow, Bimosen (BM)	None	Fencing, power and water	None	40 households and persons	Cattle	25
Svogerslev grazing organization (SVL)	2017	6.4	Roskilde municipality	Natura 2000 for the area as Semi-natural dry grasslands and shrubland (6210) (small part)	None	Fencing, power and water	None	15	Sheep	34
Taarnby conservation organization (TB)	1997	1	Taarnby municipality	General conservation order.	None	None	None	10	Cattle	6
The grazing organization of Avedoere salt meadow (AS)	2002	13	Hvidovre municipality	General conservation order §3 protection; salt meadow	None	Fencing and shelter	None	24 households	Sheep and cattle	23 (7 sheep,11 lambs and 5 cattle
Utterlev grazing organization (UT)	2007	2	Copenhagen municipality	General conservation order and §3 protection, meadow	None	Fencing, power, water and mowing	None	18 households	Sheep	9 and lambs

* The fence was funded by Nyborg municipality. ** Area sizes were found on ArealInfo 2017 and were therefore approximate numbers. *** Number of animals were based on season 2017. **** Only the cattle grazed enclosures were investigated.

4.2 Data collection

The Data collection and chosen method for the nature and motivation assessment is presented in this chapter.

4.2.1 Nature observations

A vegetation analysis was performed to access nature status, quality and potential within the 25 organizations, on a total of 38 subareas. The investigated habitats were distributed across 141 ha, representing approx. 69 % of the organizations' available areas and composed, grassland, meadow, fen and salt meadow habitats.

Species lists were made[5], by reviewing each enclosure and registering all plants, not too withered, too small or too underdeveloped for identification. 10 raunkjaer circles of 0.1 m^2 were randomly made across the enclosures – raunkjaer circling is the Nordic correspond to the quadrat method (Kjellsson and Simonsen 2012). In accordance to NOVANA and §3 registration (Fredshavn, Nygaard, and Ejrnæs 2009), a 5-meter documentation circle was made in each investigated enclosure, or subarea within an enclosure. Subareas within the same enclosure were made, when an enclosure held a clear separation between grassland, meadow, fen or salt meadow habitat. The definition was made by the species present, soil water content and conservation order (Fredshavn 2010). The documentation circle was placed at the spot with the visually largest potential, at the time of visit and not on a representative spot. The circles made in September and May/June were not places at the same spots. A soil sample was taken in the upper soil layer (0-5 cm), within the documentation circle. This procedure was performed twice, in September 2017 and May/June 2018. The criteria of not registered species were the same in all aspect of the vegetation analysis and at both times of visit.

The books *Den store nordiske flora* and *Dansk flora* were used for plant identification along with the support from members of the Danish website fugleognatur.dk.

Microsoft Excel 2016 was used to calculate Ellenberg values[6] and all indices connected to flora registration. All other statistics connected to flora registration was completed using Rstudio v. 3.4.2 (RStudio Team 2017).

4.2.2 Volunteers and motivation

A quantitative approach was selected for this project to get quantitative data, more suitable for comparisons with the nature assessment.

[5] Can be provided at request.
[6] Can be provided at request.

The construction of the questionnaire

The questionnaire was designed as a combination of demographic (gender and age) values, socioeconomic status variables (education), motivation and attitude statements (Appendix 3). All questions regarding motivation were designed as a combination of theories and with outlines in volunteer motivation research (Table 6).

Table 6: An overview of the 22 motivational questions, including literature references, from the research which they were inspired.

Motivational question	**Source**
Q1: I am concerned about loss of nature and biodiversity in Denmark	Selinske et al. 2015
Q2: I feel it is important to take care of / protect/improve nature	Selinske et al. 2015, Bramston, Pretty, and Zammit 2011 (adapted)
Q3:Through my membership, I learn about flora and fauna in Denmark	Selinske et al. 2015, Asah and Blahna 2012, Bruyere and Rappe 2007, Guiney and Oberhauser 2009, Ryan, Kaplan, and Grese 2001 (adapted)
Q4: Participating in the grazing organization gives me a new perspective on things	Selinske et al. 2015, Clary et al. 1998 (adapted)
Q5: I feel we today do enough to protect nature	
Q6: I can share and pass on my knowledge and opinions about nature and animals	Clary et al. 1998 (adapted)
Q7: By being a member of the organization I can pass something on to other people	
Q8: The organization is, for me, a way to meet new people	Selinske et al. 2015, Clary et al. 1998 (adapted)
Q9: The organization's social arrangements are important to me	Selinske et al. 2015, Clary et al. 1998 (adapted)
Q10: I find that, in the organization, we contribute to the local community	Asah and Blahna 2012; Guiney and Oberhauser 2009 (adapted)
Q11: Through the organization, I have been able to make a difference	Bramston, Pretty, and Zammit 2011 (adapted)
Q12: People in close to me support my decision to be a member of a grazing organization	Clary et al. 1998 (adapted)
Q13: The people close to me believe it is important to make active efforts for nature	Selinske et al. 2015 (adapted)
Q14: I am a member of the organization primarily for the meat and /or wool of the animals	
Q15: I am a member of the organization, to associate/be with others	Clary et al. 1998 (adapted)
Q16: I am a member of the organization, because I enjoy spending time outdoors	Bruyere and Rappe 2007, Guiney and Oberhauser 2009 (adapted)
Q17: I am a member of the organization because it provides good stories to tell family, friends and acquaintances	
Q18: I expect to be a member of the organization, for at least the next 5 years	
Q19: I consider joining another organization within the next 5 years	
Q20: The organization provides an opportunity to protect and manage an area, I feel connected to	Selinske et al. 2015 (modified)
Q21: My experiences with the organization are personally enriching	Selinske et al. 2015
Q22: The opinions, of people in my circle, are important to me	Selinske et al. 2015 (adapted), Clary et al. 1998

The questionnaire consists of five sections: One required section, collecting background and demographic information. Two voluntary sections with statements about the members' motivation, evaluated on a 5-point Likert scale from strongly disagree to strongly agree, including an *I don't know*

option. One voluntary section about the members' attitude toward membership (incl. sharing of the organization's values, cause of membership and connection to the organization). To finish, one voluntary section, with open-ended questions, they were designed to access the participants' attitude, towards what motivates them the most by being members, if they like the idea of a union for all grazing organizations in Denmark and finally an opportunity for them to comment or share any additional thoughts, they feel were not covered by the questionnaire.

The questionnaire was piloted before distribution, by Laanshoj grazing organization, and in the Facebook group *Grazing organizations for nature active citizens* (Græsserforeninger for naturaktive borgere). Piloting tested the construction, length and question design on a somewhat representative group.

Section separation was made to make the questionnaire seem short. All answer-options within one question were shuffled. This method was chosen, instead of question-shuffling, as this confused the pilot group.

An online approach was adopted in this project, due to funds and the geographic distribution of participants. All questionnaires were distributed in Danish as the participants were Danish speaking. The questionnaire was constructed using Google Forms and distributed by email to the chairmen of the organizations. The chairmen then distributed it to the members of their organization, in accordance to Danish law, the Privacy Act (Lov om behandling af personoplysninger 2017). The questionnaire was tested in all standard browsers (Internet Explorer, Firefox, Chrome and Safari) both the newest and older versions and on different devices (PC, MAC, tablets, iPhone and android phones).

Questionnaire data were collected between 28 of November 2017 and 14. of January 2018. Reminders and small summaries of the vegetation registrations, from September 2017, were sent to all organizations after two weeks After further two weeks the data collection was initially planned to end, by inactivating the questionnaire link. Due to the Christmas holiday and two organizations missing in the sample, the data collection period was extended with approx. two weeks.

Descriptive statistic was constructed using Microsoft Excel 2016. All other statistical analyses connected to questionnaire analysis were completed using R Studio v.3.4.2 (R Studio Team 2017).

4.3 Post processing and statistical analysis

This chapter presents the post processing and statistical analysis chosen to process the collected data for the nature and the motivation assessment.

4.3.1 Nature condition and potential

Species composition is essential information in the identification and evaluation of habitats. The plant community was evaluated, as plants are nonmobile species, completely dependent on the properties and status of their surroundings.

Species indicators and current condition

Ellenberg values for light (L), soil moisture (F), reaction referring to soil or water acidity (R) and nitrogen (N), were calculated in the assessment of the plant community (Appendix 1). All Ellenberg values were lookups (Bunce et al. 1999, p. 13-45). From the soil samples water content (%), total N (%), C (%) and pH were measured (Appendix 1). If an organization had subareas within an enclosure Ellenberg values, water content (%), total N (%), C (%) and were found for both circles.

Pearson's correlation was applied to check for linear correlations between soil properties water content (%), pH and C/N ratio and Ellenberg F, R and N. It was completed using Rstudio v. 3.4.2 (RStudio Team 2017) the ggpubr package v. 0.1.6. Ellenberg N was compared against the C/N ratio, and not the total N, as both Ellenberg N and the C/N ratio is a measure for available nitrogen, where total N is the total amount of nitrogen, including unavailable nitrogen.

Species ordination and species indicators

Ordination can summarize community data, placing similar species or samples close together and dissimilar further apart. Ordination can describe relationships between species composition and environmental gradient, which may influence the species composition (Freitas 2013).

A three-dimensional ordination, from the combined plant list data (September 2017 and May/June 2018), was completed, using Rstudio v. 3.4.2 (RStudio Team 2017) the vegan package version 2.4-6, and scatterplot3d v. 0.3-41 and vegan3d v. 1.1-1.

Non-metric multidimensional scaling (NMSD) was chosen. NMSD ordination, using Jaccard dissimilarity makes ordination for present-absent possible. Jaccard dissimilarity was chosen, as it is comparable to Soerensens index, which can tell the difference in species composition between locations. The metric properties show that 1) if two sites are identical the distance between them are zero and 2) if two sites are different the distance between them are larger than zero.

A species indicator analysis was completed using Rstudio v. 3.4.2 (R Studio Team 2017) the labds package v. 1.8-0, for habitat and animal type. The method combines species relative abundance with the frequency of occurrence in different sites. Indicator species were defined as the most typical species of each group (habitat or animal), found mostly within the group and present at most sites, belonging to the investigated group (Dufrene et al. 2013).

Diversity and animal units

Based on the total of 20 raunkjaer circles from September and May/June, Simpson and Shannon diversity indices were calculated (Appendix 1)[7].

Simpson's and Shannon's indices were chosen in the assessment of the diversity from the raunkjaer circling. Simpson indices because they work at relative small sample sizes and are least sensitive toward, if the sample size were a representative part of the population. Shannon because it assumes individuals are randomly sampled, which complement the design of the raunkjaer method.

To be able to compare the different areas animal units were calculated. A mean of diversity was found if more enclosures were investigated, as the animal units are across all available area.

They were calculated based on the Nature and Business's (Natur og Erhverv) calculations for number of animal units and harmony area, in accordance with the Manure Order, rules of 1 of August 2014 (version 8.7 – June 2015). All cattle were measured as 6 to 27-month, heavy breed, except Munksoegaard grazing organization which had a bull and suckler cows as they do not slaughter their animals every season. If there were observed any calves, they were registered as heifers and steers 0 to 6 months. Sheep were registered as sheep with lambs.

Nature potential and habitat definition

Structure and species indices were calculated as they are comparable across different habitat types and areal sizes (Fredshavn 2010). Both indices contribute to the nature conservation status index, which is used in the assessment of nature quality and potential (Appendix 1)[8].

When calculating structure index, species index and nature conservation status index, it was necessary to categorize each location within EU habitat nature (European Commission 2007). As the method has not yet (2018) been developed for non-habitat-nature.

[7] Results for Shannon and Simpson indices can be proved on request.
[8] Structure, species and nature conservation index results can be provided on request.

§3 protection is an efficient baseline for habitat categorization. Subtypes or transition zones are likely to occur within the investigated sites. All cultivated subdivisions were omitted in this project, as it was necessary to identify habitat nature to calculate indices. For areas not definable, no structure-, species- or nature conservation status index was calculated.

The main investigated areas were meadow, grassland, fen and salt meadow habitats. Grasslands subdivide into: Species-rich Nardus grasslands (6230) or Semi-natural dry grassland and shrubland (6210), mainly separated according to soil acidity. There is only one meadow habitat in Denmark Molinia meadows (6410). Salt meadow habitats could be Atlantic (1330) or Inland salt meadow (1340), depending on a location. Fen habitats in Denmark are divided into: Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (7210), Petrifying springs with tufa formation (7220) or Alkaline fen (7230) (Habitatdirektivets naturtyper 2018).

All habitats were categorized after habitat description anno 2016 (Habitatbeskrivelser, årgang 2016 2018) the number of positive species according to field table (Naturkvalitetsplanlægning 2017) and conservation order, §3 meadow, fen, salt meadow or grassland. In the field, field tables and the app *§3-nature* were used. Afterward, the classification was reviewed in accordance to habitat description anno 2016 (Habitatbeskrivelser, årgang 2016 2018) and if necessary the Ellenberg values for the registered areas[9]. All categorizations can be seen in table 7.

[9] Plant lists and Ellenberg values can be provided on request.

Table 7: Habitat categorization of the 38 investigated subareas.

ID	Habitat*	Reason
Arrenaes grazing organization (AN)	Grassland (6210)	Most indicators for calcareous soil, as *Medicago lupulina* (humle sneglebælg), *Centaurea jacea* (alm. knopurt), *Leucanthemum vulgare* (hvid okseøje) and scrubs as *Rubus sect. Rubus* (brombær), *Crataegus laevigata* (alm. hvidtjørn) and *Rosa canina ssp. Canina* (glat hunde-rose).
Bondemosens grazing organization A1 (BM)	Grassland (6230)	§ 3 protected fen. Drier area with a clear dominance of acidic soil indicators, and positive grasslands species such as *Galium saxatile* (lyng snerre) and *Campanula rotundifolia* (Liden klokke).
Bondemosens grazing organization A2 (BM)	Fen (7230)	§ 3 protected fen with indicators of calcareous soil, such as *Persicaria amphibia* (vandpileurt), *Mentha aquaticam* (vandmynte), *Epilobium parviflorum* (dunet dueurt) and *Epilobium hirsutum* (lådden dueurt). This indicates calcareous soil and the fact that Anna Bodil Hald, in July 2017, classified part of the areas as a spring-fen (vældmose) (Natur & Landbrug 2016).
Copenhagen grazing organization A1 (CPH)	Meadow (6410)	The moist areas had meadow potential, with indicator species as *Carex panicea* (hirsestar), *Carex flacca* (blågrøn star) and *Juncus effuses* (lysesiv).
Copenhagen grazing organization A2 (CPH)	Grassland (6230)	The dry areas have grassland potential, with *Potentilla erecta* (tormentil) a very positive species for acidic grassland.
Dalbyhoj grazing organization 1 (DH)	Grassland (6210)	Most indicator species connected to calcareous.
Dalbyhoj grazing organization 2 (DH)	Grassland (6210)	Adjacent to enclosure 1.
Furesoe grazing organization A1 (FS)	Fen (7230)	Partly § fen, and the rest had a general protection. Samples were taken within the protected fen habitat, with indicators of calcareous soil, such as *Veronica beccabunga* (tykbladet ærenpris) and *Cardamine amara* (vandkarse).
Furesoe grazing organization A2 (FS)	Grassland (6210)	Partly §3 fen, and the rest had a general protection. Dry area with calcareous soil indicators such as *Medicago lupulina* (humle sneglebælg), *Prunella vulgaris* (Alm. Brunelle) and *Crataegus monogyna* (engriflet hvidtjørn).
Hjortespring nature conservation association KDF (HS)	Meadow (6410)	Meadow species *Epilobium parviflorum* (dunet dueurt) and a location next to a reed bed.
Hjortespring nature conservation association HGF (HS)	Grassland (6230)	Dominated by *Dactylis glomerata ssp. Glomerate* (alm. hundegræs) which can indicate grassland habitat, and positive indicator of acidic soil *Stellaria graminea* (græsbladet fladstjerne).
Hjortespring nature conservation association FTF (HS)	Meadow (6410)	Partly §3 protected meadow, with indicator species with the indicator species *Potentilla erecta* (tormentil).
Hojmosen grazing organization (HM)	Meadow (6410)	§3 protected fen, adjacent to a football field. Indicator species such as *Juncus bulbosus ssp. Bulbosus* (liden siv).
Jyllinge Holme sheep association (JH)	Grassland (6210)	Natura2000 site, protected Semi-natural dry grasslands and shrubland (6210) and Atlantic salt meadow (1330), both registrations taken within habitat 6210.
Kasted fen grazing and conservation organization (KF) 1 - NEW	Meadow (6410)	Partly §3 protected fen, but with positive and negative meadow species already present, as *Dactylis glomerate* (alm. hundegræs) and *Pastinaca sativa* (pastinak).
Kasted fen grazing and conservation organization (KF) 2	Meadow (6410)	Protected §3 meadow.
Kelleris grazing organization (KR) 2	Grassland (6230)	Overweight of acidic soil indicators, as *Danthonia decumbens* (tandbælg), *Plantago lanceolate* (lancetbladet vejbred) and presence of *Calamagrostis epigeios* (bjergrørhvene).

Kelleris grazing organization (KR) 3	Grassland (6230)	Overweight of acidic soil indicators, as *Danthonia decumbens* (tandbælg), *Plantago lanceolate* (lancetbladet vejbred) and presence of *Calamagrostis epigeios* (bjergrørhvene).
Kodriverne (KD)	Meadow (6410)	§3 meadow, as only a small part in the western end is §3 protected fen.
Konusserne (KN)	Fen (7230)	Protected §3 fen and grassland. Categorized as fen habitat, as the grassland was a minor part of the enclosure. Most species indicated calcareous soil, species such as *Persicaria amphibia* (vandpileurt), *Mentha aquaticam* (vandmynte) *Epilobium parviflorum* (dunet dueurt) and *Epilobium hirsutum* (lådden dueurt).
Munksoegaard grazing organization (MSG) E	Grassland (6210)	Calcareous grassland, as most plants were indicators of grassland with calcareous soil e.g. *Dactylis glomerata* (alm. hundegræs), and *Medicago lupulina* (humle sneglebælg).
Munksoegaard grazing organization (MSG) F	Meadow (6410)	§3 protected meadow.
Nivaa sheep breeding association (NSBA)	Meadow (6410)	§3 grassland and meadow. Meadow was the largest part, with species such as *Cynosurus cristatus* (alm. kamgræs) and *Agrostis stolonifera* (kryb hvene).
Petersminde grazing organization (PM)	Grassland (6230)	§3 grassland, with acidic soil indicator species such as *Deschampsia flexuosa* (bølget bunke), *Agrostis capillaris* (alm. hvene) and *Campanula rotundifolia* (liden klokke).
Saerlose grassland forest boar and grazing organization A1 (SG)	Grassland (6230)	A drier area with acidic soil indicator species such *as Stellaria graminea* (græsbladet fladstjerne) and *Campanula rotundifolia* (liden klokke).
Saerlose grassland forest boar and grazing organization A2 (SG)	Meadow (6410)	A moist area dominated by sedges and *Hypericum* (perikon) species.
Slaglunde grazing organization (SL)	Meadow (6410)	Protected §3 meadow
Slotsmosens grazing organization (SLM)	Meadow (6410)	Protected §3 fen. A mosaic of both fen, meadow, grassland and culture habitat. In accordance to an earlier study, 98 species out of 125 species belonged to meadow species (Hald and Nielsen 2004).
Soellerod nature conservation- & grazing organization (SOR)	Grassland (6230)	Dry area with acidic soil indicator species, such as *Deschampsia flexuosa* (bølget bunke) and *Rumex acetosa* (alm. syre).
Sondermarkens grazing organization (SOM)	Meadow (6410)	Meadow habitat species e.g. *Carex acutiformis* (kær star) and *Dryopteris carthusiana* (smalbladet mangeløv).
Soroe grazing organization (SR) BFL	Meadow (6410)	§3 protected meadow.
Soroe grazing organization (SR) BFO	Meadow (6410)	§3 protected meadow.
Svogerslev grazing organization (SVL) G	Grassland (6210)	A small part of the enclosure was already categorized as habitat type 6210.
Svogerslev grazing organization (SVL) WG	Grassland (6210)	In extension of Svogerslev grazing organization (SVL) G, not grazed at time of investigation.
Taarnby conservation organization (TB)	Meadow (6410)	Adjacent protected Atlantic salt meadow area, no clear salt adapted species, why it must be a transition zone.
The grazing organization of Avedoere salt meadow (AS)	Salt meadow (1330)	Protected Atlantic salt meadow.
Utterslev grazing organization (UT) 1	Meadow (6410)	Protected §3 meadow.
Utterslev grazing organization (UT) 2	Meadow (6410)	Protected §3 meadow.

*Species-rich Nardus grasslands (6230), Semi-natural dry grassland and shrubland (6210), Molinia meadows (6410). Atlantic salt meadow (1330) and Alkaline fen (7230).

Biological status

The biological status was assessed on a reference scale from 0 to 1, where 1 is the optimal condition. The value of the nature conservation status index was translated into one of the five status classes (Appendix 2) analogous to the ecological status classes of the EU Water Framework Directive (Fredshavn and Skov 2005).

Many factors influence nature condition e.g. grazing pressure, grazing animal, years of continuous grazing and habitat type. An ANOVA was applied to September 2017, May/June 2018 and the combined dataset, to test effects of the categorical independent variables habitat and animal, on soil properties, Ellenberg values or nature indices. Linear regression was applied to September 2017, May/June 2018 and the combined dataset to find correlations for both Ellenberg values and soil properties and for the combined dataset also animal units pr. Ha. All tests were completed using Rstudio v. 3.4.2 (RStudio Team 2017) the ggpubr package v. 0.1.6.

4.3.2 The volunteers

Descriptive statistics will function as a presentation of the volunteer group participating in this project. For all questions percentages and number of answers will be used, to understand this volunteer group. A comparison with the general volunteer force in Denmark will be made, to investigate the differences and similarities.

Motivation analysis

A motivation analysis will be made containing an exploratory factor analysis for the total volunteer group and ordinal tests to analyse the effect and correlation between motivation and organization affiliation and demographic variables.

Factor analysis

An exploratory factor analysis was completed using Rstudio v. 3.4.2 (RStudio Team 2017) the psych version 1.8.3.3 and corrplot package version 0.84.

