A land of one's own

Sami resource use
in Sweden's boreal landscape
under autonomous governance

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Cover: Forest Sami in Mausjaur reindeer herding community, Pite Sami district, demonstrating a makeshift raft used for fishing perch in small lakes in 1937 (Manker, 1968, p. 101) (photo: Ernst Manker, Nordiska museet, NMA.0043087, CC BY-NC-ND).

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Abstract

The Sami dominated large parts of boreal Sweden well into the 18th century, and knowledge of Sami subsistence patterns is therefore a key to the region's forest history. Although much research has been done on Sami resource use and landscape impact, the context is often vaguely understood.

The aim of this thesis is to contribute to a deeper understanding of Sami land use through studies of resource division, use and management. The focus is on the period from the late 1600s to the late 1800s, a period of declining but still existing autonomous Sami resource governance. Various historical and modern sources have been analysed with an array of methods from different academic disciplines.

The results show that the forest Sami's landscape was almost entirely divided into taxlands in the 17th century and that most lands were held by a single Sami household which controlled the land's resources. Fishing was the main subsistence mode, although it was combined with hunting, reindeer herding and plant gathering in different proportions. Taxlands were most likely created to divide lakes and rivers. Most of the year, households moved between permanent settlements close to fishing sites, and their settlement pattern is best described as semisedentary.

Since each household was in control of its own taxland, resources could be used flexibly. In winter, surplus pastures and hunting grounds were leased to reindeer-herding mountain Sami. During the 18th century, the forest Sami increasingly focused more on reindeer herding and less on fish. Summer movements were now performed between settlements installed to meet the needs of the reindeer, but the settlement pattern remained semisedentary. Fences were built in strategic places to control the movements of both own and foreign reindeer.

Remains of former Sami resource use are often difficult to detect. Data collected with airborne laser scanning (ALS) can be used to map several kinds of remains, provided that the data is processed in an optimising way as shown in the thesis.

In short, the thesis describes former forest Sami resource use as flexible and subject to change, and presents new methods to map cultural remains with maximum coverage.

Keywords: ALS, archaeology, boreal forest, dendrochronology, forest history, historical maps, interdisciplinary research, lidar, Sami, settlement patterns

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Ett eget land: samiskt resursutnyttjande under autonoma förhållanden i Sveriges boreala landskap

Sammanfattning

Samerna dominerade stora delar av det boreala Sverige långt in på 1700-talet. Kännedom om samiska försörjningsmönster utgör därför en nyckel till områdets skogshistoria. Trots att mycket forskning har utförts om samiskt resursutnyttjande och dess påverkan på landskapet är formerna för detta bristfälligt kända.

Målet med den här avhandlingen är att försöka nå en djupare insikt i samernas roll genom undersökningar av hur resurser fördelats, använts och förvaltats. Den berör perioden från slutet av 1600-talet till slutet av 1800-talet, en tid då samerna fortfarande i mångt och mycket kunde fatta autonoma beslut om resurserna. En mängd olika historiska och moderna källor har analyserats med metoder från olika vetenskapsområden.

Resultaten visar att skogssamernas landskap var nästan helt indelat i skatteland på 1600-talet och att de flesta land innehades av ett enda samiskt hushåll som kontrollerade landets resurser. Försörjningen baserades först och främst på fiske, men jakt, renskötsel och insamling av växter bidrog i varierande proportioner. Skattelanden hade förmodligen ursprungligen inrättats för att dela upp sjöar och vattendrag. Under merparten av året flyttade hushållen mellan permanenta boplatser i anslutning till fiskeplatserna och bosättningsmönstret kan bäst beskrivas som semisedentärt (delvis bofast).

I och med att varje hushåll hade kontroll över sitt skatteland kunde resurserna utnyttjas på ett flexibelt sätt. Vintertid hyrdes överskottet av betes- och jaktmarker ut till fjällsamer som var mer inriktade på renskötsel. Under 1700-talet började även skogssamerna satsa mer på renskötsel och mindre på fiske. Sommarens förflyttningar skedde nu mellan bosättningar som anlagts i första hand för renarnas behov, men bosättningsmönstret förblev semisedentärt. Stängsel byggdes på strategiska platser för att styra renarnas rörelser, både de egna renarnas och andras.