An exploratory factor analysis (EFA) attempt to uncover patterns in data (Yong and Pearce 2013). EFA is often used to understand the underlying factors in questionnaires, to facilitate interpretation. A large dataset is important for valid data, to get enough observations to contribute to each factor. A rule of thumbs is a ratio of 1:10, for a useful sample size e.g. this project has 22 motivational questions, hence the sample size must be at least 220.

Scree test and p-value were used to find the number of underlying factors. The scree test examines a plot of eigenvalues. The number of data points above where the curve naturally *break*s represent the

number of factors in the dataset. As confirmation of the scree test factor-prediction, the p-value is used. If the p value is above the chosen significant level ($p>0.05$), the tested number of factors are efficiently describing the underlying variables.

After determining the number of factors loading are used to group variables under the same factor. Only items loading above 0.30 are good enough to be included. Low loading can be kept, if they have a strong theoretical connection. Factors with lower than three variables were not considered valid and will be excluded from the data set (Costello, Osborne, and Costello 2005).

Correlation between motivation and demographics variables

Testing the demographic variables effect on motivation an ordinal approach was chosen. A CLM (Cumulative Link Model), was used to fit the data, as it was on Likert-scale (Christensen 2011). The ordinal fitted model was analysed using ordinal regression. This test was chosen as it can handle categorical data and will tell, if there is a correlation between the participants demographics and their motivation. Afterward, post hoc tests will be used to tell which demographic-options differ from one another.

Due to the nature of the collected data backward reduction was used, when fitting the model, to avoid collinearity between demographic variables. So that all significant variables, were significant on their own. It was chosen over a 10% significant threshold approach, as this approach does not too same extent correct for collinearity[10].

This test was completed using Rstudio v. 3.4.2 (RStudio Team 2017), package ordinal v. 2018.4-19 and for post hoc test package emmeans v. 1.2.1.

Differences between organizations

Investigating organization-affiliation-differences in the volunteers' motivation and attitude, a Kruskal Wallis analysis of variance and an ordinal ANOVA based on a CLM (Cumulative Link Model), were chosen, to test with or without the influence of the volunteers' demographics. To test which organizations differed from each other, a Dunn's post hoc test was performed and a post hoc test also revealed where members from different organizations overlapped.

A Kruskal Wallis analysis of variance will also be applied to test if the members from different organizations, differed in attitude towards their organization (membership cause. shared values, expectations, and human-nature relationship after joining).

[10] Results from the 10% threshold test can be provided on request.

The tests were completed using Rstudio v. 3.4.2 (RStudio Team 2017), the FSA package v. 0.8-19, the ordinal package v. 2018.4-19 and for post hoc test the package emmeans v. 1.2.1.

4.3.3 Relation between motivation and nature

Means of the nature conservation status index was found for organizations with more enclosures or more subareas within an enclosure. In the attempt to draw connections between the different organizations' volunteers and the nature status and potential on their areas.

A regression on a linear mixed effect model (LMEM), with the organization as random effect, was applied. This tested if the answers to the 22 motivation questions affected or correlated with the nature conservation status index measure on the managed areas.

A LMEM model was chosen as it can handle count data (Bolker et al. 2009). It allows both fixed and random effects, the members' organization were a random effect. It can handle that members belonging to the same group, might be more similar in opinions as they e.g. manage the same area, compared to members from different organizations.

An ordinal regression on a cumulative linear mixed model (CLMM), with the organization as random effect, was applied to check if the nature conservation status index measured on the organizations' areas has an effect or correlate with responses to the 22 motivation questions. A CLMM was chosen for this test, as it can handle the dependent variable being on a Likert-scale and as the LMEM model, it can handle random effects.

These tests were completed using Rstudio v. 3.4.2 (RStudio Team 2017), package lme4 v. 1.1-17 and package ordinal v. 2018.4-19.

4.4 Summary

Ellenberg values and the soil samples of total N (%), C (%), pH and water content (%), provides a snapshot and a more continuous measure of the habitat conditions. These will be compared.

Ordination and indicator analysis investigates the dissimilarities among organizations and the influence and external factors e.g. habitat and animal type.

In the estimation of the potential, status and in comparison, the nature conservation status index and species indices were calculated. An ANOVA and linear regressions will be applied to evaluate the conditions of the organizations' areas.

Motivation among the volunteers will be estimated through an exploratory factor analysis, trying to find underlying patterns. To evaluate how demographics, influence the volunteers' motivation, ordinal regression will be applied.

An ordinal ANOVA and Kruskal Wallis test of variance will be applied, in estimation of organization influence on the members motivation., finally a Kruskal Wallis test of variance will be applied, to investigate differences in attitude among members from different organizations.

Different linear mixed modes will access if the members' motivation affects the biological status (nature conservation status index) of the area they manage, or if the biological status affects their motivation for participating.

5 Results

This chapter will present results for the nature and volunteer assessment.

5.1 Nature status

In this project, 348 different species were registered, after two data collection trips, in September 2017 and May/June 2018.

5.1.1 Ellenberg values and soil properties

A Pearson's correlation test applied to Ellenberg values and soil properties for September 2017, and May/June 2018 showed that all Ellenberg values were correlated with its matching soil properties (Figure 2). The plants' Ellenberg F and Ellenberg R values were positively correlated with the measured soil water (water content %) and soil pH. At a low C/N ratio more nitrogen is available to the plants. This was seen by the inverse relation between plants' nitrogen preferences (Ellenberg N) and the C/N ratio. The same trends were seen for the May/June data, except for Ellenberg N and C/N ratio, where no significant correlation was found.

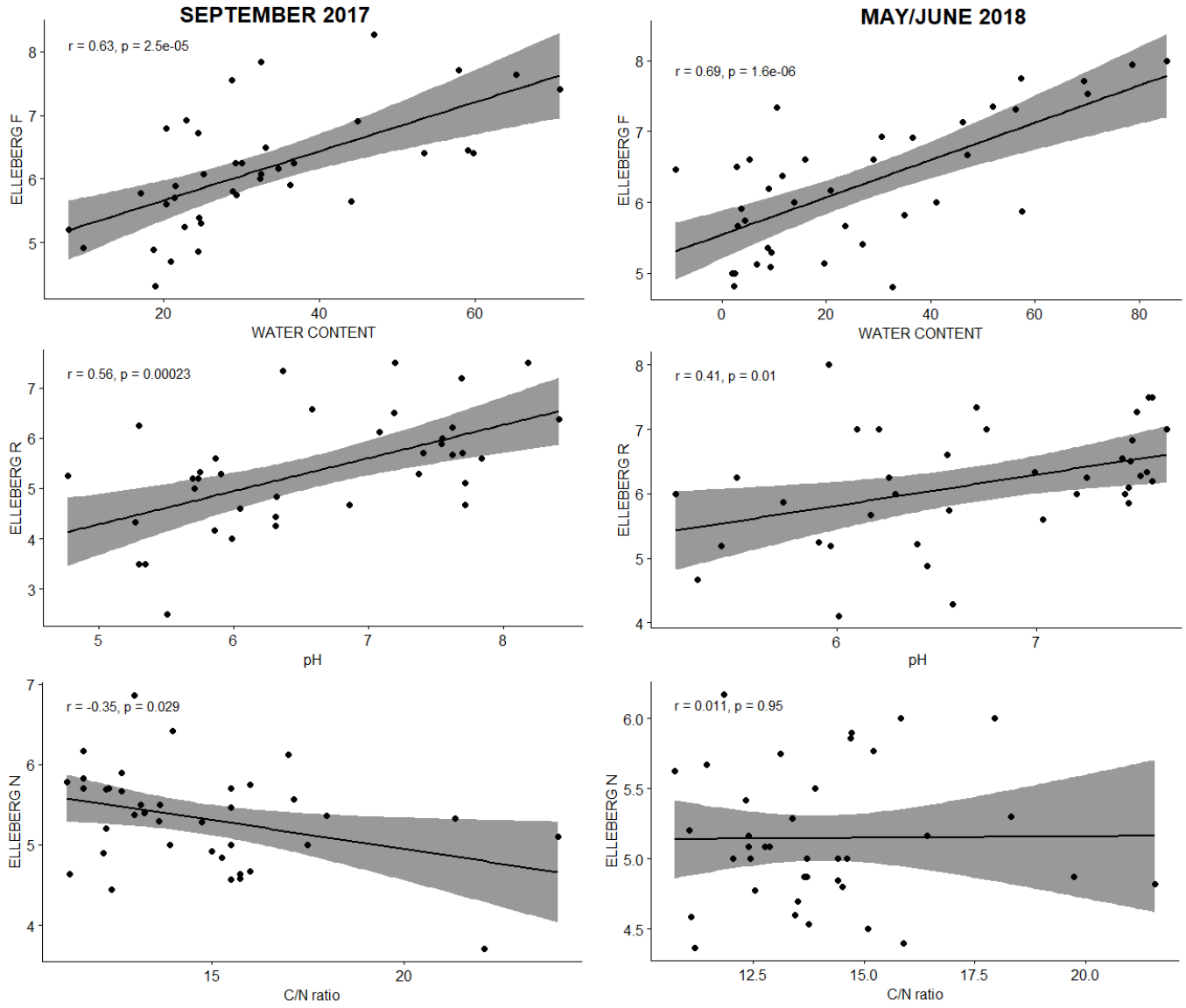


Figure 2: The correlation between Ellenberg F and soil water (water content), Ellenberg R and soil acidity (pH) and Ellenberg N and C/N ratio for September 2017 and May/June 2018.

5.1.2 Ordination and species indicator analysis

A three-dimensional ordination (stress=1.67) were applied to the plant communities. The grazing organization of Avedoere salt meadow and Konusserne were removed from the data, as they were the only organizations with salt meadow and fen habitats. Further, all combi-habitats, where one enclosure held more than one habitat, were removed as these represented four measurements and were not all the same combination[11].

[11] Bondemosens grazing organization and Furesoe grazing organization having a combination of grassland and fen and Copenhagen grazing organization and Saerlose grassland forest boar and grazing organization having a combination of grassland and meadow habitat.

Based on plant registrations alone, Svogerslev G, Jyllinge Holme and Munksoegaard E were similar in plant community composition, as they were placed close to one another. These three were all categorized as calcareous grassland 6210, with Jyllinge Holme being included in the Natura2000 network. Interestingly, was the grazed part of Svogerslev grazing organization's enclosure more similar in plant community composition, to the two other grassland habitats, than the ungrazed Svogerslev WG. In fact, it seemed that the enclosures Svogerslev G, Jyllinge Holme and Munksoegaard E were more similar in plant communities to the enclosure Kodriverne, which was categorized as meadow habitat, than they were at the ungrazed enclosure Svogerslev WG. The plant community composition of Hjortespring HGF and Slaglunde were relatively similar. These enclosures were categorized within meadow habitat and grassland, emphasizing that meadow and grassland share species pools. Arrenaes grazing organization and Petersminde grazing organization, were both grassland habitats. They were rather similar in plant community composition, even though they in this project were categorized as grasslands on calcareous and acidic soil. The plant community at Hjortespring KDF differs a lot form all other plant communities even though it physically was located close to both Hjortespring FTF and Hjortespring HGF and categorized as meadow habitat. This shows how diverse three closely located enclosures can be (Figure 3).

The investigated sites most different from one another, regarding plant community composition were Hjortespring KDF and the enclosures belonging to Utterlev grazing organization, which are meadow habitats. Further, the areas Soroe BFL and Kelleris 2, were very different form the areas Nivaa and Munksoegaard F. These were mostly meadow habitats, except Kelleris 2, suggesting that the most prominent diversification between plant communities could be found between grasslands and meadows (Figure 3).

The ordination releaveled which locations were similar in plant community composition. Emphasizing that even though many of the investigated areas were similar, some were totally different. It also visualized how difficult habitat categorization can be.

Influencing variables on the plant community composition for September were animal ($p=0.004$), habitat ($p=0.008$), total N (%) ($p=0.01$) and total C (%) ($p=0.04$) and for May/June the animal ($p=0.009$), habitat ($p=0.04$), total N % ($p=0.008$) and total C % ($p=0.03$).

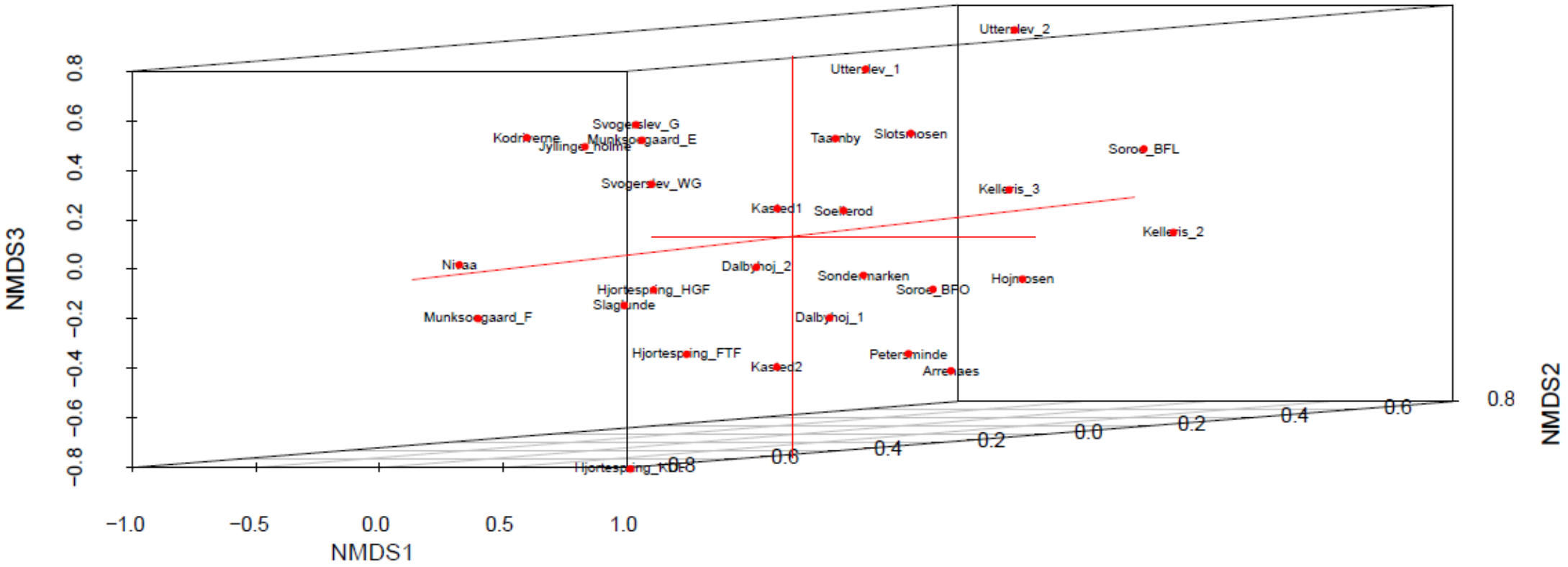


Figure 3: A visualization of the ordination for the remaining 19 organizations' 28 subareas, after data cleaning.

A species indicator determined if any species were related to either habitat or animal type. It showed that *Epilobium parviflorum* (dunet dueurt), and *Deschampsia cespitosa* (mose bunke) were related to cattle grazed areas. It was not possible to detect any species related to sheep grazing (Table 8).This suggests that cattle avoid *Epilobium parviflorum* (dunet dueurt) and *Deschampsia cespitosa* (mose bunke) or that cattle often are used as grazers in damper areas that these species prefer.

Elytrigia repens (alm. kvik) and *Cynosurus cristatus* (alm. kamgræs) indicated grassland habitat and *Carex acutiformis* (kær star) and *Agrostis stolonifera* (kryb hvene) indicated meadow habitat (Table 8). *Elytrigia repens* (alm. kvik) is a problematic species and *Cynosurus cristatus* (alm. kamgræs) is s a positive species in grassland and meadow habitats. *Carex acutiformis* (kær star) and *Agrostis stolonifera* (kryb hvene) are common species in meadow habitats and often indicators of calcareous soils.

Table 8: Indicator analysis for animal and habitat.

Indicator analysis			
Species	**Cluster**	**Indicator value**	**probability**
Epilobium parviflorum (dunet dueurt)	cattle	0.64	0.01
Deschampsia cespitosa (mose bunke)	cattle	0.5	0.05
Elytrigia repens (alm. kvik)	grassland	0.67	0.005
Cynosurus cristatus (alm. kamgræs)	grassland	0.48	0.02
Carex acutiformis (kær star)	meadow	0.38	0.02
Agrostis stolonifera (kryb hvene)	meadow	0.31	0.04

5.1.3 Effects on diversity and nature potential

An ANOVA determined effects of habitat and animal for Ellenberg values, soil properties and nature indices in September 2017 and May/June 2018. A linear regression determined correlations of soil properties, Ellenberg values and nature indices. The tables *15* and *17* (Appendix 4) show if effects or correlations were found, and a post hoc test determines where the differences were.

September

In September, the plants' moist preference (Ellenberg F) and soil water content (%), were significantly different between grassland and meadow and grassland and fen habitats (Appendix 4, Table 16). In both cases, soil water and the plants' soil water preferences (Ellenberg F) were higher at meadow and fen habitats compared to grasslands (Figure 4 A, C). This was to be expected as the habitat characterization was based upon meadow and fen habitats being moister than grasslands.

Meadow habitats had significantly higher amounts of total N (%) and C (%) compared to grasslands. fen habitats only differed from grasslands regarding amount of C (Appendix 4, Table 16).

The grazing animal type influenced the plants' pH (Ellenberg R) and nitrogen (Ellenberg N) preferences (Appendix 4, Table 16), suggesting that plants at sheep grazed areas prefer more calcareous soils and were more nitrogen demanding, (Figure 5). This may not be an effect of sheep grazing.

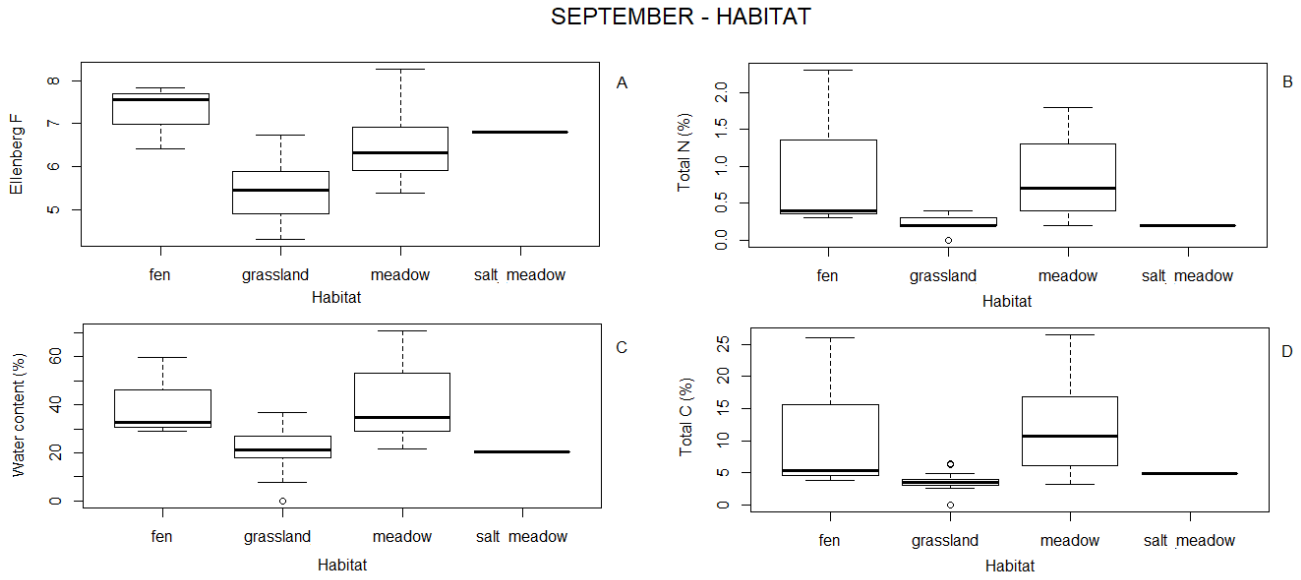


Figure 4: Significant results. A) habitat and Ellenberg F, B) habitat and total N (%), C) habitat and soil water (water content %), D) habitat and total C (%).

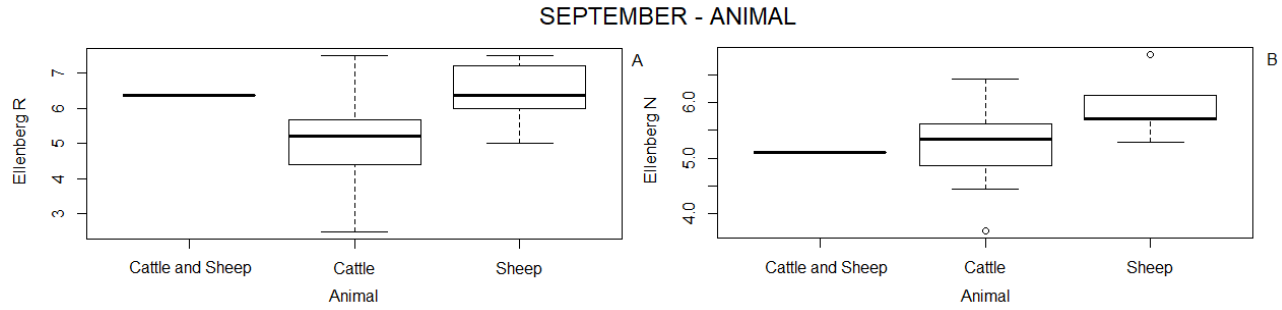


Figure 5: Significant results, A) animal and Ellenberg R, B) animal and Ellenberg N.

The plants' soil pH and nitrogen preference affected the diversity status (Appendix 4, Table 16). The plants' preference to soil pH (Ellenberg R) and nitrogen (Ellenberg N) increased, the diversity status (species index) decreased (Figure 6 A, B). An inverse relation was also found between nature conservation status index and Ellenberg N (Appendix 4, Table 16), where the nature conservation status index decreased as the plants' preference for nitrogen increased (Figure 6 C).

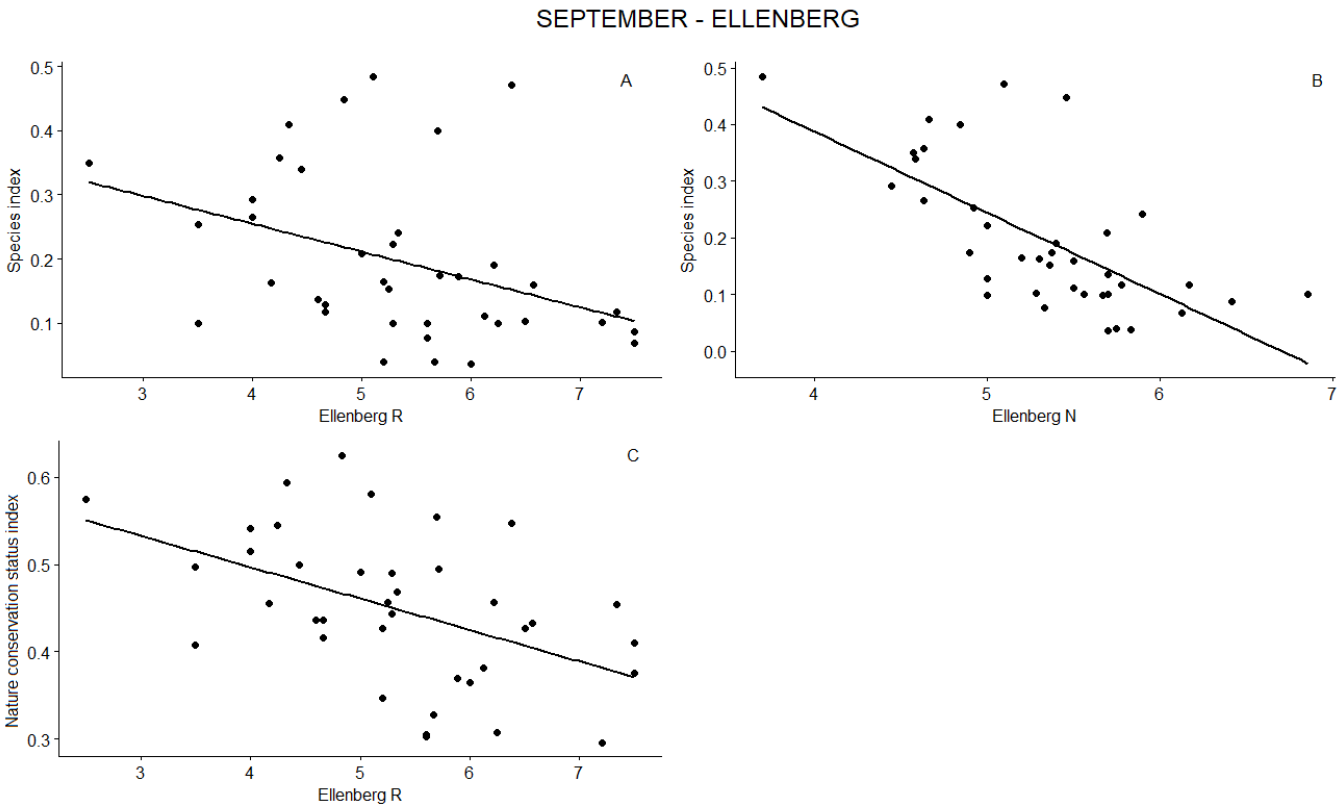


Figure 6: Significant correlations. A) Ellenberg R and species index B) Ellenberg N and species index C) Ellenberg R and nature conservation status index.

May/June

In May/June, plants' moist preferences (Ellenberg F) and soil water (%), differed between grassland and meadow habitats and grassland and fen habitats (Appendix 4, Table 18). As expected, and found in September, soil water (%) and the plants' water preference (Ellenberg F) were higher at fen and meadow habitats (Figure 8 A, C).

Plants found at the salt meadow had a higher water preference (Ellenberg F) than species from grassland habitats (Figure 8 C). This difference was only detectable in summer, suggesting larger differences in blooming flowers' moist preferences.

Like in September, total C (%) and N (%), were affected by habitat (Appendix 4, Table 18). The amount of N and C were higher at fen and meadow habitats than in grassland habitats (Figure 8 E, B), indicating slower decomposition rate.

Structure index was also affected by habitat (Appendix 4, Table 18), where meadow habitats had a significantly better structure than grasslands (Figure 8 D). Grazing animal influenced nature

conservation status index in May/June (Appendix 4, Table 18), sheep grazed areas had a lower nature conservation status index than cattle grazed (Figure 7).

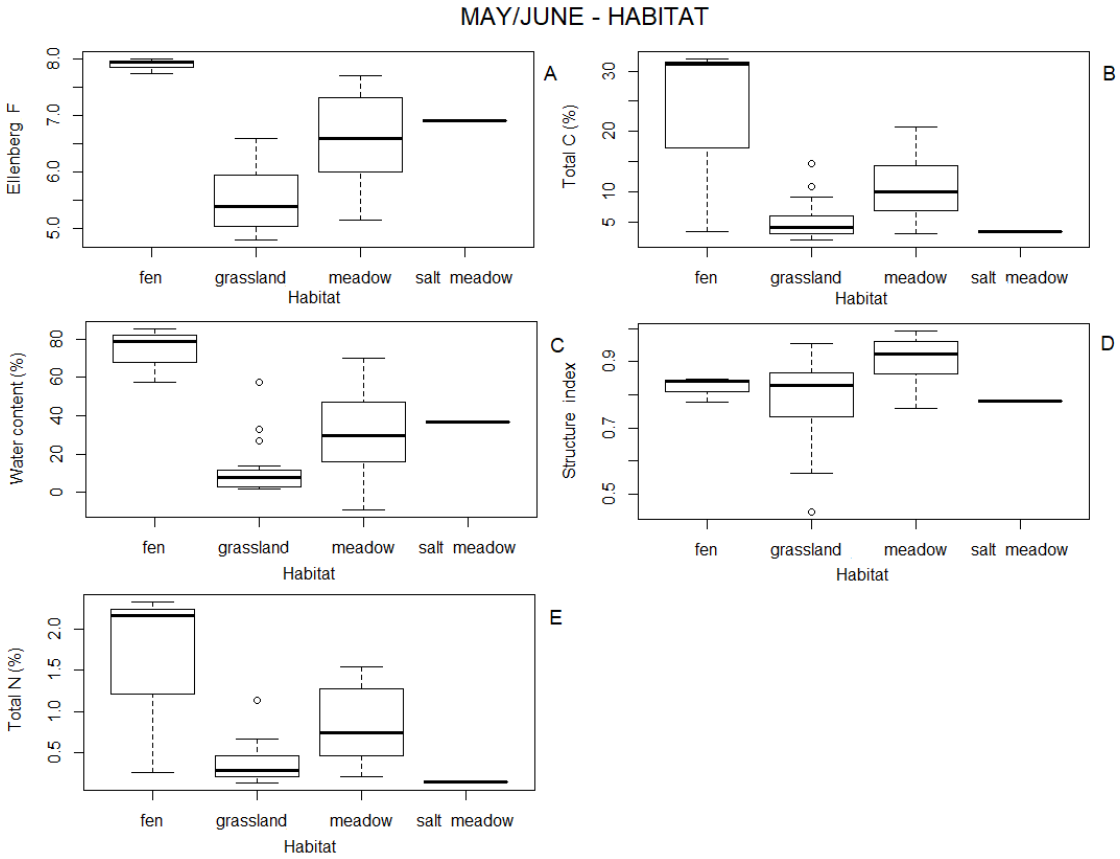


Figure 8: Significant results. A) habitat and Ellenberg F, B) habitat and total C (%), C) habitat and soil water (water content %) D) habitat and structure index E) habitat and total N (%).

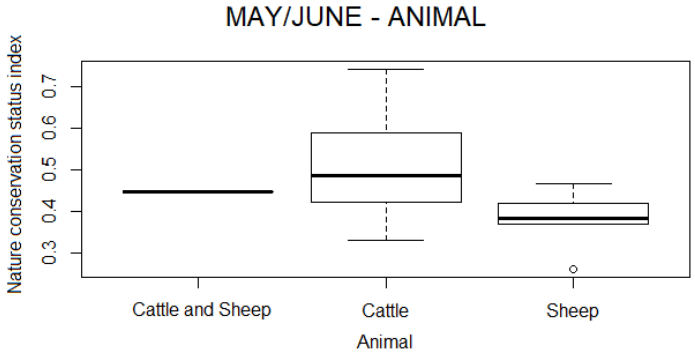


Figure 7: Significant results, animal and nature conservation status index.

Soil properties had no direct effect in September, but in May/June soil pH influenced species index, and soil water content (%) influenced species index and nature conservation status index (Appendix 4, Table 18). The species index increased with increasing soil pH and both species index and nature conservation status index increased with increasing soil water (water content %) (Figure 10 A, C, E). The C/N ratio, and thereby available nitrogen, influenced structure index (Appendix 4, Table 18), which decreases with less available N (larger C/N ratio) (Figure 10 G). Total N (%) and C (%)

influenced species index and nature conservation status index (Appendix 4, Table 18). The indices increased with an increase in the amount of N and C (Figure 10 B, D, F, H).

As the plants' moist reference increased so did the species index and the nature conservation status index (Appendix 4, Table 18). Species index and nature conservation status index were also influenced by the plants' nitrogen preference (Appendix 4, Table 18), lower tolerance among plants resulted in a higher species index and nature conservation status index, (Figure 9).

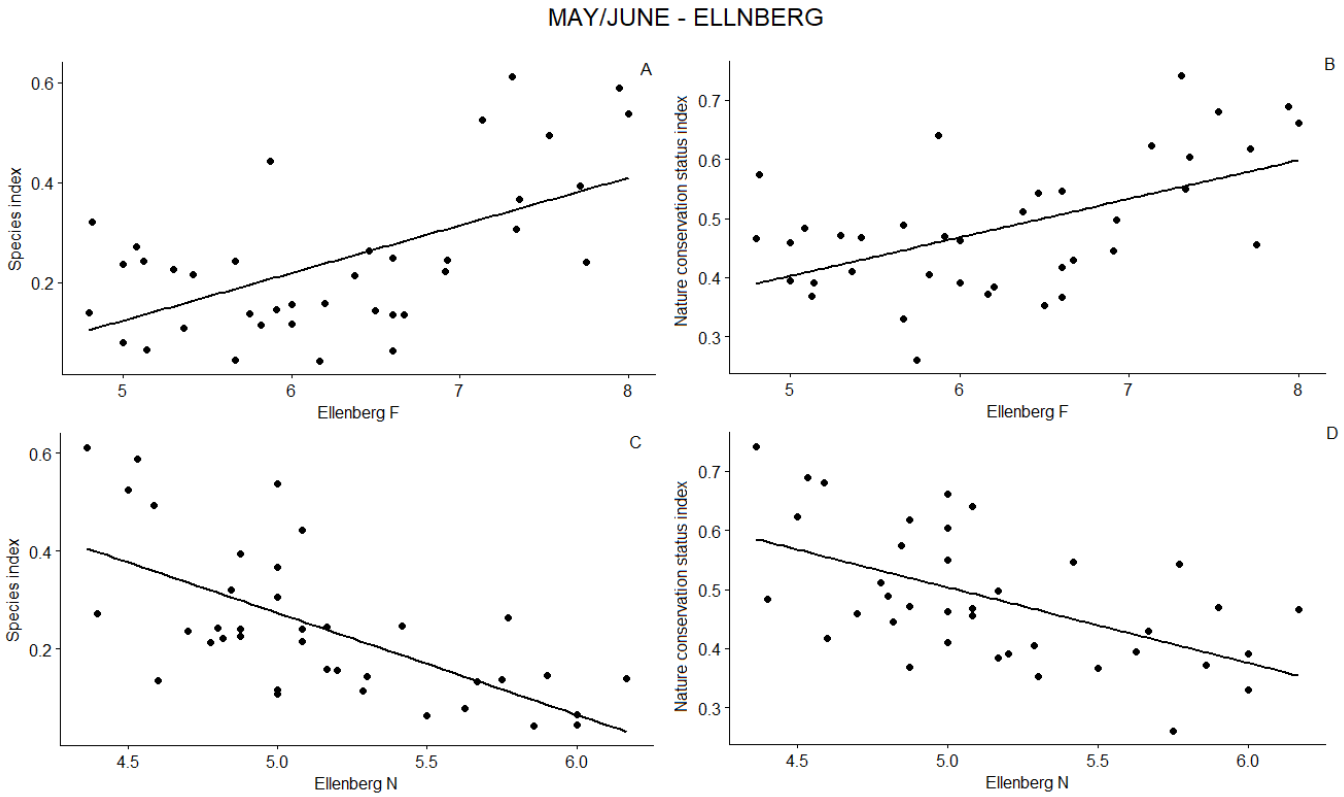


Figure 9: Significant correlations. A) Ellenberg F and species index, B) Ellenberg F and nature conservation status index, C) Ellenberg N and species index, D) Ellenberg N and nature conservation status index.

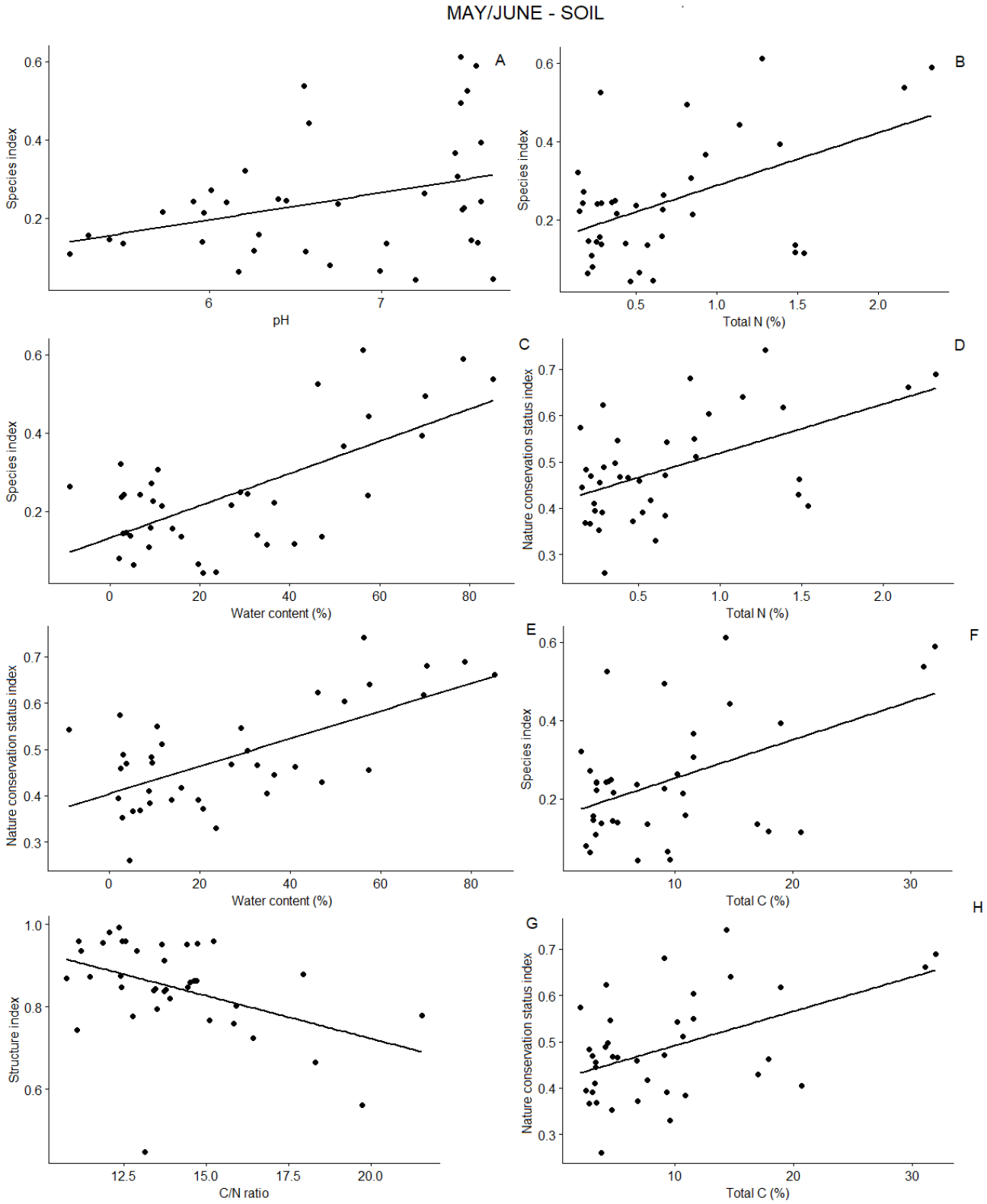


Figure 10: Significant correlations, A) pH and species index, B) Total N (%) and species index, C) Water content and species index, D) Total N (%) and nature conservation status index, E) Water content and nature conservation status index, F) Total C (%) and species index, G) C/N ratio and structure index H) Total C (%) and nature conservation status index.

Total

An ANOVA and a linear regression applied to the total dataset across the organizations' areas, evaluated their total management effort and effects of habitat and animal on Ellenberg values, soil properties, diversity indices and nature indices, and for the animal also number of identified species. The influence of grazing years and animal units pr. Ha were tested on Ellenberg values, soil properties, diversity indices and nature indices and the number of species. Finally, the influence of soil properties and Ellenberg values were tested on diversity and nature indices (Appendix 4, Table 19).

Habitat affected plants' moist preference (Ellenberg F) for the total data (Appendix 4, Table 20), plants in fen, meadow and salt meadow habitats all preferred moister conditions compared with species found in grassland habitats (Figure 11 A). Meadow habitats had significantly more soil water content, than grasslands (Figure 11 C). All other habitats except salt meadow, seem to have more soil water than grassland habitats (Appendix 4, Table 20). In the total dataset, the amount of soil water content, were also used to separate meadow and fen habitats from grasslands, why this was only to be expected.

Habitat also affected the species richness (Simpsons richness). Grassland habitats had the most diverse plant communities (Figure 11 B), significantly more than fen habitats (Appendix 4, Table 20).

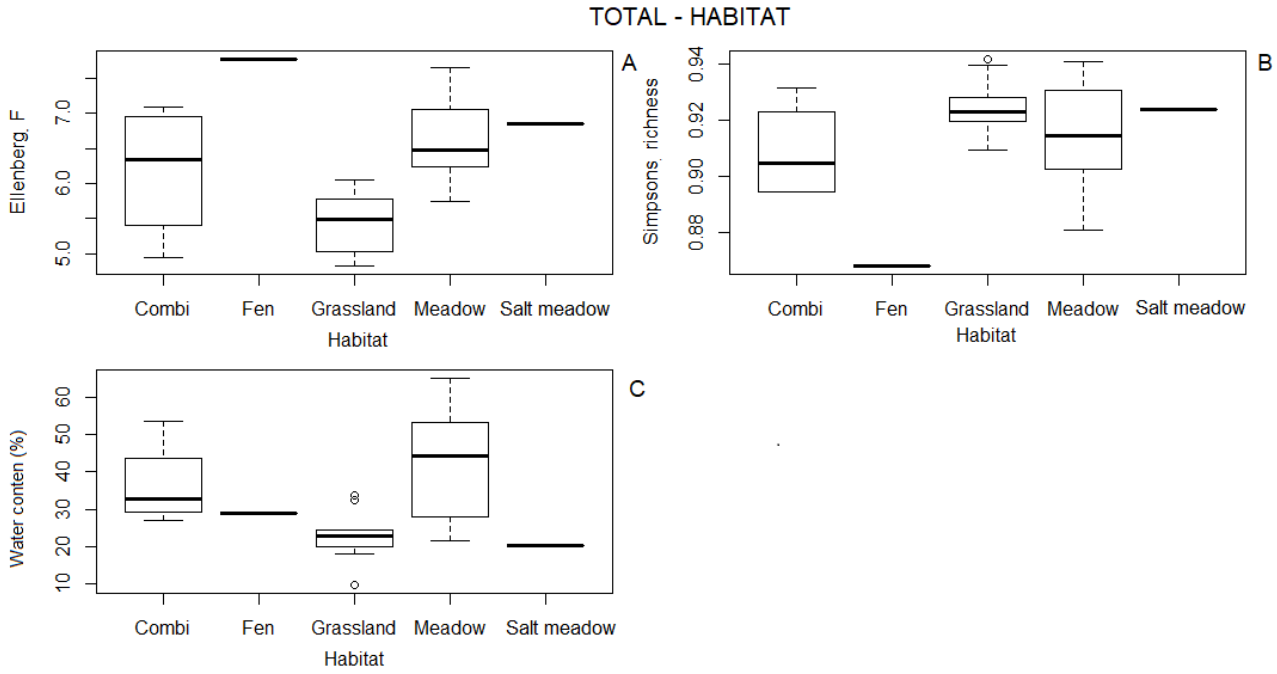


Figure 11: Significant results, A) habitat and Ellenberg F, B) habitat and species richness, C) habitat and soil water (water content %).

In the total dataset, grazing animal seemed to influence the plants' pH (Ellenberg R) and nitrogen (Ellenberg N) preferences (Appendix 4, Table 20). Plants on sheep grazed pastures had a lower preference to acidic soil compared to plants on cattle grazed pastures, but a larger preference to nitrogen (Figure 12 A, C), if this is a direct effect of sheep grazing is uncertain. The species index and nature conservation status index at sheep grazed areas, were lower than cattle grazed areas (Figure 12

B, D), and grazing with both livestock seemed to have higher indices, however, this was not significant (Appendix 4, Table 20).