Det är ofta svårt att upptäcka lämningar efter äldre samiskt resursutnyttjande. Data som insamlats genom luftburen laserskanning (ALS) kan dock användas för att kartlägga flera typer av lämningar under förutsättning att databehandlingen är optimal.

I avhandlingen beskrivs således äldre samiskt resursutnyttjande som flexibelt och föränderligt. Dessutom presenteras nya metoder för att inventera kulturlämningar så heltäckande som möjligt.

Nyckelord: ALS, arkeologi, boreal skog, bosättningsmönster, dendrokronologi, historiska kartor, lidar, samer, skogshistoria, tvärvetenskap

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Dedikation

Till alla er som gått före i de boreala skogarna.

Men när de frågar var du har ditt hem
säger du då allt det här
På Skuolfedievvá reste vi tältkåtan
i vårflyttningstider
i Čáppavuopmi hade vi kåtan i brunsttiden
Vårt sommarviste är Ittunjárga
och om vintern är våra renar i Dálvadas trakter

Du vet det syster
du förstår bror

Våra förfäder har eldat på Allaorda
på Stuorajeaggis tuvor
på Viidesčearru
Farfar drunknade i fjorden under fiske
Farmor skar sitt skohö i Šelgesrohtu
Far föddes i Finjubákti i brinnande kyla

Och ändå frågar de
var har du ditt hem

Nils-Aslak Valkeapää
Ur *Vidderna inom mig*
Översättare: Mia Berner, John E. Utsi & Kristina Utsi.

Contents

List of publications

This thesis is based on the work contained in the following papers, referred to by Roman numerals in the text:

I Norstedt, G.*, Axelsson, A.-L. & Östlund, L. (2014). Exploring Pre-Colonial Resource Control of Individual Sami Households. *Arctic*, 67 (2), pp. 223–237. © 2014 by The Arctic Institute of North America.

II Norstedt, G.* & Östlund, L. (2016). Fish or Reindeer? The Relation between Subsistence Patterns and Settlement Patterns among the Forest Sami. *Arctic Anthropology*, 53 (1), pp. 22–36. © 2016 by the Board of Regents of the University of Wisconsin System.

III Norstedt, G.*, Rautio, A.-M. & Östlund, L. (2017). Fencing the forest: early use of barrier fences in Sami reindeer husbandry. *Rangifer*, 37 (1), pp. 69–92. Available from: http://septentrio.uit.no/index.php/rangifer/article/view/4222

IV Norstedt, G., Axelsson, A.-L. & Östlund, L. Optimising airborne laser scanning (ALS) data for detection of cultural remains in a boreal forest landscape. (manuscript)

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* Corresponding author.

Abbreviations

CBP	charcoal burning platform
cf.	compare
DEM	digital elevation model
DSM	digital surface model
DTM	digital terrain model
et al.	and other authors
f.	and the following page
ff.	and the following pages
HR	high-resolution
LR	low-resolution
p.	page
pp.	pages
QTM	Quick Terrain Modeler, a software
SLU	Swedish University of Agricultural Sciences
SNA	Swedish National Archives

1 Introduction

The boreal landscape of Fennoscandia has often been labelled Europe's last wilderness, but it is increasingly being recognised as an ancient cultural landscape (Johnson & Miyanishi, 2012; Östlund & Bergman, 2006). Even the parts that have not been transformed by culture in the sense of agriculture have been influenced from time immemorial by culture in the sense of human action. This is particularly true of the interior of northernmost Sweden and Finland, where non-cultivating Sami dominated well into the early modern period.

The impact of the Sami is readily visible in forests with absence of commercial logging, especially forests dominated by the long-lived and long-lasting Scots pine (*Pinus sylvestris* L.). Where old trees abound, so do culturally modified trees. There are trees with large scars from the removal of inner bark for food or wrappings (Östlund *et al.*, 2004; Zackrisson *et al.*, 2000; Itkonen, 1948a, pp. 288ff) (*Figure 4*, p. 27). There are stumps from trees that were cut by reindeer herders to provide the animals with arboreal lichens (Berg *et al.*, 2011a; Berg *et al.*, 2011b), and stumps that once supported storage facilities (Rautio *et al.*, 2014). There are trees with trail blazes, trees where handles have been carved out to tie reindeer for milking, trees where wedges have been inserted to hold milk vessels, and trees which have been made into idols (Östlund *et al.*, 2002).