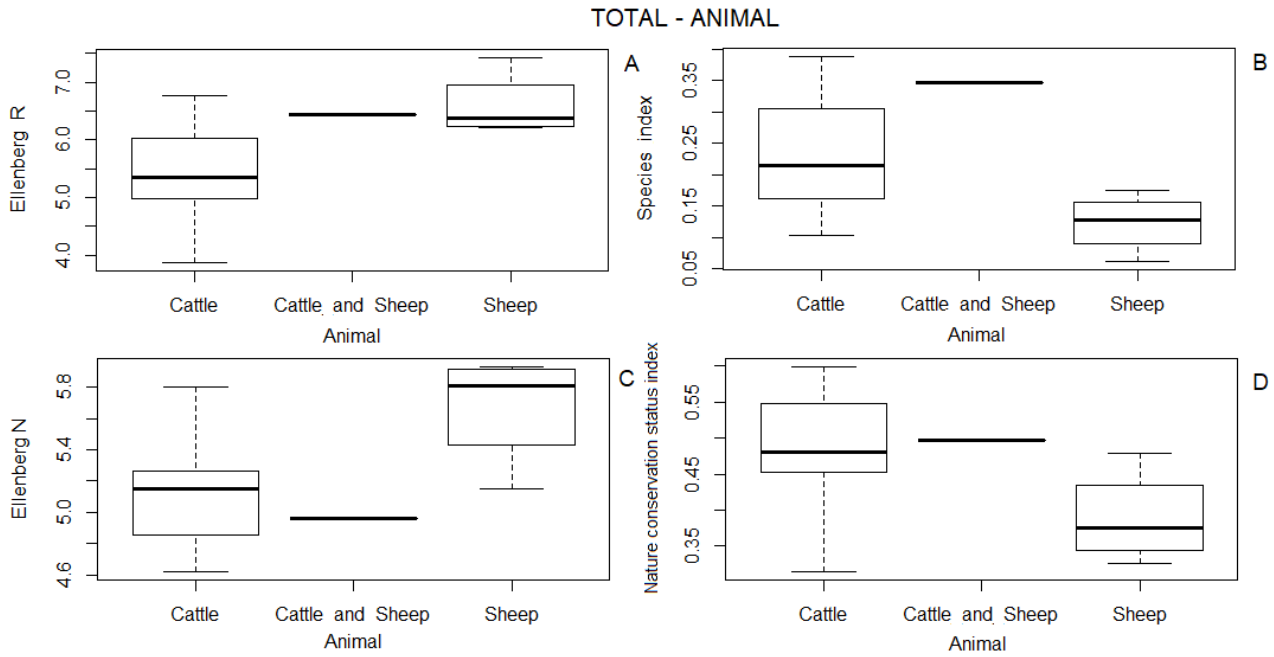


Figure 12: Significant results, A) animal and Ellenberg R, B) animal and species index, C) animal and Ellenberg N, D) animal and nature conservation status index.

In the total dataset, soil acidity (pH) and the C/N ratio, affected structure index (Appendix 4, Table 20), which decreased with a decrease in soil acidity and available nitrogen (larger C/N ratio) (Figure 13 A, B). This indicates that independently of habitat type structure is dependent on soil acidity and available nitrogen.

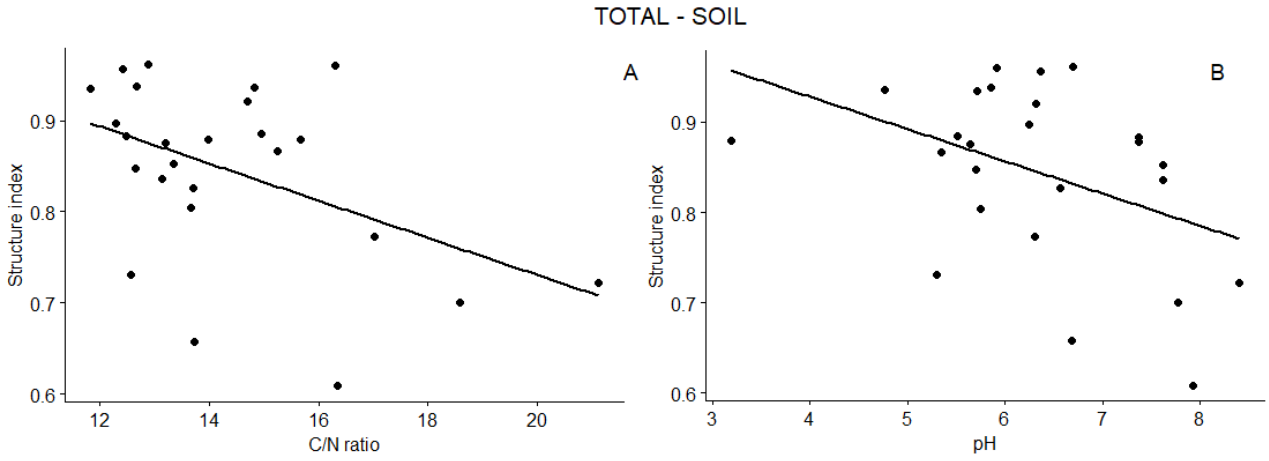


Figure 13: Significant correlations, A) C/N ratio and structure index, B) pH and structure index.

The plants' nitrogen preferences (Ellenberg N) effected the species index, for the total data (Appendix 4, Table 20). Where the species index decreased with the plants' adaption to nitrogen (Ellenberg N) (Figure 14).

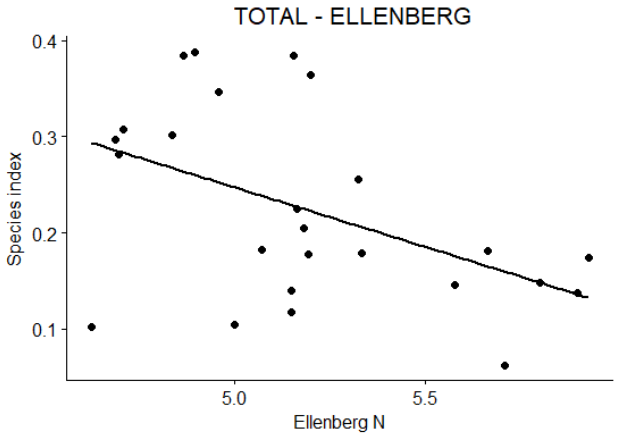
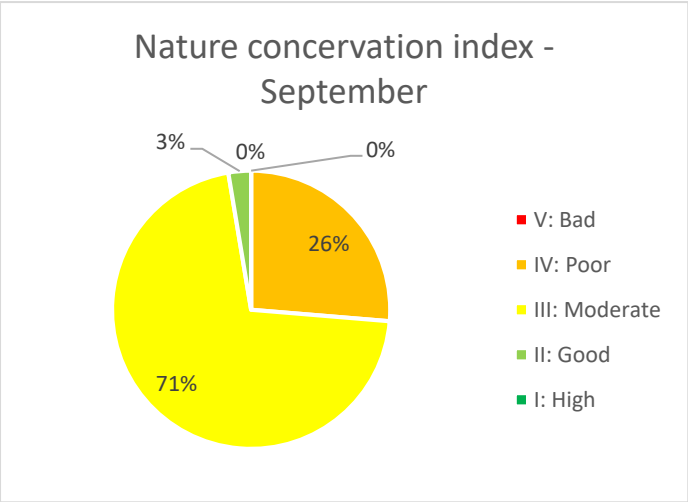


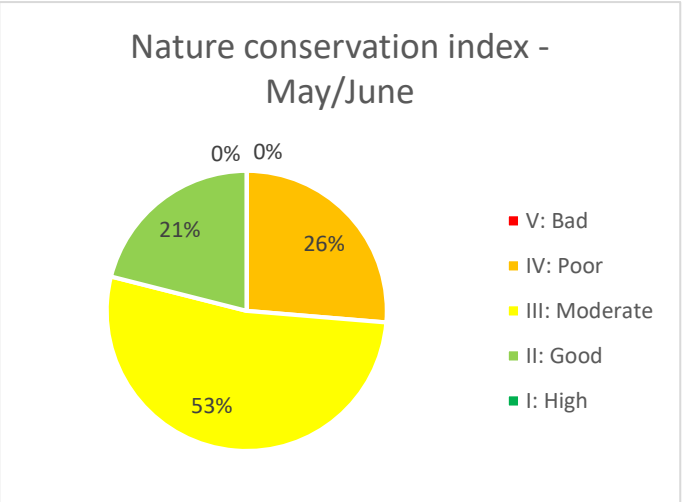
Figure 14: Significant results, Ellenberg N and species index.

5.1.4 Biological status

The assessment of the nature potential and status via the nature conservation status index, revealed that none of the organizations had areas within the worst (Bad) and best (high) category. This means that none of the organizations' enclosures had severe anthropogenic changes with none of few normally occurring traits. On the other hand, none of the organizations' enclosures were untouched by anthropogenic activities. The number of organizations with poor to good conditions differed from September and May/June (Figure 15). In September and May/June most organizations had moderate nature, indicating medium levels of anthropogenic activities, and significant differences from an unspoiled habitat. In September and May/June 10 out of 38 subareas (26%) were in poor quality, indicating that these habitats were under major anthropogenic influence. Few organizations in September had enclosures with good nature (3%), where 21 % had areas of good quality when revisited in May/June, indicating low levels of anthropogenic influence and only slight differences from an optimal habitat. Looking at the total data, 10 % of the areas had good quality habitats, this included Kasted fen grazing and conservation organization's enclosure 2, and the fen habitat in Bondemosens grazing organization's enclosure and the meadow habitat in Copenhagen grazing organization's enclosure. Most (66%) areas were still in moderate condition and almost one quarter had habitats of poor quality[12].

[12] Overview over the subareas biological status, can be provided on request.





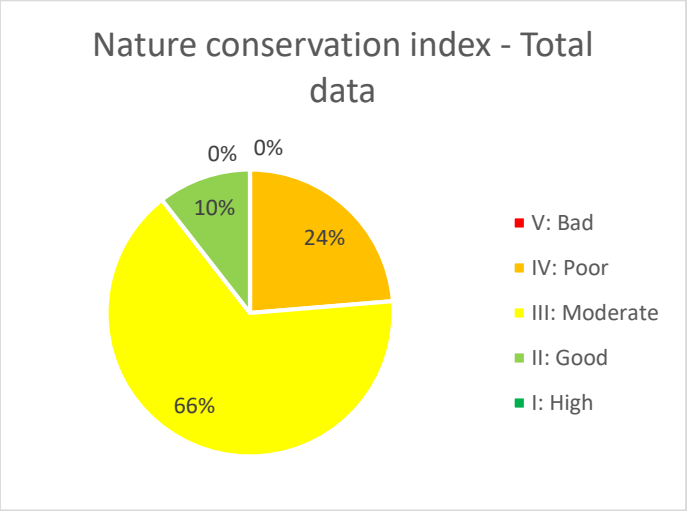


Figure 15: The distributions (%) of the 38 subareas, in the five status classes, based on nature conservation status index, for September 2017, May/June 2018 and the combined total data. V: Bad 0-0.2, IV Poor 0.2-0.4, III: Moderate 0.4-0.6, II: Good 0.6-0.8, I: High 0.8-1.

5.2 Volunteer data

5.2.1 Descriptive statistics

347 members responded to the questionnaire, corresponding to approx. 38% of all possible answers[13]. All organizations were represented from Munksoegaard grazing organization, with the lowest number of members to Kasted fen grazing and conservation organization with one of the highest number of members (Table 5 and Appendix 7). Most of the responding members were *regular* members (Appendix 7).

The volunteer group had an almost equal number of males (53.3 %) and females (46.7%), and a third were brought up in the city, suburbs or countryside, respectively (Appendix 6, Table 24). The organizations' foundation dates span from 1990-2017 (Table 5), reflected in years of membership,

[13] Where number of members are reported in households it was assumed that one from each household had been able to participate.

where almost a third has been members in 1-5 years, more than 5 years or from the foundation of their organization (Appendix 7).

The typical volunteer was a married middle age to old adult, with no children living at home, who had a longer educational background, and worked either full-time or was retired (Appendix 6, Table 24). Most members lived close to the enclosures, with 5-15 minutes transportation. Annually they used less than an hour including transportation time per week on the voluntary work, however, the mode of transportation was not specified. It is important to remember that, Munksoegaard grazing organization having year-round grazing and Jyllinge Holme sheep association having stable facilities, were the only organizations with animals doing the winter. One third of members used respectively, a lot of time (80-100%) or little time (0-20%) at enclosure related activities. In comparison, almost half (47.6%) used little time (0-20%) on administration (Appendix 7).

Motivation and attitude

A tendency to positive responses was seen across organizations, revealing a general concern and interest in nature and involvement in their organization among members (Appendix 8). Improvement/protection of nature for the next generations was the greatest reason for membership (86.8%) (Appendix 8). More than half of the members (62.5%) felt it was important to protect and improve nature and only 5.2 % were not concerned by the loss of nature and biodiversity in Denmark. This resulted in just 0.1 % felt that we today do enough for nature.

Sharing knowledge was highly valued by members. Only 5.5% did not find general knowledge sharing important, and more than half of the members (61.1%), liked sharing knowledge about plant and animals. In addition, about half (54.7 %) felt being a member gave them a new perspective. Many (72.9 %) felt they contributed to the local community through the organization, while only 5.5 % of the members were not feeling they were able to make a difference (Appendix 8).

Outdoor activities were enjoyed by many members, and three quarters (75.8 %) were a part of the organization because they enjoy spending time outdoors. While the opportunity to get meat and/or wool were not valued as much among all members. A third (33.2 %) of the members saw meat and/or wool as their primary reason for membership, while 41.8% did not. When asked if social association was the primary reason for membership, a similar trend was observed among members. Regardless, approx. 40% of members still found the social arrangements important and were part of their organization to meet new people. Independently of primary membership cause, almost all (96.7 %) members though that their experiences in the organization had been personally enriching (Appendix 8).

About 80 % of the members expected a tangible or visible outcome and flexible activities, in accordance to knowledge and time. Even though, expectations to flexibility and outcome were the most common, half of the members would like or expected to get influence in their organization. Apart from the fulfilment of expectations, agreement with the organization's values are important for continued membership. The organizations' values toward animal welfare were strongly shared by members, with approx. 90 % of the members approving their organization's view and practice around animal welfare. Fewest connect to their organization's social values (Appendix 8).

The possibilities of learned abilities

Learning has been found to be important for other volunteer groups including nature volunteers. This was why four initial statements were presented to the members, about what they learned from their membership (Appendix 3). Most members (61.1%) had learned a combination of the four statements (Table 9), the most common combination was, to take care of the animals and manage nature (10.4 %) (Appendix 5, Table 21). Separately, one third of the members had learned to take care of animals, where learning about flora, nature management and fauna were less widespread (Table 9). About 5% declared that they learned something other than the initially stated, e.g. I have learned to cook diverse types of meat, I have learned about public bureaucracy for farmers and applications and permissions or I learned that a social community is important for newcomers.

Table 9 Learned from membership, data from the online questionnaire, complete sample (n = 347). Sub-table oTable 21 (Appendix 5).f

Variables		**Total sample**	
What have you learned doing membership		Count	Percentages
	I have learned about the flora (vegetation)	12	3.5
	I have learned about the fauna (animals)	7	2.0
	I have learned to manage and care for nature habitats	12	3.5
	I have learned to take care of our animals	106	30.5
	Combinations	212	61.1
	All	36	10.4
	Nothing	5	1.4
	Other*	16	4.6
	Blanks	47	13.5

*Other, The taste of quality meat, Diseases (lever flukes), Paperwork (applications and permissions), The significant differences between city and countryside. Handle and cook all types of meat. The history behind the meadows and their use, Learn about scything, Board duties. Learn to be outdoors and can at the same time make a difference, learn about animal behaviour and my own skills as an animal keeper, Learned about grazing organizations. Learned that a social community is important for newcomers, learned about a local initiative, which makes me happy, learned to enjoy the animals, expanded my contact to the local people in the area, I have learned about the public bureaucracy for farmers. I learn that supermarket meat is not the only kind, and I learned my kids, that animals are entitled to a good life as long as they live. to fight for what you believe in spite of obstacles.

How I became a member

In the investigation of how the members became part of a grazing organization, results showed that most were invited. About 13 % found the organization themselves through social or other medias and

17% had no prior association with the organization before joining. Most were invited by friends or family, but some mentioned other ways of becoming a member, e.g. some were invited by neighbours, others by members of the organization, some saw an advertisement and took contact and approx. 5% were founder or cofounder (Table 10).

Table 10: How did you become a member of the organization data from the online volunteer questionnaire, complete sample (n = 347). Sub-table of Table 22, (Appendix 5).

Variables	Total sample	
	Count	Percentages
My association with the organization:		
Friends who are already members encouraged me to join	95	27.3
Family members who are already members encouraged me to join	34	9.8
I found the organization through online, social or other media (e.g. the local newspaper) and became a member	45	12.9
In advance, I had no association with the members of the organization	60	17.2
Combination	65	18.6
I was a founder/co-founder	18	5.2
Other*	30	8.6
I don't know/blanks	1	0.3

* Other: Locals invited me, I reached out to the organization, was invited by letter, participated in an info-meeting, neighbours invited me, I were invited through work, as a member of Green forum I invited the organization to an arrangement, and became member afterwards, I saw advertisement in the locale supermarket, I saw an advertisement at the enclosure, I was invited by members, I were invited through the homeowner association, fen-meeting.

Motivation for continued membership

Seven initial statements, with possible and realistic actions and activities, for continuous membership motivation, were suggested (Table 11).

Approximately half of the members found a combination of the suggested actions appealing. The most popular combination was courses related to animals and nature and a general desire to learn (Table 23, Appendix 5). Courses related to nature was the most motivating of the individual actions, closely followed by the opportunity to have different kind of animals e.g. organizations with cattle found it interesting to also have sheep and vice versa. Some even suggested wild grazers like roe deer or fallow deer. Apart from an interest in nature education, different animals and general learning, a strengthened social community and courses related to animals were found motivating. Under 2% found more animals or sightseeing among the organizations motivating (Table 11).

Table 11: What could further motivate your membership data from the online volunteer questionnaire, complete sample (n = 347). Sub-table of 23 (Appendix 5).

	Variables	Total sample	
		Count	Percentages
Further motivation			
	Courses related to the animals (care or meat)	12	3.5
	Courses related to nature (gatherer trips, botanical trips and nature management)	24	6.9
	Sightseeing, see, meet and learn from other organizations	2	0.6
	More animals	6	1.7
	Different kind of animals	22	6.4
	To learn something	14	4.0
	A strengthened social network/community	14	4.1
	Combination	186	54.4
	None of the above	6	1.7
	All	5	1.4
	Blank	49	14.1

* Other: No aging, more nature friendly grazing (e.g. year-round grazing without supplementary feeding), contribute to local diversity, communication about our management, no further motivation.

Satisfaction and a grazing union

According to the members, the most satisfying by being a member was quality meat from animals which had had a good life, enjoyment of nature and animals, contribution to nature management and the opportunity to teach children about food, animals, animal welfare and nature. One member wrote, *"The most satisfying is to see the grassland improve year after year and cook the meat, the fat marbling can't be brought in a supermarket".* The contact to the local community and being a part of a local initiative, combined with the opportunity to communicate knowledge and to get more outdoors experiences, were also among the frequently mentioned satisfactions, another member wrote *"Personally, it has been fun and enriching to start a new project, that already in its first year has had a lot of influence in the local community. It is great to contribute to nature management and greater recreational value in the area. Many get attached to the animals and feel that it is a unique experience. Lovely to contribute to greater fellowship and increased attention to our nature, animals and meat production".*

Many voluntary nature efforts are connected to a union e.g. Danish Society for Nature Conservation, why the attitude toward a union was investigated among the grazing organisations' members. More than half did not answer this question, and therefore it was hard to determine the members' attitude. Among members who did respond, some saw disadvantages and others saw advantages (Table 12). The main reasons for not wanting a union, were the concern that organizations were too different. The members found the local aspect important and they did not want even more bureaucracy, as one mentioned *"it is DOF (Danish Ornithological Organization) and DN (The Danish Society for Nature*

Conservation) who are the political players". Some of the people who did not like the idea of a union, still saw a benefit for the organization. Among members interested in a union, were the most mentioned advantages; collaboration, knowledge and experience sharing among the organizations. Other mentioned more visibility in the public debate, help with rules and legislation, more focus on nature management and follow-ups on efforts and common activities for all organizations, but also family and friends.

Table 12: Union interest data from the online volunteer questionnaire, complete sample (n = 347).

Variables		**Total sample**	
Would you be interested in a Union for all grazing organizations in Denmark		Count	Percentages
	Yes	67	19.3
	No	83	23.9
	I don't know/blanks	197	56.8

5.2.2 Motivation analysis

The motivation analysis will provide factors motivating the complete volunteer group and investigate how the demographic variables and organization affiliation influence the members' motivation.

Factor analysis

Initially, the factorability of the 22 motivation variables were examined. The Kaiser-Meyer-Olkin measure of sampling adequacy (0.82) and Bartlett's test of sphericity (X^2= 1877.9, df =231, $p < 0.05$), both indicated good factorability.

Exploratory factor analysis was applied to all 22 motivation questions (Appendix 8). A scree plot (Figure 16), helped determine the number of factors. The second break on the curve (p=0.19) were chosen, confirming that nine factors were enough to explain the variance within the data. The first break at four factors (p=8.69e-09), was omitted as four factors were not enough to explain the variance. Four out of the nine factors were excluded as they had fewer than three explaining variables. Items with loading below 0.30 were also omitted (Appendix 9), unless they had a strong theoretical fit with the factor.

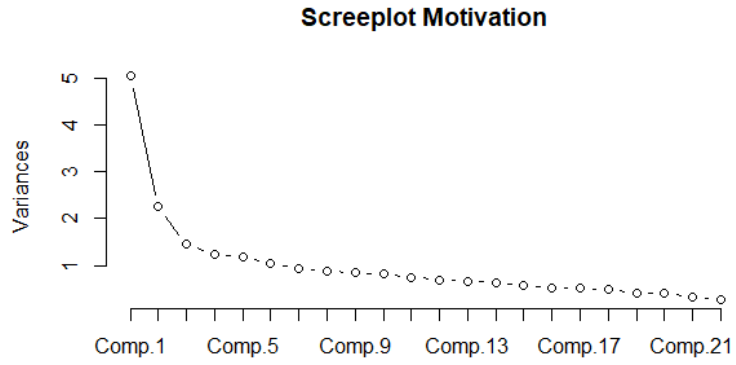


Figure 16: Scree plot for the 22 motivation variables

The five remaining factors were named according to the variables describing them (Table 13). The first factor was named *Social,* as all its explaining variables were concerned with meeting or associating with other people. The second factor was named *Personal benefit*, as its describing variables all revolved around membership benefits. The third factor was named *Nature value,* as it was concerned with a concern about the degradation of nature and a will to conserve it. The fourth factor was named *Identification*, as it was concerned with the feeling of belonging or be closely connected to a volunteer group or community. The fifth factor was named *Instrument* as all its variables expressed a desire to obtain rewards, through meat, stories or social recognition.