Not only individual trees were modified, but also the very forest. Around Sami settlements, the vegetation changed (Hicks, 1993) and the forest structure was substantially altered by cutting of wood for fuel and construction (Östlund *et al.*, 2013; Josefsson *et al.*, 2010b; Josefsson *et al.*, 2009; Östlund *et al.*, 2003). Where reindeer were gathered for milking and other activities, the soil chemistry and the ground vegetation were transformed by trampling and manuring (Kamerling *et al.*, 2017; Karlsson, 2006; Aronsson, 1991). Edible plants such as garden angelica (*Angelica archangelica* L.) and common sorrel (*Rumex acetosa* L.). have probably been introduced to settlements (Rautio, 2014). It has even been suggested that lichen pastures were managed through the use of fire (DeLuca *et al.*, 2013; Hörnberg *et al.*, 1999).

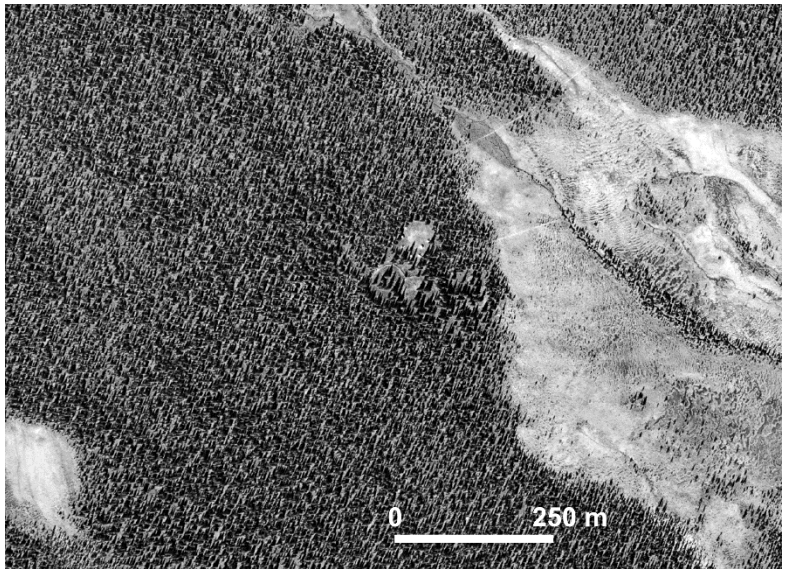

Figure 1. Tjadnes forest Sami settlement in Pite Sami district is visible as a clearing in the middle of this recent photo. Immediately south of the clearing are two adjoining reindeer corrals built for calf marking and separation of herds (Brännström *et al.*, 2017, p. 235). The site is an example of an intensely used hotspot in a landscape that otherwise appears as pristine. © Lantmäteriet.

These examples of Sami impact should not, however, be interpreted as if the boreal forest was fundamentally altered. Rather, the result of ancient Sami land use was a landscape with small, intensely used hotspots surrounded by large areas of low impact (Rautio *et al.*, 2016a). This landscape has been characterised as domesticated, but only in the sense that the Sami knew about available resources and how to use them in a sustainable way (Rautio, 2014, pp. 62ff). As far as we know, this kind of land use had no negative impact on biodiversity. In fact, Tjieggelvas nature reserve, where most of the above-mentioned studies on Sami impact have been done, is also an area where red-listed fungi are common (Josefsson *et al.*, 2010c). More often than not, nature reserves that are perceived as pristine are also areas where remains of Sami land use can be found today.

During the last two decades, much research has been done on the cultural impact of the Sami on the boreal forest landscape. Nevertheless, the context of this impact is often only vaguely understood. In both contemporary and earlier research on Sami land use, culture is often seen as dualistic, consisting of the habits of either one category or another, and then sometimes a transition between the two. Hunting is opposed to herding (Hedman *et al.*, 2015; Bergman *et al.*, 2013), intensive herding to extensive herding (Hultblad, 1968; Tomasson, 1918, p. 88), nomadism to seminomadism (Hedman, 2003, p. 18; Wiklund, 1922), western Sami to eastern Sami (Ruong, 1982, p. 69; Tegengren, 1952, p. 199),

forest Sami to mountain Sami (Fjellström, 1986, p. 171; Ruong, 1944). An application of dual categories is often justified for an analysis of limited questions, but it can also obscure more complex relationships.

The importance of a deeper understanding of former Sami land use was recently brought to light when Girjas Sami reindeer herding community (*sameby*) filed legal action against the Swedish state. According to Girjas, fishing and small-game hunting rights in a certain area are the exclusive possession of its members, and can only be leased to others by the community. Nevertheless, those rights are currently being managed by the County Administrative Board and can be leased to others without the reindeer herders' consent. The case was first tried by Gällivare District Court, which in February 2016 ruled in favour of Girjas. The judgement was brought to the Court of Appeal for Northern Norrland, which in January 2018 ruled that neither Girjas nor the state has exclusive hunting and fishing rights, and that the County Administrative Board can continue to decide on leases. The judgement of the appellate court has now been brought to the Supreme Court.

A recurrent theme of the Girjas trials has been Sami presence and land use during earlier times since their rights are not based on formalised titles of ownership but on customary law (*sedvanerätt*) or immemorial prescription (*urminnes hävd*). Many scholars and many academic works have been cited during the trials to prove that the Sami have or have not been the exclusive users of the area's resources in earlier days. While I have been finishing my thesis, I have listened through the proceedings of the Court of Appeal. This has inspired my thoughts on a couple of things which I will comment on further on.

Whether in lawsuits or in research, all discussions on former Sami land use are complicated by the deficiency of our knowledge. Scientists may measure and document all kinds of data in an excellent way, but the interpretation of those data is largely dependent on primary sources and published literature whose reliability may always be questioned. Even when they are reliable, they are never complete. Although some literature on the Sami was published already in the 16th and 17th century, most of it has appeared since ethnography developed as a science in the early 20th century. When the early ethnographic works look back in time, they describe conditions of the 19th century. It is sometimes tempting to generalise these conditions as describing "the past", but they are actually about a time when settlers were already present in large numbers and the Sami had lost important parts of their autonomous governance. When it comes to primary sources of Sami history, they mainly exist from the 17th century onward. The further back in time, the scantier are the sources, and the higher the probability that single statements appear to be universally valid in the absence of contradictions.

As to prehistoric conditions, our knowledge is derived from archaeological investigations (which, by the way, also contribute greatly to our knowledge of historical conditions). Theoretically, such investigations could be performed in a landscape-covering and unbiased manner. In reality, however, this is never done except in very limited areas due to economic and practical restraints. In northern Sweden, the main archaeological surveys were carried out during the 20th century for the production of the economic map and for the planning of hydroelectric exploitation (Selinge, 1978; Janson & Hvarfner, 1966). Principles of assessment and registration have changed several times. Until 1977, only monuments that were clearly prehistorical or medieval were noted (Granholm, 2012, p. 4), whereas current legislation applies to most remains from before 1850. Several kinds of remains that are typical of Sami land use, such as hearths, storage pits and bone caches, have only been considered as ancient monuments and systematically registered since around 1990 (Karlsson, 2014, p. 20; Granholm, 2012, p. 8). Also, northern Sweden, especially the interior part, has generally been surveyed superficially and incompletely (Karlsson, 2014, p. 20).

The low densities of ancient monuments registered in the boreal forest therefore cannot be interpreted as anything else than a reflection of where and how archaeological investigations have been carried out. The data deficiency causes serious restraints on the possibilities to interpret patterns of earlier land use. It is all the more lamentable since even registered monuments are often damaged or destroyed through forestry practices such as soil scarification (Unander & Claesson, 2016) (*Figure 18*, p. 98). It goes without saying that non-registered monuments will often disappear without even having been noticed and will never be included in future analyses of former land use.

In this thesis, my aim is to contribute to the understanding of the context of former Sami resource use in the boreal landscape. More specifically, I will focus on the following questions:

- How were resources divided between households? (Paper I, section 5.3.1)
- How were resources defended, or shared? (Paper I, III, section 5.3.2)
- How were resources used, in terms of subsistence patterns and settlement patterns? (Paper II, section 5.3.3)
- How were resources managed? (Paper III, section 5.3.4)
- Can new methods be developed to find and map cultural remains in a non-biased way in the forest landscape? (Paper IV, section 6)

These questions are huge and can hardly be answered in a general manner. Therefore, my investigations have been restricted in several ways as will be defined and discussed in the next chapter.