Table 13: Results from the factor analysis, including the accepted factors and contributing variables with loadings, mean and SD.

Factors	Loadings	Mean	SD
Social		3.05	1.02
Q8: The organization is, for me, a way to meet new people	0.71		
Q9: The organizations social arrangements are important to me	0.75		
Q15: I am a member of the organization, to associate/be with others	0.8		
Personal benefit		3.75	0.88
Q4: Participating in the grazing organization gives me a new perspective on things	0.38		
Q6: I can share and pass on my knowledge and opinions about nature and animals	0.55		
Q7: By being a member of the organization I can pass something on to other people	0.73		
Q10: I find that, in the organization, we contribute to the local community	0.37		
Q11: Through the organization, I have been able to make a difference	0.56		
Nature value		3.59	1.43
Q1: I am concerned about the loss of nature and biodiversity in Denmark	0.84		
Q2: I feel it is important to take care of / protect/improve nature	0.44		
Q5: I feel we today do enough to protect nature	-0.31		
Identification		3.73	0.99
Q12: People in close to me support my decision to be a member of a grazing organization	0.31		
Q18: I expect to be a member of the organization, for at least the next 5 years	0.45		
Q19: I consider joining another organization within the next 5 years	0.32		
Q21: My experiences with the organization are personally enriching	0.50		
Instrumental		3.22	1.06
Q14: I am a member of the organization primarily for the meat and /or wool of the animals	0.56		
Q17: I am a member of the organization because it provides good stories to tell family, friends and acquaintances	0.38		
Q22: The opinions, of people in my circle, are important to me	0.28		

The Influence of organization and demographics on motivation

To look at differences among members motivation based on organization affiliation and demographic influence, Kruskal Wallis tests and ordinal ANOVA and regressions for the CLM (Cumulative Link Models) were performed. For the tests showing a significant difference ($p<0.05$) (Appendix 11, Table 30 and Appendix 10, Table 28), post hoc tests were performed to determine where the differences or

correlations were. An overview of which demographics influencing each other can be seen in table 37 (Appendix 14).

The social factor

Members of Soellerod nature conservation- & grazing organization were least likely to volunteer for social reasons, where members of Saerlose grassland forest boar and grazing organization were among the most likely. All giving different values to the social arrangements, the opportunity to meet new people and the association with others.

Members of Saerlose grassland forest boar and grazing organization and Svogerslev grazing organization, all seemed to value the opportunity to meet new people, while members of Soellerod nature conservation- & grazing organization, Hjortespring nature conservation association, Kasted fen grazing and conservation organization and Taarnby conservation organization, seemed not to value it as much (Figure 17). It was only members from Arrenaes grazing organization, Svogerslev grazing organization and Saerlose grassland forest boar and grazing organization, who were significantly more likely to volunteer due to the opportunity to meet new people, compared to members of Soellerod nature conservation- & grazing organization (Appendix 10, Table 29). Because members of Saerlose grassland forest boar and grazing organization and Svogerslev grazing organization, were highly motivated by meeting new people, they also differed significantly from members of Hjortespring nature conservation association, Kasted fen grazing and conservation organization and Copenhagen grazing organization, among others (Appendix 11, Table 31).

Members of Saerlose grassland forest boar and grazing organization and Soellerod nature conservation- & grazing organization, did again differ, within the social factor, with members finding the social arrangements very important and others finding them less important. Apart from members of Saerlose grassland forest boar and grazing organization, it seemed that members of Konusserne, Bondemosens grazing organization, and Jyllinge Holme sheep association all found the social arrangements very important. Where the members of Nivaa sheep breeding association, Hjortespring nature conservation association and Copenhagen grazing organization together with members of Soellerod nature conservation- & grazing organization were among those finding the social arrangement less important (Figure 17). Members of Soellerod nature conservation- & grazing organization were those who found their organization’s social arrangements least important (Appendix 10, Table 29). They felt less motivated by their organization's arrangements than most other members, but especially compared to members of Saerlose grassland forest boar and grazing organization and Bondemosens grazing organization (Appendix 11, Table 31). However, it was members of Bondemosens grazing organization and Jyllinge Holme sheep association, who found their social

arrangement most important (Appendix 10, Table 29). They were especially more motivated by social arrangements than members of Nivaa sheep breeding association and Hjortespring nature conservation. Many of the other organizations also differed from each other, but only the most prominent are mentioned the rest can be seen in (Appendix 10, Table 29 and Appendix 11, Table 31).

Members of Saerlose grassland forest boar and grazing were more likely to be part of their organization to associate with others (Figure 17). In fact, more than members from eight other organizations (Appendix 11, Table 31).This emphasizes that the members of Saerlose grassland forest boar and grazing organization are highly motivated by social motives. For example, they were, three times as often members because they liked to associate with others compared to members of Soellerod nature conservation- & grazing organization and about twice as often as members of Hjortespring nature conservation grazing organization, Bondemosens grazing organization, Kasted fen grazing and conservation organization, Nivaa sheep breeding association and Soroe grazing organization (Appendix 10, Table 29).

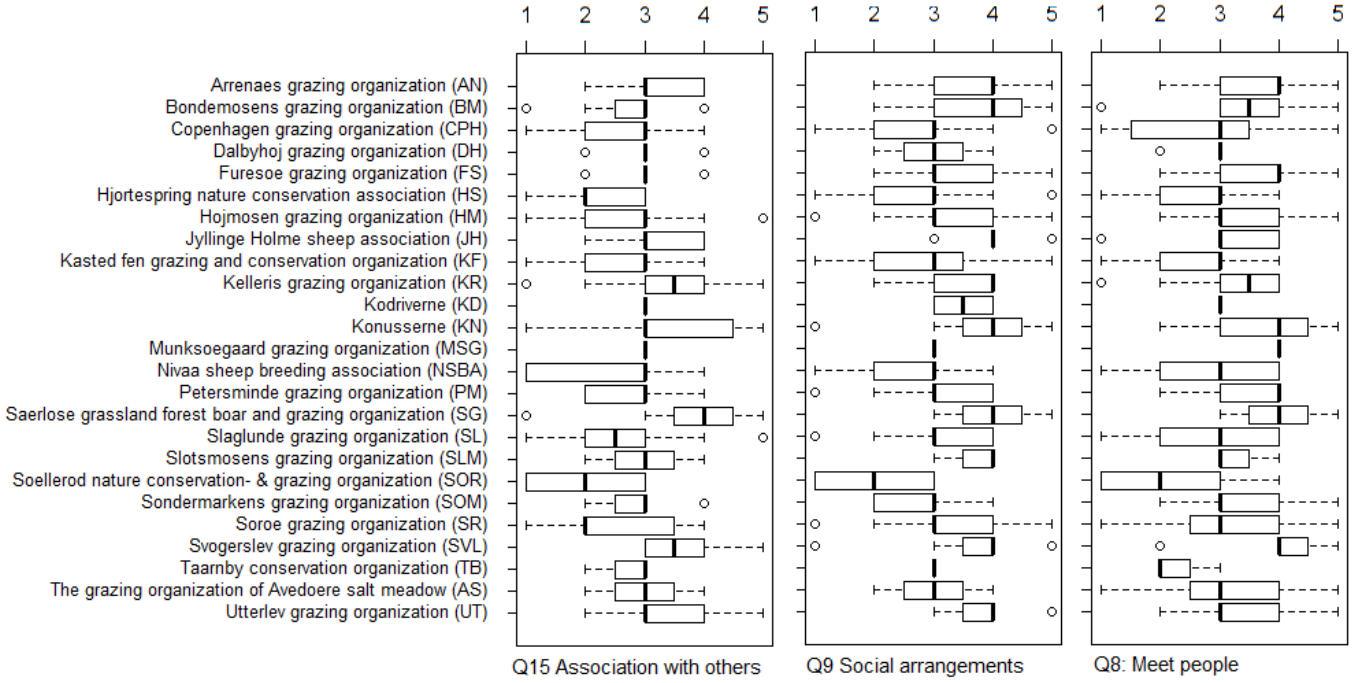


Figure 17: Boxplot, organization affiliation and the social factor. Q8: The organization is, for me, a way to meet new people Q9: The organization's social arrangements are important to me, Q15: I am a member of the organization, to associate/be with others. 1: Strongly disagree, 2: disagree, 3: Neither nor, 4: Agree, 5: Strongly agree.

Demographics also influenced how strongly the members were motivated by the social factor. The oldest and the youngest members mostly saw the organization as an opportunity to meet new people (Figure 18 A), in fact, they were twice or three times as interesting in meeting new people through the organization, compared to the members between 21-30 (Appendix 10, Table 29). Males were more likely to associate with others than females (Figure 18 D) and independently of gender the

members' interest for social association almost rose with age, (Appendix 10, Table 29). The exception was that, the youngest members between 16-20 were most likely to be part of the organization to associate with others (Figure 18 E). However, few young people were represented, why this could be different if the number of young members increased.

The members time use in the enclosure (including participants in social arrangements) influenced how important they found their organization's social arrangements (Figure 18 C). Members using the smallest amount of time 0-20%, seemed to find the social arrangement half as important as members using more time at the enclosure (20-60%) (Appendix 10, Table 29). In addition, did retired members appreciated social arrangements (Figure 18 B), twice as much as full-time employed also suggesting that life stage or employment status affects appreciation of social arrangements.

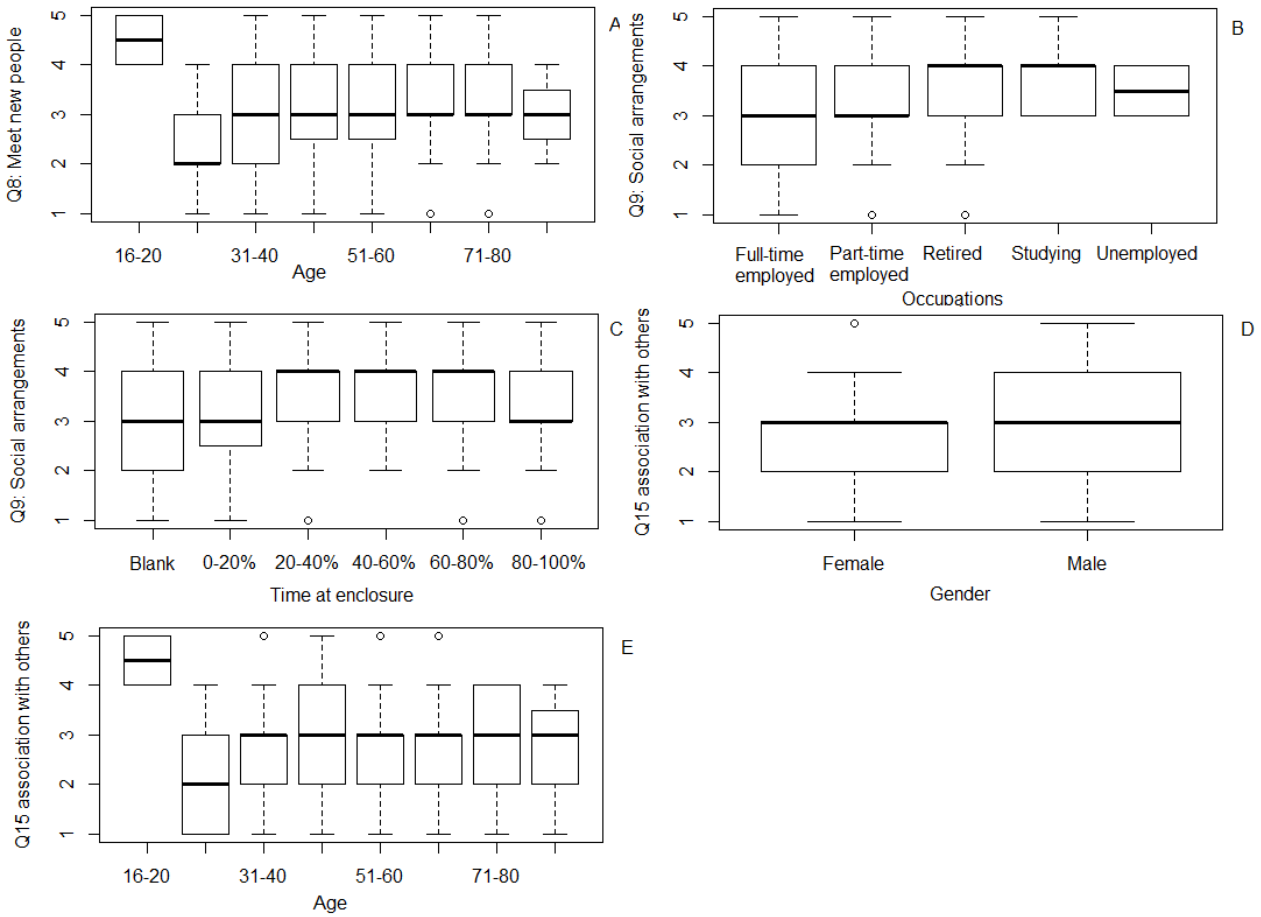


Figure 18: Boxplot of demographics influencing motivation within the social factor, Q8: The organization is, for me, a way to meet new people, Q9: The organization's social arrangements are important to me, Q15: I am a member of the organization, to associate/be with others. 1: Strongly disagree, 2: Disagree, 3: Neither nor, 4: Agree, 5: Strongly agree. Blank: the members that did not answer the question regarding the time at the enclosure, but still scored the motivation item.

The pesonal benefit factor

Which organization the members belonged to affected if they felt they got a new perspective through their membership, or if they had contributed to the local community and been able to make a difference

(Figure 19). Members of Soellerod nature conservation & grazing organization seemed to be least motivated by the personal benefit factor, but no members belonging to a single organization were most motivated by personal benefit motives.

Members of Arrenaes grazing organization felt their participation gave them a new perspective more than members of Nivaa sheep breeding association, (Appendix 10, Table 29). Members of Slotsmosens grazing organization were among those feeling they contributed most to their local community, while members of Soellerod nature conservation & grazing organization, felt they contributed the least. Members of Slotsmosens grazing organization only differed significantly from members of Soellerod nature conservation & grazing organization, where members of Soellerod nature conservation & grazing organization, differed from 10 organizations apart form Slotsmosens grazing organization (Appendix 11, Table 31). Only members of two organizations differed when asked if they felt they have been able to make a difference through their membership (Appendix 11, Table 31). Members of Soroe grazing organization felt they had made a difference, especially compared to the members Soellerod nature conservation & grazing organization.

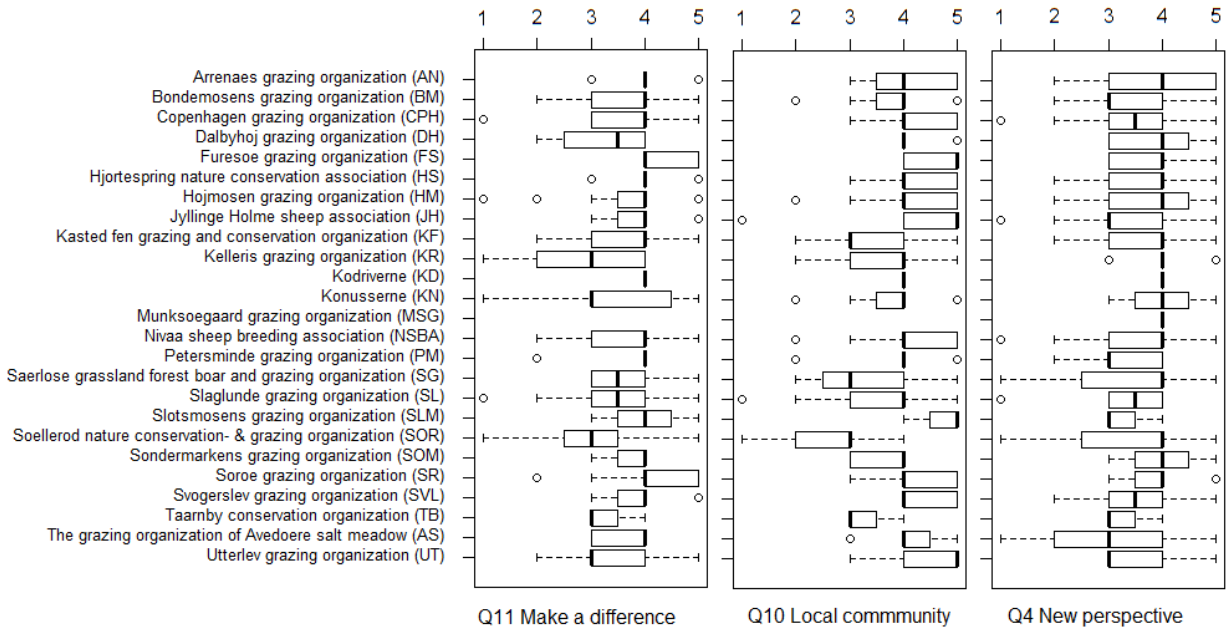


Figure 19: Boxplot, organization affiliation and the personal benefit factor. Q4: Participating in the grazing organization gives me a new perspective on things, Q10: I find that, in the organization, we contribute to the local community, Q11: Through the organization, I have been able to make a difference. 1: Strongly disagree, 2: disagree, 3: Neither nor, 4: Agree, 5: Strongly agree.

No demographic variables influenced all aspects of the personal benefit factor. The members time use at enclosure activities influenced their feeling of, passing something on to others (Figure 20 D). Members using 20-40% of their time felt, they were twice as able to pass something on to others compared to members using all their time at enclosure activities (Appendix 10, Table 29). In addition, members spending 20-40 % of their time at enclosure activities, most often felt, they could share their opinion on nature and animals with others (Figure 20 A), (Appendix 10, Table 29). Chairmen found

sharing knowledge about nature and animals about twice as important as regular members (figure Personal benefit B), (Appendix 10, Table 29).). Apart from membership status, which were directly connected to the grazing organization. The member's child situation also affected their opinion toward knowledge sharing. People with children above 6 years or no children at home were more eager to share and pass on knowledge about nature and animals (Figure 20 C), with people having no children living at home being twice as likely to share compared to people having small children between 0 and 5 years (Appendix 10, Table 29).

Transportation time and indirectly connection to the local community, affected the members' view on, their organization's contribution the local community. Members living close (less than 5 minutes away), were most likely to agree that they contributed to the local community (Figure 20 E). Additionally, members using relative short (16-30 minutes) and long (31 minutes to 1 hour) transportation time were significantly different from one another, again members using the shortest time on transportation felt they contributed most to the local community (Appendix 10, Table 29).

The members level of education affected their view on whether they were able to make a difference, through the organizations (Figure 20 F). Skilled members were twice as likely to feel they made a difference compared to the members with a short higher education (Appendix 10, Table 29). This indicated that level of education can affect how the volunteers perceive their own efforts, properly in relation to what education they have and the volunteer case.

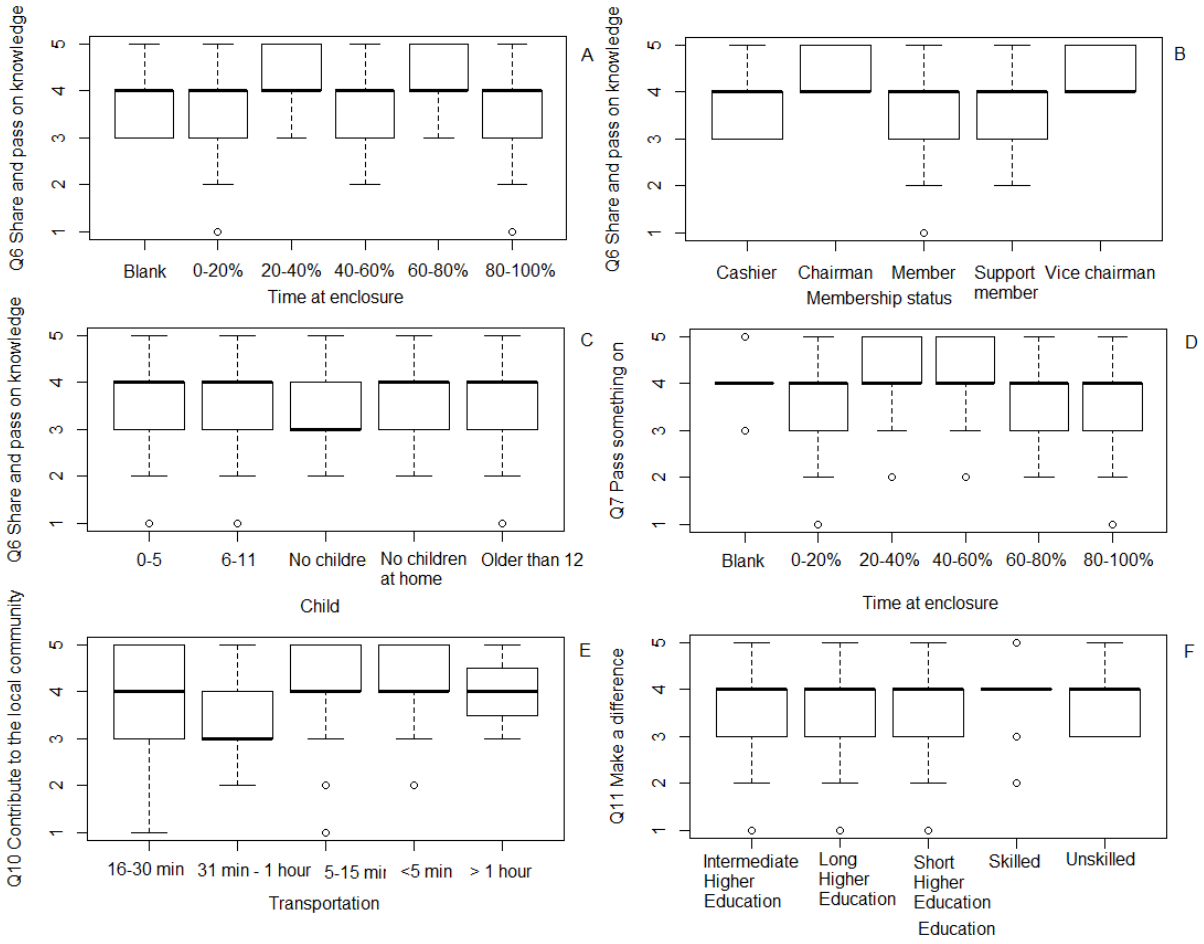


Figure 20: Boxplot of demographics influencing motivation within the of the personal benefit factor Q6: I can share and pass on my knowledge and opinions about nature and animals, Q7: By being a member of the organization I can pass something on to other people, Q10: I find that, in the organization, we contribute to the local community, Q11: Through the organization, I have been able to make a difference. 1: Strongly disagree, 2: Disagree, 3: Neither nor, 4: Agree, 5: Strongly agree. Blank: the members that did not answer the question regarding the time at the enclosure, but still scored the motivation item.

The nature value factor

Which organization the members belonged to, only affected their opinions toward our common nature protection effort (Figure 21). Even though most members, independently of organization, did not think enough is done to protect nature, the members of Jyllinge Holme sheep association were slightly more positive, this may be related to the fact that they manage a Natura2000 area. Members of Jyllinge Holme sheep association differed from members of six of the other organizations (Appendix 11, Table 31), especially members of Hjortespring nature conservation association, but also members of Copenhagen grazing organization, Dalbyhoj grazing organization, Kasted fen grazing and conservation organization, Kelleris grazing organization and Soroe grazing organization.

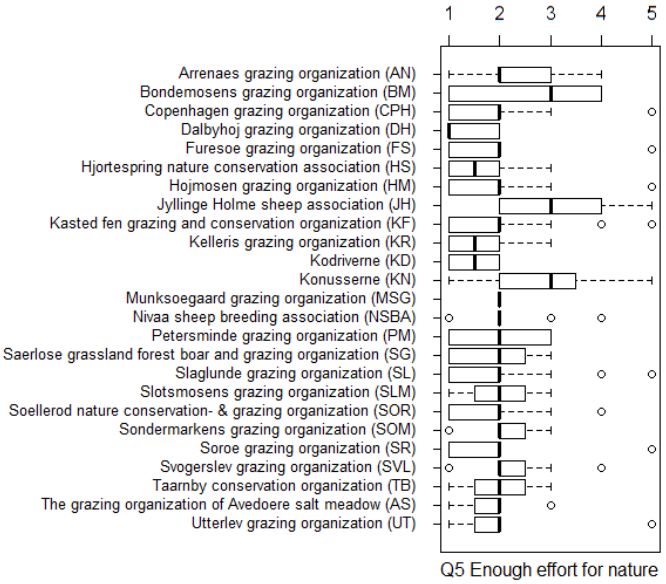


Figure 21: Boxplot, organization affiliation and the nature value factor Q5: I feel we today do enough to protect nature. 1: Strongly disagree, 2: disagree, 3: Neither nor, 4: Agree, 5: Strongly agree.

Many demographics influenced the members' connection to the factor; Nature value. The members gender influenced if they felt it was important to take care/protect nature and if enough is done to do so. Females were more likely to think it was important to protect nature than males and about half as likely to think we do not do enough to do so (Figure 22 A, B). Even though, all generally agreed with the importance of nature protection and disagreed with the amount of effort done to do so (Appendix 8). Additionally, members brought up in the city were more likely to think that we do not do enough for nature, especially not compared to members brought up in the countryside (Figure 22 C).

Apart from gender, the members educational level affected if they felt it was important to take care of, protect or improve nature. Members with an intermediate higher education (Figure 22 D), most strongly felt it was important to take care of nature, about twice as much as e.g. members with a short higher education. (Appendix 10, Table 29).

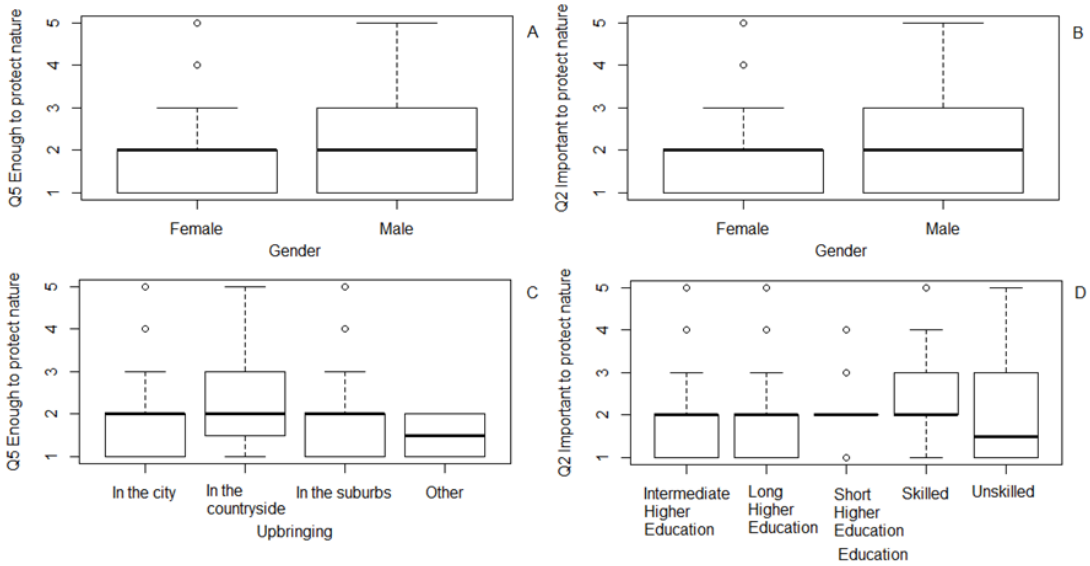


Figure 22: Boxplot of demographics influencing motivation within the of the nature value factor. Q2: I feel it is important to take care of / protect/improve nature, Q5: I feel we today do enough to protect nature. 1: Strongly disagree, 2: Disagree, 3: Neither nor, 4: Agree, 5: Strongly agree.

The identification factor

Members of Soellerod nature conservation & grazing organization, among others were least likely to be motivated by identification motives, where members of Hjortespring nature conservation association and Soroe grazing organization were some of the most likely (Figure 23). Members of Hjortespring nature conservation association and Soroe grazing organization were four times as likely to feel their experiences had been enriching compared to members of Soellerod nature conservation- & grazing organization (Appendix 10, Table 29). Members of Soellerod nature conservation & grazing organization were, in fact, the least likely think their experiences has been personally enriching. This made them significantly different from additionally three organizations (Appendix 11, Table 31).

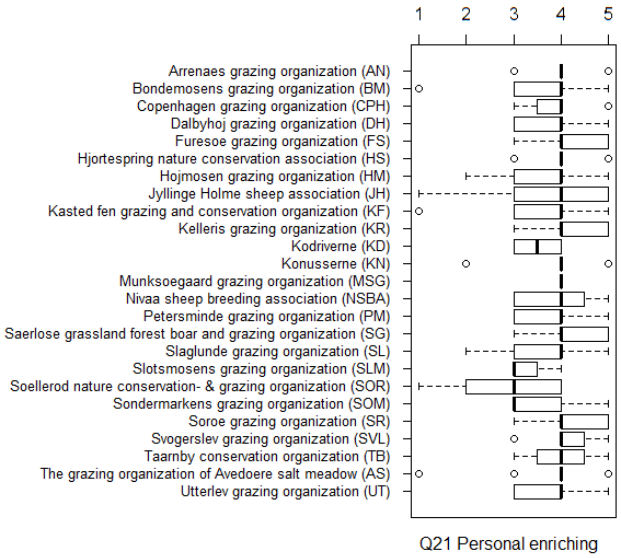


Figure 23: Boxplot, organization affiliation and the identification factor, Q21: My experiences with the organization are personally enriching. 1: Strongly disagree, 2: disagree, 3: Neither nor, 4: Agree, 5: Strongly agree.

Females were more likely to think that people supported their decision of beeing part of the organization, than males (Figure 24 A). Active members were also more likely to believe their decision was supported by others, especially cashiers and vice chairmen (Figure 24 B), (Appendix 10, Table 29).

Civil status was the only variables influencing if the members still expected to be members in 5 years, where the members current occupational status influenced if they considered joining another organization (Figure 24 C). Married and widowed were the members most likely to stay in the organization, married were in fact twice as likely to stay members compared to members in relationships (Appendix 10, Table 29). Where employed or studying members, were more likely to join another organization, e.g. full-time employed were about three times as likely to consider joining compared to retired members (Appendix 10, Table 29), (Figure 24 D).

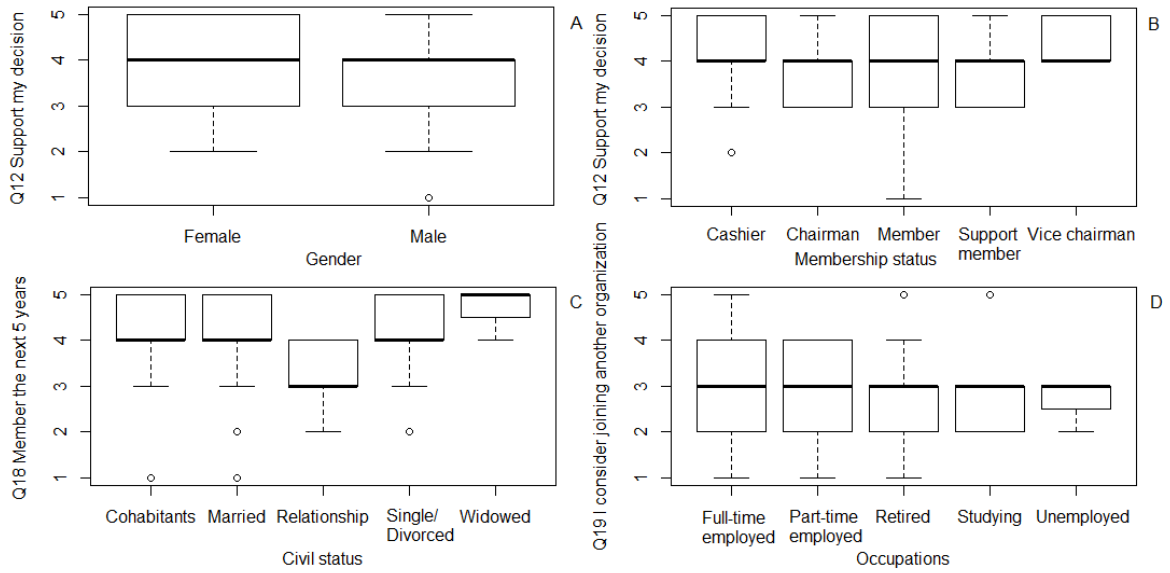
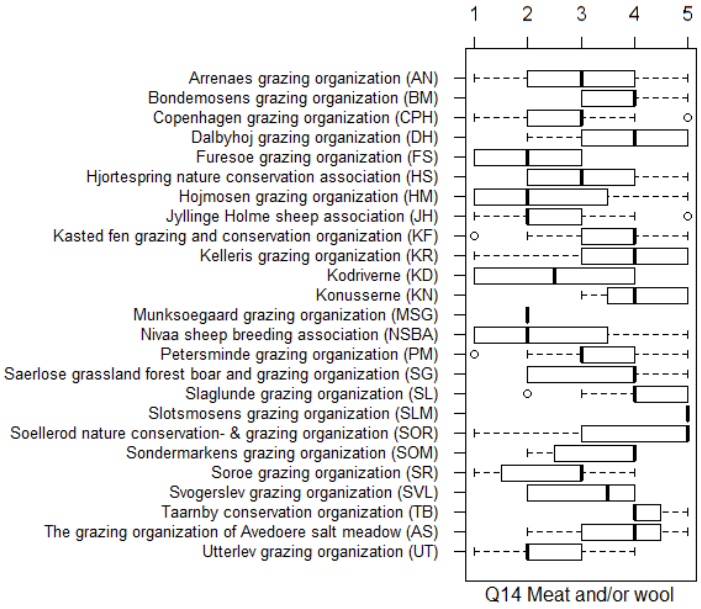


Figure 24: Boxplot of demographics influencing motivation within the of the identification factor. Q12: People in close to me support my decision to be a member of a grazing organization, Q19: I consider joining another organization within the next 5 years.1: Strongly disagree, 2: Disagree, 3: Neither nor, 4: Agree, 5: Strongly agree.

The instrumental factor

Meat and/or wool as the primary drive for membership seemed to be a key factor, as members of approximate 10 organizations (40%) valued it high (Figure 25). Members of Bondemosens grazing organization, Dalbyhoj grazing organization, Kasted fen grazing and conservation organization, Konusserne, Soellerod nature conservation & grazing organization, Kelleris grazing organization, Taarnby conservation organization, Slaglunde grazing organization, Slotsmosens grazing organization and the grazing organization of Avedoere salt meadow were the ones valuing meat/wool, they all differed from members of Furesoe grazing organization. Individually, some of the organizations' members differed from more than the members of Furesoe grazing organization (Appendix 11, Table 31).



'igure 25: Boxplot, organization affiliation and the ıstrumental factor Q14: I am a member of the rganization primarily for the meat and /or wool of the nimals. 1: Strongly disagree, 2: disagree, 3: Neither nor, : Agree, 5: Strongly agree.

The members' age, membership status, educational level and the time used per week all influenced if they saw meat and/or wool as a primary reason for membership. The oldest and youngest members seemed to be less interested in this opportunity, (Figure 26 A), e.g. all above 70 were less interested in getting meat and/or wool (Appendix 10, Table 29). Naturally, all active members were more likely to see meat and/or wool as their primary reason for membership, compared to support members (Figure 26 B). Among active members, chairmen and vice chairmen were not the members valuing meat and/or wool the most (Appendix 10, Table 29). The influence of education generally showed increasing interest in meat and wool with a decrease in education length, except for skilled members. Members with an intermediate or a short high education were about three times as likely to see meat and/or wool as the primary reason for membership compared to members with a long higher education (Appendix 10, Table 29). Apart from an interest in meat/wool, the members educational level affected if they felt the opinions of people close to them were important (Figure 26 C, F). Members with a long higher education gave more attention to the opinion of their social circle, twice as much as members with a shorter higher education and skilled (Appendix 10, Table 29). Members using one hour in the organization pr. week, were four times as likely to see meat and wool as a primary reason for membership, compared to members using less than an hour (Figure 26 D).

The members' gender was the only variable influencing if they were members because it provided good stories to tell, where males found it twice as important as females (Figure 26 E).

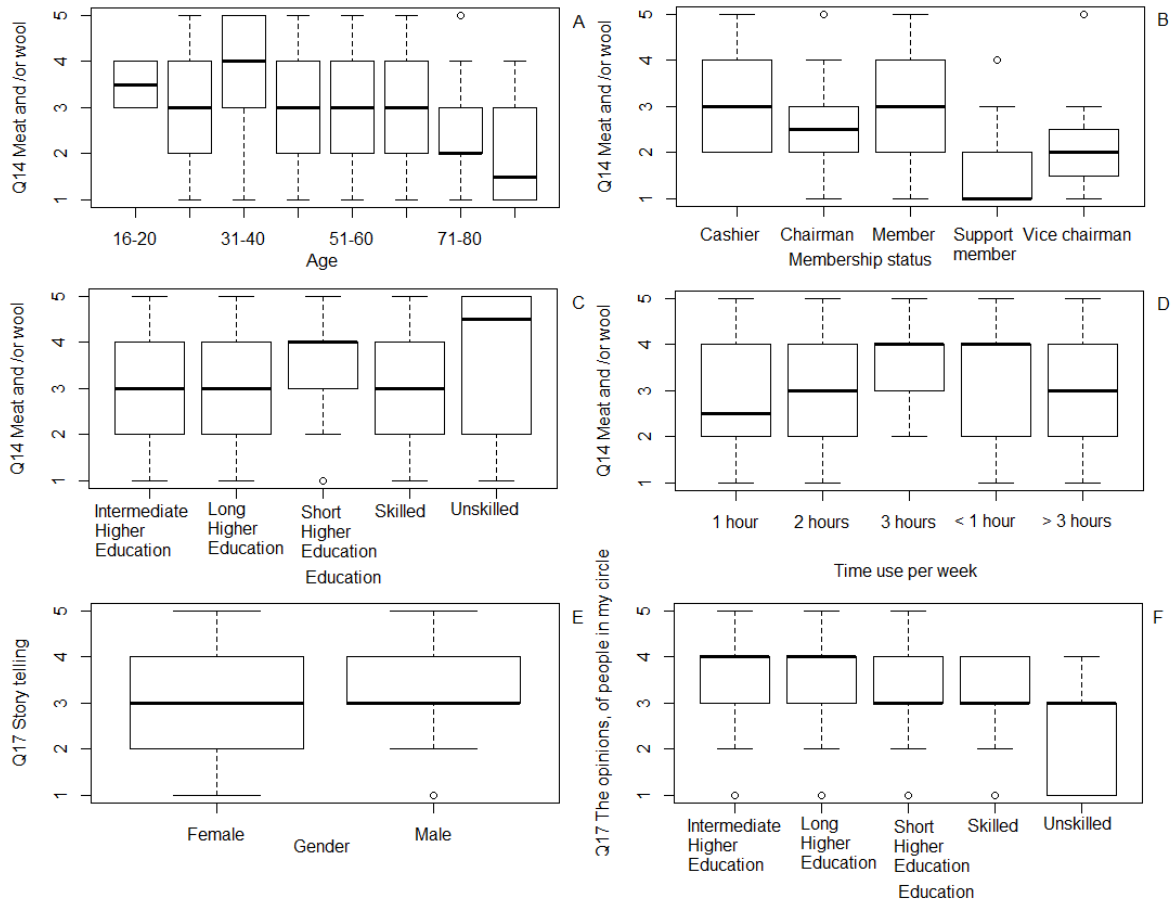


Figure 26: Boxplot of demographics influencing motivation within the instrumental factor. Q14: I am a member of the organization primarily for the meat and /or wool of the animals and Q17: I am a member of the organization because it provides good stories to tell family, friends and acquaintances 1: Strongly disagree, 2: Disagree, 3: Neither nor, 4: Agree, 5: Strongly agree.

Four of the initial 22 motivation statements, did not contribute to the factors describing motivation, however some were still influenced by organization affiliation and the measured demographics. Members of 17 organizations rated their joy of spending time outside high (Figure 27). Members of Soellerod nature conservation & grazing organization rated it lowest, separating them significantly from members of 10 other organizations (Appendix 11, Table 31), but especially members from Furesoe grazing organization, Hjortespring nature conservation association and Kelleris grazing organization.

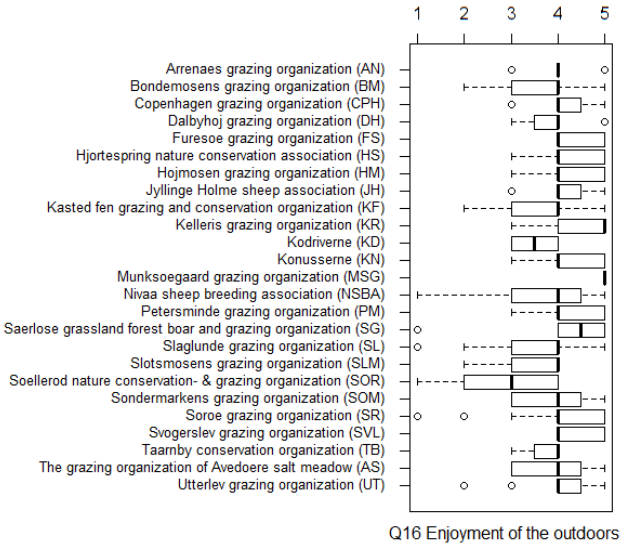


Figure 27 Boxplot, organization affiliation and motivation question nit included in any factor Q16 I am a member of the organization, because I enjoy spending time outdoors. 1: Strongly disagree, 2: disagree, 3: Neither nor, 4: Agree, 5: Strongly agree.

Apart from organization affiliation, time used at enclosure activities and transportation time influenced if the members were a part of their organization because they enjoy spending time outdoors (Figure 28 B, C). Members using the smallest amount of time (0-20%) were less likely, about half to one-forth, to be members just because they enjoyed the outdoors compared to members using more time at enclosure related activities (Appendix 10, Table 29). In addition, it seemed that increased transportation time among members reduced the likelihood of enjoyment of outdoor activities as a membership reason (Appendix 10, Table 29). The members using 20-40% on enclosure related activities, felt they learned most about flora and fauna (Figure 28 A), (Appendix 10, Table 29).

Age of youngest child living at home, membership status and time used for transportation influenced if the members felt their organization provided an opportunity to protect and manage an area, they felt connected to. Members with children over 12 years, including children not living at home, all felt they got an opportunity to protect an area the felt connected to, about three times as much as members with no children (Appendix 10, Table 29), (Figure 28 D). Chairmen across the organizations were twice as likely as regular members to feel they were protecting an area they felt connected to (Figure 28 E). Independently of children and membership status, members living close, less than 5 or 5-15 minutes away, all saw the organization as an opportunity to protect an area they feel connected to (Figure 28 F), about twice as much as e.g. members using 31 minutes to 1 hour on transport (Appendix 10, Table 29).