2 Scope and definitions

The limitations of the thesis' scope will be explained in this chapter, as well as certain key definitions. Each subsection refers to one part of the thesis' title.

2.1 The place: the boreal landscape

The area in focus of the thesis is located in northern Sweden at 64−67°N, 15−20°E (*Figure 2*). The landscape is moderately broken with elevations increasing from about 130 m a.s.l. in the east to generally around 700 m in the west. Most of the area is drained by the large rivers Piteälven, Skellefteälven, and Umeälven. These rivers rise in the Scandes, the mountain range that forms the border to Norway, flow towards the south-east, receive numerous confluents, and finally fall into the Baltic Sea. Apart from the rivers, the landscape is characterised by a large number of lakes, streams, and mires.

The bedrock is mostly acidic granites and metamorphic equivalents, although there are some occurrences of mafic rocks such as gabbros and basalts. During the Weichselian glaciation, the area was pressed down by ice masses, and at the end of deglaciation 10 000 years ago, the coastline was about 260 m higher than today. Almost all of the study area is located above this highest coastline and is mainly covered by glacial tills, with coarse postglacial sediments along the river valleys (SGU, 2018). However, considerable parts of the Krycklan catchment (paper IV) are located below the highest coastline and are characterised by more fine-grained sediments (Laudon, 2016).

The area is almost entirely within the boreal zone, i.e. the global taiga forest belt that continues through Russia and North America (Sjörs, 1963). According to Hugo Sjörs, the scientist who first applied the global classification system to Sweden, the boreal zone includes both the northern coniferous forest region and the subalpine birch woodland region om higher elevations (Sjörs, 1965). I have

however chosen to limit my use of the "boreal" concept to the coniferous forest and the landscape where it is found.

Figure 2. Map of Fennoscandia with the study areas of the papers. Papers I and II treat the area covered by Jonas Persson Gedda's map from 1671 (Gedda, 1671), i.e. most of Ume or Lycksele Sami district. Paper III focuses on Arjeplog Municipality. Paper IV is about the Krycklan research catchment in Vindeln Municipality (Laudon *et al.*, 2013). All areas except Krycklan are located in Swedish Lappland.

In Sweden, the boreal forest is dominated by two coniferous species, Scots pine (*Pinus sylvestris* L.) and Norway spruce (*Picea abies* (L.) H. Karst.) with some occurrences of deciduous trees. Pine is particularly common on the dry sedimentary soils along the rivers, while spruce prevails on the moister tills on hillsides and upland (Malmström, 1949). The natural tree distribution is also strongly influenced by fire history, since pine is more fire-resistant and colonises more rapidly than spruce (Högbom, 1934).

The coniferous forest grows up to about 500–600 m above sea level, where it is replaced by a subalpine belt of mountain birch (*Betula pubescens* ssp. *czerepanovii* (N. I. Orlova) Hämet-Ahti). Above 800 m, the vegetation is mostly treeless alpine heath. In the northern part of the study area, there are also some mountains further east that peak around 700–900 m a.s.l. and that present the same zonation. These "low alpine mountains" (*lågfjäll*) are thus surrounded by coniferous forests (Rönnow, 1944). Neither the subalpine birch woodland nor the treeless alpine heaths will be considered in this thesis more than en passant.

The areas studied in papers I, II and III are located in the province of Lappland, or more correctly in the *lappmarker* (in this thesis called *Sami districts*) (*Figure 3*). The Sami districts were separated from *nedre landet* (the lower country) by an approximate border, most of which was finally defined in 1751–52 (Göthe, 1929, pp. 451ff). The Krycklan catchment (paper IV) is located in the inner part of the lower country where there were a few peasant settlements in the 16th century. By contrast, the first known peasant in Lycksele Sami district (papers I and II) settled in Örträsk around 1678 (Egerbladh, 1965), while in Arjeplog Municipality (paper III), the first farm was established in Kasker in 1704 (Hoppe, 1944, p. 90). As far as we know, these areas had until then been exclusively inhabited by Sami who focused on fishing, hunting, reindeer herding and gathering, and who were organised in a number of communities (*lappbyar*) (cf. *Figure 9*, p. 55).