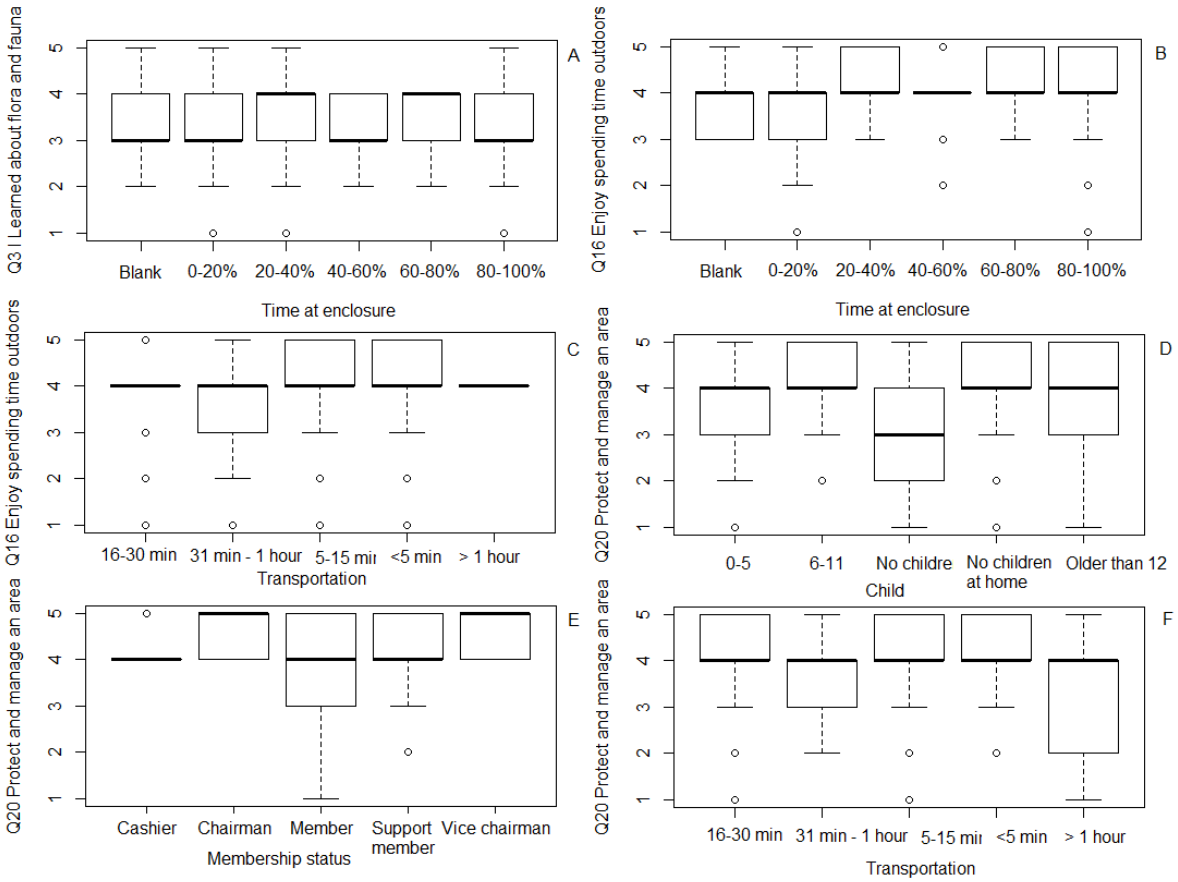


Figure 28: Boxplot questions not included in a motivation factor. Q3: Through my membership, I learn about flora and fauna in Denmark, Q16: I am a member of the organization because I enjoy spending time outdoors, Q20: The organization provides an opportunity to protect and manage an area, I feel connected to. 1: Strongly disagree, 2: Disagree, 3: Neither nor, 4: Agree, 5: Strongly agree. Blank: the members that did not answer the question regarding the time at the enclosure, but still scored the motivation item.

5.2.3 Influence of organization on attitude

In addition to differences between organizations regarding the members' motivation, differences were also accessed for the members' attitude regarding the cause of membership, expectations to their organization, shared values and nature relationship. Kruskal Wallis tests were performed, for tests showing a significant difference ($p<0.05$) (Appendix 11, Table 32), Dunn's multiple comparison tests were performed to determine which organizations differed.

Environmental concerns did not seem to be the main membership reason, for members of Jyllinge Holme sheep association (Figure 29 LQ3), making them different from members of Arrenaes grazing organization and Kasted fen grazing and conservation organization (Appendix 11, Table 33). Members of Soroe grazing organization seemed to find protecting nature for future generations very important, differentiating them from members of Bondemosens grazing organization (Appendix 11, Table 33), even though both organizations' members rated it important (Figure 29 LQ4).

A tangible, here also visible outcome, was important for members of Saerlose grassland forest boar and grazing organization and Slaglunde grazing organization (Figure 29 BQ3), at least more than members of Hojmosen grazing organization, Jyllinge Holme sheep association, Nivaa sheep breeding association, Soroe grazing organization and for Slaglunde also members of Bondemosens grazing organization (Appendix 11, Table 33). Visible nature improvements and meat/wool were not separated in this question, making it hard to tell if members of Saerlose grassland forest boar and grazing organization and Slaglunde grazing organization expected both or just one of the outcomes, more than the members from the organizations they differed from.

All members across organizations approved of their organization's opinion toward social activities, nature management, animal welfare, quality meat and dissemination of nature management. Still, members of Jyllinge Holme sheep association, Petersminde grazing organization, Slotsmosens grazing organization and Saerlose grassland forest boar and grazing organization, all to greater extend shared their organization's view toward social actives (Figure 29 RQ1). Members of Soellerod nature conservation & grazing organization, seemed to be the members agreeing the least with their organizations view on social activities (Appendix 11, Table 33), but also members of Copenhagen grazing organization (Appendix 11, Table 33). This differentiated them especially from members of Saerlose grassland forest boar and grazing organization and Jyllinge Holme sheep association. The members shared their organization's view on quality meat across all organizations (Figure 29 RQ4). However, members of Furesoe grazing organization, were the ones sharing it the least. Members of Furesoe grazing organization ranged from agreeing to disagreeing, why they differed significantly from members of Dalbyhoj grazing organization, Konusserne, Saerlose grassland forest boar and grazing organization and Slaglunde grazing organization (Appendix 11, Table 33), who all strongly agreed with their organizations view on quality meat.

Regarding members attitude toward nature after they joined the organization, it seemed that members of Bondemosens grazing organization spend more time in nature after joining their organization compared to members of Copenhagen grazing organization (Appendix 11, Table 33), (Figure 29 GQ1). If this was because the members of Copenhagen grazing organization do not spend as much time in nature or were already spending a lot of time in nature before joining their organizations was unclear.

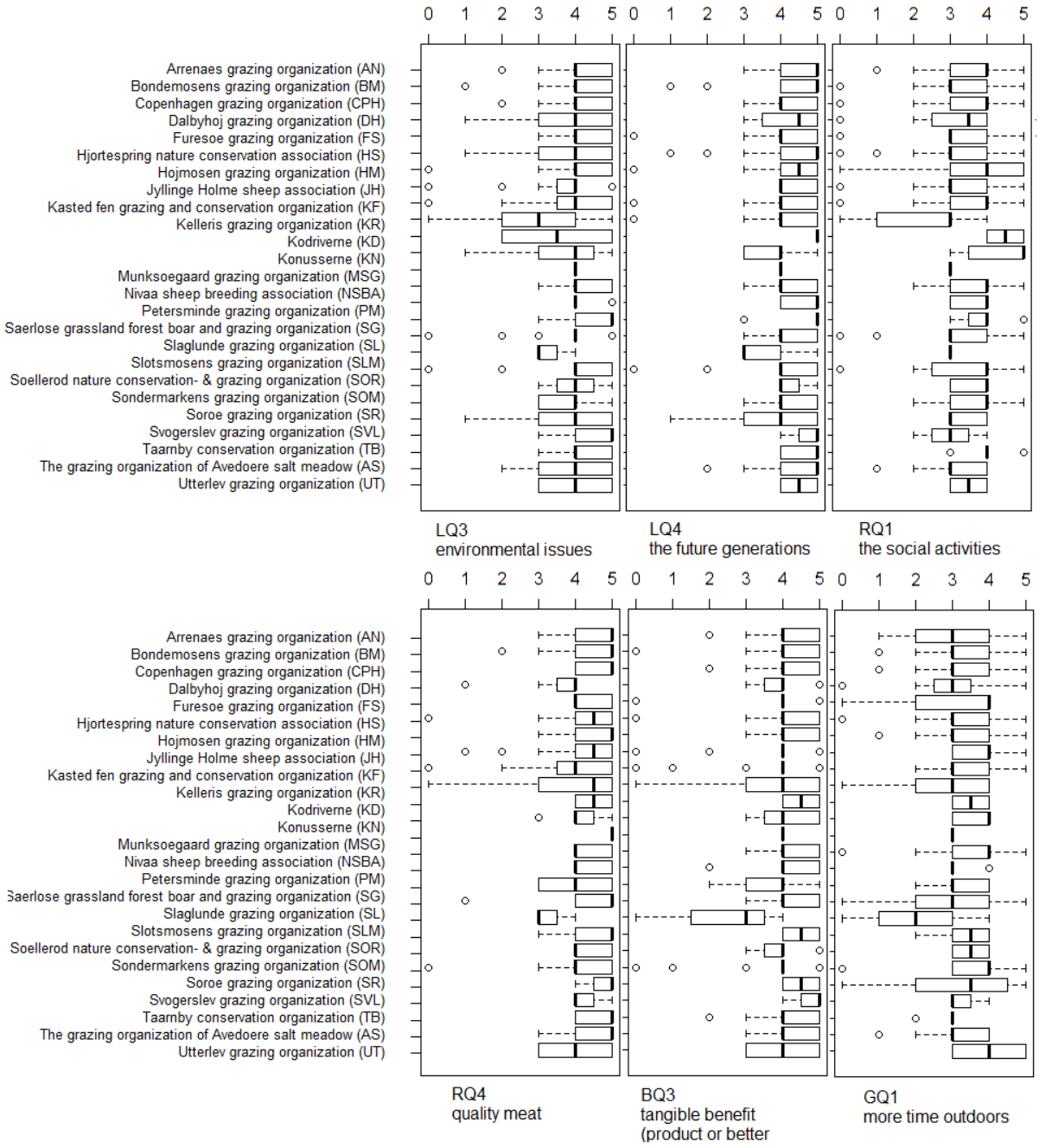


Figure 29: Boxplot, for the attitude variables. LQ3: I am generally concerned about environmental issues, LQ4 I want to conserve and protect nature, for the future generations, BQ3 Expectation: I get a tangible benefit (product or better nature), RQ1 Shared values: Social activities and RQ4 Shared values: Quality meat. 1: Strongly disagree, 2: disagree, 3: Neither nor, 4: Agree, 5: Strongly agree.

5.3 Correlations between motivation and nature status

Regressions for a linear mixed effect model (LMEM) and a cumulative linear mixed model (CLMM) checked for correlation between responses to motivation questions and the nature conservations indices measured in September, May/June, respectively, and combined. No correlations were found when testing if the members' answers to the 22 motivation questions influenced the biological status of the areas they managed (Appendix 12, Table 34).

No correlations were always valid, when testing if the nature conservation status index and thereby nature quality influenced the members' motivation. However, the area's quality may positively affect if the members feel they get a new perspective by participating in the organization (Appendix 12, Table 35). Further, the biological status may affect the members' cause of membership either being meat and/or wool or being their enjoyment of spending time outdoor, but this was only seen when testing against May/June data (Appendix 12, Table 35).

5.4 Summary

The comparison of Ellenberg indicator values and soil properties for September 2017 and May/June 2018, showed positive correlations between Ellenberg R/soil pH and Ellenberg F/soil water and an inverse relation between Ellenberg N and C/N ratio. The indicator analysis revealed that cattle grazing was indicated by the presence of *Epilobium parviflorum* (dunet dueurt) and *Deschampsia cespitosa* (mose bunke) and grassland habitats were indicated by presence of *Elytrigia repens* (alm. kvik) and *Cynosurus cristatus* (alm. kamgræs), while meadow habitats were indicated by presence *Carex acutiformis* (kær star) and *Agrostis stolonifera* (kryb hvene).

The ANOVA and linear regression comparing diversity and nature conservation indices with affecting variables (animal, founding year, habitat etc.), suggested seasonal differences between September 2017 and May/June 2018. Grassland seemed to be the most species rich of all investigated habitats and the grazing animals (sheep and cattle) seemed to affect the plants' pH and nitrogen tolerance. Cattle grazing also seemed to most positively affect the diversity status (species index) and biological status (nature conservation status index). In general, the biological status of the organization's 38 subareas, were mostly moderate (66%), with some (24%) having poor quality and 10% having a good biological status.

This volunteer group was married, middle age to old adults, with no children living at home, with a longer educational background, today either full-time or being retired.

The motivation analysis revealed five motivational factors *Social, Personal benefit, Nature value, Identification* and *Instrumental*. The members' organization affiliation and demographics affected their motivation. The most common affecting demographics were gender and how much time the members used at enclosure activated including the social activities and their membership status.

Members of Soellerod nature conservation- & grazing organization were the least likely to volunteer due to social motivation, where members of Saerlose grassland forest boar and grazing organization were amongst the most likely.

Members of Soellerod nature conservation & grazing organization seemed to be the ones least motivated by the personal benefit factor. No single organization's members could be said to be most motivated within this factor.

All members independently, of organization affiliation, did not think enough is done in Denmark to protect our nature, which were the only variable affected within the nature value factor. Anyway, the members of Jyllinge Holme sheep association, seemed to disagree the least, and they were also least likely to be members because of a general concern for environmental issues.

Members of Soellerod nature conservation & grazing organization were among those, who were the least motivated, this time by identification motives, where members of Hjortespring nature conservation association and Soroe grazing organization were among some of the most motivated.

Approximate 40 % (10 organizations) valued meat and/or wool, which were the only factor within the instrumental factor that depended on organization affiliation.

The members' motivation, independently of what it was, did not seem to affect the nature quality/status of their areas. However, it appeared that the status of their areas could affect their motivation. It seemed that the better status/quality the organizations' areas were, the more the members felt they got a new perspective by being members.

All members, in general, agreed with their organization's view on quality meat and animal welfare.

6 Discussion and perspectivation

In this chapter the initial research questions will be discussed base on the results found in this project and related to relevant results or research in the literature.

Today (2018), species decline 100-1000 times faster than what is natural (Petersen et al. 2012), for this reason, this century has been called the sixth mass extinction. The Economic Councils (De økonomiske råd) estimated in 2012, that a concrete effort for biodiversity in the open natural habitats would cost about 730 million DDK (98 million EURO)[14], making prioritizing and involvement of volunteer forces essential.

Most studies examining volunteer motivation are still an assessment of how managers can recruit more members, often completed in social settings. When done in a nature setting, the focus was still, a design or recruitment purpose. This project is the first cross-study of nature volunteers, concerned

[14] The actions in open nature habitats include management of existing nature, increase of nature areas and reduction of nitrogen impact.

with the motivation among members, and the nature status of the areas they manage it is a case study of 25 grazing organizations across Denmark (Figure 1).

6.1 Differences in the investigated areas

Habitat, grazing animals and enclosure size were the most visible factors separating the participating organizations. Problematic and positive species were found as indicators of grassland and meadow habitats (Table 8) was the common species separating the plant communities at the different areas, even though some rare species were found e.g. *Dactylorhiza majalis* (maj gøgeurt). Area size often has immense effects on diversity. Large coherent areas are important in nature management, and for diversity and sustainability of populations. On average the organizations manage areas at 8 ha, but the investigates sites ranged from 1 to 11 ha, between Taarnby conservation organization and Copenhagen grazing organization (Appendix 13). The smaller areas may have less diverse plant life but can act as refugees for mobile species and stepping stones for dispersal of plant species over larger distances. All habitats included in the project, were hard to characterize. They were mosaics of different habitats, with smooth transitions. This is generally beneficial for biodiversity, as habitat diversity poses more colonization opportunities.

The open natural habitats in this project, were characterized and accessed using NOVANA registration and methods developed for Natura2000 nature. No methods have yet (2018) been developed to estimate biological status for nature outside Natura2000 reign. New methods are under development, at least in Denmark, making it possible to measure biological status in all habitats from Natura2000 sites to National parks and even gardens (Dansk naturindikator2018).

The ordination, based on plant community composition, gave an idea of which areas were similar based on plant community composition, without any pre-assumptions about which species or area belonged to a specific habitat (Figure 3). It made it clear that habitats are plastic and nature cannot be boxed. The plant species occur where their requirements are fulfilled, not because, we have decided that they are meadow species and therefore should occur in meadow habitats. The categorization of habitats is more a guideline of what we might expect to find in a certain area.

Meadow and fen habitats were moister and the plants growing in these habitats were all well adapted to moister conditions, which also was one of the criteria used in habitat categorization. The differences in soil water between habitats combined with plants water preferences , made the different locations habitable for different species. The grasslands had species such as *Galium verum* (gul snerre), *Pilosella officinarum* (håret høgeurt) and *Bromus hordeaceus ssp. hordeaceus (*blød hejre), preferring dryer conditions (Bruun and Ejrnæs 1998).

Apart from limited space, too much fertilizer is one of the biggest threats to nature and biodiversity. Fen and meadow habitat had the highest amount of N (%) and C (%) (Figure 7), but the C/N ratio did not significant differ among habitats. The amount of N and C is often related to the soil water content. High levels of soil water can lead to insufficient aeration for the soil organisms slowing down the decomposition rate. Moist or wet habitats as meadows and fens usually have slower processing, and a high C/N ratio (less available nitrogen) (Yuntao et al 2017), compared to drier habitats. However, such differences in C/N ratio were not detected in this study. The C/N ratio was not found to affect the plant community composition, whereas total N and C did (5.1.2 Ordination and species indicator analysis).

It takes many years for grazing to positively affect an area. Meadow and combination habitats have on average been grazed, by the organizations, in 13 years, were grassland and fen habitats have been grazed in about 10 years and the only salt meadow in 16 years. Areas belonging to e.g. Petersminde grazing organization, Jyllinge Holme sheep association and Furesoe grazing organization had been grazed before the organizations were founded, promoting better effects today, than e.g. Hojmosen grazing organization, which has been grazed one season, and had not been grazed before.

Apart from management history, the surroundings can affect the diversity and richness potential in a habitat. Habitats included in or adjacent to Natura2000 sites, will have better initial conditions. Habitats with more niches have the potential to get most diverse, against what was expected, combination habitats were not the most species rich, it was the grassland. The diversity was only detected in the plant community, many of the grassland scrubs e.g. *Rosa* (Rose) are connected to more than 150 fauna species and flower plants as *Lotus corniculatus* (Alm. kællingetand) are connected to about 50 fauna species (Buttenschøn 2007), making it interesting to expand the diversity measures to the fauna community as well.

6.2 Grazing effects

All investigated plant communities were affected by the gazing animals. The common species were indicators for the grazing animals. *Epilobium parviflorum* (dunet dueurt), and *Deschampsia cespitosa* (mose bunke) indicated cattle grazed areas (Table 8), suggesting that cattle often are used as grazers in damper areas that these species prefer or that they avoid them. No indicators were directly connected to sheep grazed areas, maybe because only 20% of the organizations had sheep.

All effects of grazing from fall and summer remained important (figure 12). The lower biological status (nature conservation status index) at sheep grazed pastures, indicated that sheep are less effective nature managers compared to cattle. In addition, sheep grazed areas also had significantly lower species index compared to cattle, when discarding seasonal effects. The lower indices at sheep grazed

pastures could be related to the grazing mode of sheep and cattle. Sheep are known to be selective grazers preferring herbs, compared to grasses. Herbs a bigger contributor to biological status, not only because they usually are more sensitive to environmental influence, but also because many are directly connected to the lifecycle of insects. Cattle are known to prefer grass species, advantageous to the overall diversity in an area.

Even though, areas with different types of animal grazing, did not have a significantly better diversity status, the results suggest that grazing with different types of animals, promotes diversity most. This tendency was very weak, as only one organization had different animals in their enclosure. A more elaborate evaluation is necessary to get this tendency confirmed.

6.3 Area properties effects on nature

Results showed, that in summer species index, were positively affected by an increase in soil pH. This contributes to the understanding that many rare species are connected to calcareous soil. Rare or vulnerable plants are not in the same way connected to soil moisture. The diversity status (species index) and biological status (nature conservation status index) still increased with increasing soil water content. Drainage is a threat against open natural habitat, naturally water occurrence can promote diversity, as it creates gradients within the habitats, resulting in more niches and thereby more diversity.

The nutrient availability, and especially nitrogen available to plants, is one of the most important factors in determining plant community composition. Too much available nitrogen will favour nutrient-loving species, decreasing the overall diversity. Small amounts of nitrogen compared to carbon, will result in nitrogen limitation, where only a little nitrogen becomes available to the plants, favouring the hardiest species. The threshold for the C/N ratio for nitrogen limitation is 1:15 (Strandberg et al. 2005). The available nitrogen (C/N ratio) did not directly affect diversity status (species index) and nature status and potential (nature conservation status index) the N (%) and C (%) did. When amount of N and C increased so did diversity status (species index) and nature potential (nature conservation status index) (Figure 10). This indicates that unavailable organic and inorganic N and C, e.g. as build in in biomass, manure and decomposing organic matter affects the diversity status (species index) and nature status and potential (nature conservation status index).

The structure index was the only factor affected by soil properties, when not looking at seasonal differences between September and May/June (Figure 13). It may have been the only factor stable enough at both registrations to produce significant results, emphasizing the importance of seasonal changes in a plant community.

Competition and overgrowth are among the biggest threats against open natural habitats. Available nutrients and hence the plants' nutrients preferences, affects competition in a plant community. The more available nutrients, the harder the competition. Species preferring this condition, will grow fast and outcompete more vulnerable species reducing diversity status (species index) and potential (nature conservation status index). Results showed that the diversity status (species index), increased with a decrease in the species nitrogen preferences, independently of data collection time (Figure 11). This indicates that competition and indirectly excessive nitrogen amounts are most influencing on diversity and especially of the more vulnerable species.

6.4 Nature potential

More than half of the organizations' biological status were moderate and about a quarter had a poor biological status, indicating moderate to large anthropogenic impact. Biological status was best in the summer, where about one-fifth of the organizations had good biological status at their areas. Nonetheless, about 10% of the investigated subareas had a good biological status independent of season (Figure 15), responding to four organizations having partly good biological status at their areas. The biological status is an expression of the structure at the organizations' areas and the diversity status (species index). The seasonal differences must mainly be related to species, identification of blooming species in summer is easier vegetative species in fall. The structure is only partly affected by season.

6.5 Who volunteer for nature?

Many different people volunteer. The typical nature volunteer, within a grazing organization, was a married, middle age to old adult, with no children living at home, often with a longer educational background, now either working full-time or being retired (Appendix 6). Compared to other Danish volunteers (Center for frivilligt og socialt arbejde), this volunteer group consisted of many retired people. Retirees are nationally the most involved in voluntary work. Young people and students were massively under-represented among members of the grazing organizations. Nationally, 40% of Danish volunteers are students and young people, age 16-19, where under 2% of the members were under 20 years and studying in this group. Previous studies suggested well educated and resourceful people as the most likely to volunteer, partly as a side effect of more invitation opportunities or more knowledge about the problem (Wilson 2000; Musick 2008). In this setting most were well-educated and one third became a member based on an invitation from ether, friends, family, neighbours or colleges– so even within nature volunteering educational level and the power of invitation still seem to catalyse volunteering.

These nature volunteers could also be defined by other parameters more directly related to the organization they were members of. Members often lived close to the area they managed (5-15

minutes) and in average used less than an hour on their voluntary work per week annually (Appendix 7). This expressed a time-benefit-attitude, where less transport and shorter duration of volunteering were typically and seen as beneficial. This was very different form the *regular* Danish volunteer, who on average uses four hours per week volunteering .(Center for frivilligt socialt arbejde. 2018)

Most nature volunteering, not only grazing organizations, are practiced in the summer months. In a grazing organization, the members are not bound in the same way as in e.g. people volunteering in red cross stores, are bound to participate in a certain number of hours. Members of grazing organizations have supervision duties and can participate in social activities or work day within the organization, but the latter is not mandatory. Providing these volunteers with the luxury of having both freedom and responsibilities, heavily affecting the time used within the organization. How people use their time within a volunteer organization, is highly dependent on the kind of volunteer organization they have joined. It might be interesting to investigate this aspect some more, maybe as an efficiency- or purpose -marker for different volunteering work, but also to see if all nature volunteers are as connected to the local community and aware of transport-cost, as members of these grazing organizations. These aspects were not covered in connection with this project.

The organizations' foundation date span from 1990-2017 (Table 5), and the membership length span accordingly. One third of all participants had been members since the foundation of their organization. This indicates dedication, of at least people being part of the establishment of the organization, emphasized by a comment from a member *"most of us are older people now, we need some young blood".* She was right. Only about 4 % of members of grazing organization was under the age of 30. This may paint a picture of a core of older enthusiast in most organizations.

Not surprisingly, most participants were *regular* members, paying and participating in activities, but about 6 % were inactive members, i.e. only paying members, supporting the organizations financially. This volunteer model is most common in Denmark, were members pay a contribution, where they are active volunteers. There is no record of all the inactive volunteers, only supporting a cause financially. This is another way of contributing to a cause, without donating time. In this model you can support even more cases, because you don't have to actively be present and do the work – time is after all one of our most valuable assets. This was emphasized by the pattern among volunteers were, fewer become volunteers, but people already involved often volunteer for more than one case, Generally, every third volunteer, participate in more than one activity (Center for frivilligt socialt arbejde 2018). This was even more pronounced among this group of nature volunteers where half participate in more than one volunteer activity.

6.6 Motivation among nature volunteers

Few have yet (2018) investigated motivation among nature volunteers. Many members, in this project, were positive toward their nature management tasks and the purpose of their organization (Appendix 8). This made them similar to other nature volunteers, who were motivated by an ability to envision a brighter future was motivating (Bennett et al. 2018). Five motivational factors were identified for this group of nature volunteers, the social factor, the personal benefit factor, the nature value factor, the identification factor and the instrumental factor. All factors seemed to be of almost equal importance, with a slight tendency toward personal benefit and identification motivations were the most important among the members (Table 13). Nevertheless, social and nature motives seemed to be the most prominent among members belonging to organizations with a high biological status on their areas.

Later studies of nature volunteers revealed nature concern as a dominant motivation, but also factors as the opportunity to learn, socialize and reflect and some even an opportunity to belonging to a community or get career benefits. For all nature volunteers across projects three major aspects recur and can be re-found in this project, 1) nature enjoyment or concern, present through the nature value factor, 2) social motives, either through social activities or expansion of network, covered by the social factor – social motivation also exists among non-nature volunteers. In fact, engaging in a social community was the third most important motivation, among Danish volunteers according to the Volunteer report 2016-2018 (Center for frivilligt socialt arbejde 2018). 3) Learning motives was included in the personal benefit factor, which presents a compromise of learning, teaching and reflective motives. It can also be re-found as some members declared learning, without specifying what, could motivate them in a continued membership. Then again, some other studies found place attachment to be important (Asah and Blahna 2012; Selinske et. al 2015). This was not found directly as a motivation factor but indicated, as most members lived close to their organization and three out of four declared that they felt the organization provided an opportunity to protect an area they felt connected to.

New findings, not found in any other volunteer project, was the identification and instrumental factor**.** These factors contain elements of known motivation factors but still, added new elements. The instrumental factor had elements of *Enhancement*, where the volunteer basically volunteered for themselves, often expressed through personal development or purely selfish reasons as e.g. meat/wool. This was backed up by 84.5 % expected a tangible or visible outcome of their membership efforts (Appendix 8). However, this factor also includes the importance of other people's opinions, suggesting a strive for social accept or recognition. This was in some studies a separate factor or included in the social factor (Hjortsø, Busck, and Fabricius 2006; Greenslade and White 2005). This combination was

new, revealing something about how this group of volunteers thinks and prioritize. It indicated that they are not heavily subjects to social norms but see social recognition more as a reward or benefit in line with stories or meat/wool, than a restriction or obligation. The identification factor was completely new, as many other studies had not measured if the participants, expect to be a member for a longer period or shift to another voluntary organization. This identification factor also included elements of *social norm* and *enhancement*, by investigating how important the members found the support of people in their close circle and personal enriching experiences. In fact, about half of the volunteers thought social support was important for their participation. This new grouping gives a new perspective on motivations, as commitment and enriching experiences were the two variables loading highest (Table 13).This amplifies a commitment to the volunteer organization they are already a part of or a view of themselves as people with a volunteer identity.

Apart from social, nature value, personal benefit, identification and instrumental motivation, many volunteers were motivated by a general enjoyment of the outdoors and an opportunity to teach their children about food, animals, animal welfare and nature. The additional motivation was the volunteers' own perception of what motivated them. These were not completely different from the five motivation factors but revealed that the volunteers saw themselves as nature loving individuals, concerned with giving their children an environmental conscience.

A desire to learn was universal for all volunteers in Denmark (Center for frivilligt socialt arbejde 2018). Results revealed that, all members, independently of organization, also had a desire to learn, especially about nature or animals (Table 11). This underlined the observation that, volunteers enjoy learning form their voluntary work, made by Bruyere and Rappe in 2007 and Selinske et al. in 2015. Different kind of animals was a grazing organization specific motivation trait, which can be advantageous for the biodiversity at the grazed areas. Different animals have different food preferences, e.g. sheep prefer bitter plants, as herbs and are likelier to eat *Heracleum* (bjørneklo), *Rumex* (skræppe) and *Taraxacum* (mælkebøtte), and leave patches with tall grasses, in favour of some butterflies e.g. *Polyommatus icarus* (alm. blåfugl). Cattle, on the other hand, eat more grass, preventing grass-domination and favouring flower plants, important for many pollinators. To favour not only different plant species and creating a more diverse plant community, but also a more diverse fauna, it would be advantages to promote differences in grazing modes, to accommodate the needs of as many species as possible.

6.7 Differences among the volunteers

Human motivation is complex. The members' motivation was mostly affected by which organization they belonged to, closely followed by their gender, membership status and how much time they used at enclosure related activities. In fact, organization affiliation influenced at least one variable in all

found motivation factors except the instrumental. Years of membership and if the members did other voluntary work had the least effect on motivation.

The purpose and premise were almost similar for all 25 organizations. However, the organizations were still different appealing to marginal different people, with different opinions and motivations. Among the members highly motivated by social motives, were members of Saerlose grassland forest boar and grazing organization, while members of Soellerod nature conservation- & grazing organization, were least motivated by social motives (Figure 17). This suggests, socializing as important, but not equally important for the total volunteer group.

Three out of five variables were affected by organization affiliation within the personal benefit factor. Members of Soellerod nature conservation- & grazing organization did not find that they been able to make a difference or contribute to the local community, especially not compared to members of Slotsmosens grazing organization. This may be affected by their location, Soellerod nature conservation- & grazing organization's area was not remote, but Slotsmosens grazing organization's area was located with a walking path on one side and a residential on the other.

Soroe grazing organization had very diverse areas with e.g. *Dactylorhiza majalis* (maj gøgeurt) and *Eriophorum angustifolium* (smalbladet trehage), making it easier for members to see management benefits. At my visit in summer, *Dactylorhiza majalis* (maj gøgeurt) had spread from one of the investigated enclosures to the other[15]. Soellerod nature conservation- & grazing organization, on the other hand, had a less diverse are, mainly dominated by *Holcus lanatus* (fløjlsgærs) and *Trifolium repens* (hvid kløver). Members of Soroe grazing organization were additionally very concerned with protecting nature for the future generations. This may inspire them to make an extra effort in their areas. These were the organizations differing the most regarding the feeling of making a difference (Appendix 11, Table 31), indicating that a visible diverse area can affect members motivation.

Organization connection had little effect on the members' *nature value* motives, revealing that all volunteers are in fact motivated by nature motives. In addition, some, e.g. from of Arrenaes grazing organization and Kasted fen grazing and conservation organization, were also concerned with environmental issues, adding to a more elaborated nature value mentality, not only concerned with biodiversity and nature management.

Personal enrichment was the only variable separating organization members who volunteered for identification reasons (Appendix 11, Table 30). This suggests that the personal enrichment was directly

[15] From the enclosure Bagflommen to Banefolden.

connected to the organization, either through nature enrichment from their areas, a social network or a feeling of being appreciated or needed.

One of The Danish Society of Nature Conservation's assumptions about members of grazing organization was that they enjoyed quality meat. Ten organization (40%), saw meat and/or wool as a very important part of their membership. It was the only motivation, depending on organization, that separating members motivated by instrumental motives. This motivation is unique for grazing organizations, as they, in fact, are the only Danish volunteer organization where the members can get a physical product from volunteering.

Members of grazing organization are not only people belonging to a certain organization, why the project also revealed demographic differences in motivation.
Differences between males and females have been identified in several areas e.g. Social problem solving (Wymerand Samu 2002). In this project, males differed from females by being more social and appreciated the storytelling aspect the organization provided. Males were they less concerned if their decision, of being a member, were supported by people in their close circle. They were more satisfied with the efforts done for nature, and thereby less interested in protecting it. This meant that females connected strongest to the nature value factor and identification factor, while males connected stronger to social and instrumental factor. This revealed interesting differences between male and female motivation, in a nature volunteer setting. Similar female motives were found by Wuthnow in 1996, where females associated volunteering with expression of their inner selves, which could be related to the expression of a volunteer identity and the nature values found in this project. The males associated volunteering with the accomplishment of a task. The male volunteers in this project were more benefit or reward orientates that their female counterparts but did also seek fulfilment of needs.

Older adults, over 60 years, are known to have relative high rates of volunteering (Wilson 2012) The findings revealed that age did not heavily affect motivation. Age mainly affected if the organizations were a place to meet new people, where an increase in age was positively correlated with being motivated by meeting new people through the organization. Older adults have earlier been found to feel more motivated by socially based motives (Omoto and Packard 2016).
More than half of the participants did not have children living at home, maybe due to more than 60 % were 51 years or older. Results showed that having older children above, 6 years, promoted members' urge to share and pass on their knowledge about animals and nature. This might as well be an effect of having any knowledge to share, as the age of your children often reflects in your own age and

thereby life experiences (Appendix 14) and maybe you desire to share and pass on your knowledge to younger generations. Results also showed that having children, regardless if they still lived at home, catalysed place attachment (Appendix 10, Table 29). Especially, members with older children above 12 felt they got an opportunity to protect an area they felt a connection to. It could be that people with older children, have a stronger connection to a place or community, as they may be raised their children there, and therefore are more likely to invest in local projects.

Education has been called the most influential predictor of volunteering. Well-educated people often have a larger network, more awareness of community or worldwide issues and more resources (Wilson 2000; Measham and Barnett 2008). In this project, members with an intermediate higher education felt it was more important to take care of nature, than all other groups. This suggested that educational level effects nature concern, maybe as an effect of more nature awareness. It also creates an opportunity to investigate, if type of education has an effect on nature volunteers' concern about nature. What if all with an intermediate higher education, by incident were educated environmental workers. High educated had the lowest interest in meat/wool, adding to the fact that they that are interested in the second part of their organization's purpose, nature protection/management. Higher education gives more awareness to problems, but members with a long higher education also gave more attention to the opinion of their social circle. This revealed, that they were the group properly most constrained or imposed by the norms of the people they associate with.

Peoples nature view is often very different and can include all from nature unaffected by anthropogenic activities to a crop field in the country side. People mainly brought up in the city, did not think that we do enough to protect nature, compared to people from the countryside (figure 22 C). Does people from the city, not think enough is done as they seldom see it with their own eyes, or maybe people from the countryside, are slightly less negative toward our common nature efforts, because nature was all around them in their childhood or because some depend on crop fields as an income, and therefore do not mind that it presents a large part of the country compared to nature. This difference indicated that upbringing has a huge effect on people's nature-view and can be important in campaigning for nature, that different gropes have a different affiliation to nature. However, the different nature-view does not, in this context, affect if people are members (Appendix 6, Table 24).

The board in the organization are voluntary and chosen by the other members. People choosing to be chairmen were people with a higher place attachment, who believed knowledge sharing was an important part of the organization and they did not see meat/wool as a primary part of their membership. This suggested that the ones choosing to be chairmen were more concerned about the

nature aspect of the organizations' purpose. This gives great opportunities for the organizations, to make an impact through their management and ensure that knowledge and experiences will be shared among members. It also provides vital information about what kind of people like being managers in such projects.

In a study from 2009 concerning conservational volunteers, the second and third most reason for volunteering were to be close to nature and be outside (Guine and Oberhauser 2009). This was not directly found in this project, but results revealed, that member using more than 20% of their time outdoors enjoyed nature more than people using below 20%. This suggests that outdoor activities promote appreciation of nature, maybe useful in sparking the general public's interest for nature. However, time in the enclosure was not proportional to learning about flora and fauna, maybe because people all come with different prior knowledge, and the organizations differ in how much they want to teach their members about flora and fauna. It is not a part of the organizations' purpose, education in nature and management is only somehow implicit. This also emphasized that outdoor activities do not give more insight and knowledge about nature this must be taught.

Transportation and time use are indicators of a cost-benefit mentality. The participants were hard to compare as the mode of transportation was not recorded. For more comparable results, it would be advantageous to know if e.g. people using 30 minutes on transportation, use a car or a bike, as the investment is different. People, investing the least in transport and having the strongest connection to the local community, found that the organization contributed to the local community (Figure 20). These members lived in the area, why they would be most likely to hear about or notice any positive feedback. People living close also expressed place attachment. This suggests that people get more joy and are more willing to volunteer in their local community, due to the first-hand experiences and feedback of the effect of their efforts. Long transportation time seemed to decrease enjoyment of outdoor activities as a membership reason. This is important information for all volunteers in outdoor settings, as it is not the intention, to minimize nature volunteers joy of the outdoors. Similar results were found in 2014 (De økonomiske råd 2014), where people visiting recreational areas mostly travel within one to three kilometres from their homes. This emphasized the importance of local nature, but also that proximity is important not only for the enjoyment of the outdoors, but also peoples use of nature.

The need for a more concrete product increased with time invested, all using above an hour of their time per week saw meat/wool as a more important cause of membership, compared to members using less than an hour. This suggests that more investment equals more expectation to a tangible outcome.

Converging the information that if you want to involve people outside a local community in volunteer work, offering a direct reward can be the catalyst to involve more people.

6.8 A grazing organization union

Volunteers are often gathered in organizations, to make collaboration with partners, especially municipalizes easier. Volunteer involvement in a grazing organization differs from involvement in e.g. Danish Society for Nature Conservation (DN). After a talk with Nick Leyssac from DN, who could tell, that the initial idea was that grazing organizations should have been associated with DN. It was investigated if the members, of the organizations, wanted to be gathered in a more union like formation. It was hard to tell if a common grazing union was seen as an advantage or a disadvantage among members (Table 12). Collaboration, knowledge and experience sharing among organizations were the most important advantages for members welcoming a union. The people against a union feared, that the organizations were to different and could not be put into a common "grazing-box". They were concerned that the local aspect would disappear or become less important and they did not want even more bureaucracy. It could have advantages, but also scare off the people, who are very interested in the local aspect and concerned about the local impact, which in fact seemed very important for many participants in this project. Due to the low response rate it is likely, that many are satisfied with the current arrangement and design of grazing organizations.

6.9 Effect of motivation

Arrenaes grazing organization, Bondemosens grazing organization, Kasted fen grazing and conservation organization and Soroe grazing organization, had the highest biological status. The areas belonging to Arrenaes grazing organization and Bondemosens grazing organization were grassland habitat with cattle, which were found to be the most species rich areas. Members of Arrenaes grazing organization and Bondemosens grazing organization were not members who differentiated greatly from other members. They did value the social factor high, both meeting new people and their organization's social arrangements, indicating that social motivation can influence the nature effort. On the contrary, members of Kasted fen grazing and conservation organization were some of the members least motivated by social motives (Figure 17). Nevertheless, members from Kasted fen grazing and conservation organization and Soroe grazing organization very much agreed that we today do not do enough to protect our natural habitats. Members of Kasted fen grazing and conservation organization, were also some of the members, most concerned with environmental issues in general. On the other hand, were members of Soroe grazing organization concerned with protecting nature for future generations and making a difference through the organization. This suggested that nature value motives affect biological status. Basically, both social motives and nature motives seem important to

promote good management results and thereby most biodiversity. In addition, social motivation especially the importance of social arrangements, were also shared among members managing areas with best diversity-status, e.g. members of Arrenaes grazing organization and Konusserne.

The motivation among members had a no significant effect on biological status at their areas, but implications, showed that nature motives and social motive were most prominent among members with good biological status. There was a strong indicator, if members manage an area with a high biological status today (2018), independently of what it may have been in the past, they obtained a new perspective. Members of Arrenaes grazing organization had nature potential, close to good quality and they had the members mostly feeling they got a new perspective. In fact, Arrenaes grazing organization also requested a presentation of flora data, which were done in December 2017 for the first part of the data collection, adding to the feeling of acquiring new viewpoints and maybe a new perspective.

7 Conclusion and future research

In this project, the aim was to find what motivates volunteers in grazing organizations to contribute to nature, access the nature on the areas they manage and if possible, to find a connection between their motivation and the status or potential of the nature they manage.

7.1 Key findings

The investigated sites were all different. The current state and biological status were not bad at any of the areas, but not high either. Independently of initial status, the plant community, diversity status (species index) and biological status (nature conservation status) were affected by the grazing animals and thereby the organizations' efforts. It cannot be rejected that some areas held a larger nature potential than others, independently of management.

A typical volunteer within a grazing organization was a married, middle age to old adult, with no children living at home, often with a longer educational background, either working full-time or being retired. Placing these volunteers in a distinct demographic group, without many young and with many well-educated people.

Volunteers are without a doubt motivated for different reasons. The organization affliation, gender, the time used at enclosure related activities, including social activities, and membership status mostly influenced members motivation. All were motivated by five underlying factors; 1) a social factor, where members volunteered for social reason, motives aligned with motivation found among other volunteers within and outside nature volunteering 2) a personal benefit factor, where members were

motivated by different potential outcomes and benefits connected to membership, either being direct impact, knowledge or perspectives shared or gained, 3) a nature value factor, were members were motivated by expressing values of nature concern. This was shared by all other nature volunteers. 4) An identification factor where members were motivated because they identify themselves, as belonging to a volunteer community and 5) an instrumental factor, where members were motivated by rewards as meat, stories and social recognition.

It was not possible to find a direct link between motivation and biological status. Neither if the motivation among members influenced the biological status, nor if the biological status of their areas effected members' motivation for volunteering. Data patterns suggested that social and nature value motivations affected or were affected by nature status on the organizations' areas the most.

7.2 Suggestions for further work

This study provided the first attempt at combining motivation among nature volunteers, with the conditions of the areas they manage. Even though, the motivation among members did not significantly affect the biological status on their areas, or vice versa this research still represents a baseline for future investigation, concerning nature volunteers, nature status on areas managed by volunteers and a combination of the two.

The results point to further investigations especially regarding the benefits that motivates the volunteers, and how they can support municipalities, NGO's and others working with nature conservation and communication of nature values. Two issues may be of specific interest. First, how to recruit future volunteers, and how to maintain the motivation of the people already involved. And secondly, if the efforts done by volunteers has any beneficial effect on the natural habitat they manage. This study gives a first cross-disciplinary baseline for evaluating these questions, but the survey would benefit significantly by retrieving data for a time series monitoring the management activities and the biological status. This would provide not only the municipalities with a measure of the management efforts, but also give the organizations an idea of what their contribution means for the status and biodiversity. The nature monitoring could be extended to a more comprehensive registration also e.g. also including fauna species.

A monitoring of the members' motivation could also be interesting, to estimate if the motivation changes as the areas they manage changes, or if motivation changes with generation. The baby boomer generation (1946-1961), dominating this research may have different motives than the generations to come. The follow-up study could also be interesting, to see if the younger members are continuing the work or if grazing organizations die with their founders. If the organizations in

fact dissolve with their founder, it is essential to figure out how to motivate and educate younger people, to take ownership and responsibility in nature management, so nature does not become a rarity.

Similar studies done for other nature volunteers, looking at both nature and motivation, would make it possible to compare effects of management efforts and find if there are some universal or shared motivation among all nature volunteers, or if every group volunteer for completely different reasons. This would contribute valuable information, not only in the different effect of nature management done by volunteers, but also how to motivate and maintain different nature volunteers, to get the best possible representation of volunteers in nature management.

People volunteering within nature often seemed to be volunteering within or close to their local community. This revealed that volunteers may not be the most efficient to manage more remote nature sites. This gives concrete material to figure out who is not only the most efficient, but also the best nature managers of the more remote management dependent areas. Furthermore, if it is possible to interest volunteers in the more remote nature, this research in fact revealed that more concrete (meat/wool) outcome, can get volunteers to move outside their local community. Maybe a recognition of volunteers as managers of natural habitats far from cities is necessary.

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