Peasants were generally rare in the Sami districts until the 1750s, at least in the areas concerned by this thesis, but then colonisation expanded quickly (Rudberg, 1957). Most of the settlers were immigrating Swedes (or initially Finns) and their descendants. However, in Arjeplog, about 30 % of the settlements established before 1868 belonged to indigenous Sami (Bylund, 1956, p. 210). In Jokkmokk, the proportion was about the same (Hultblad, 1968, p. 199). In Lycksele Sami district, the proportion of Sami settlers appears to have been smaller (Norstedt, 2011; Egerbladh, 1972b, 1967b, 1966). Today, the Sami are everywhere in the minority.

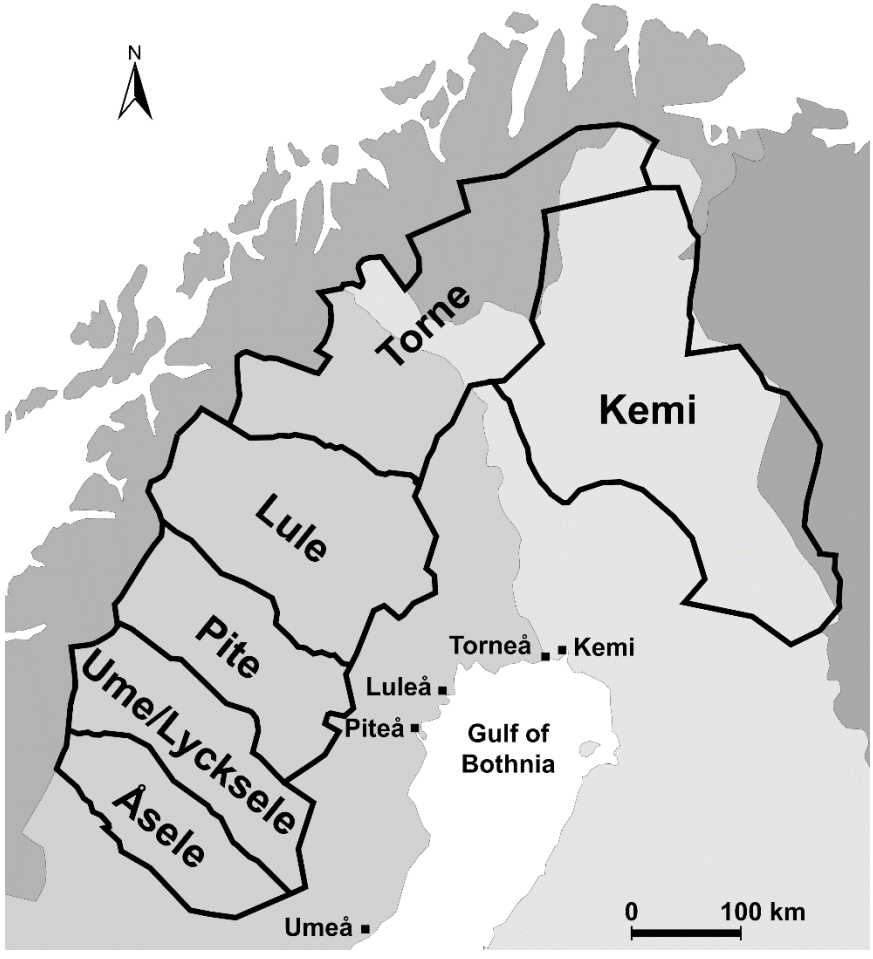

Figure 3. The extent of the Swedish Sami districts (*lappmarker*) ca 1607–1751. Together, all the districts were known as *Lappland* or more commonly *Lappmarken*. The border between Kemi Sami district and the lower country was defined in 1687 (Enbuske, 2008, p. 129) but is today obsolete. The border limiting Swedish Lappland was defined in the 1750s and 1760s (Norstedt & Norstedt, 2007; Göthe, 1929, pp. 451ff) and is essentially still valid as a border between municipalities. The Swedish border to Norway was established in 1751, and the one to Finland in 1809.

Since Swedish jurisdiction extended into parts of northern Norway until 1751 and Finland until 1809 (*Figure 3*), these areas will be included in some general discussions, especially in the study presented in section 5.1. By contrast, the provinces further south in Sweden have quite a different history and will not be treated. When nothing else is said, my research is limited to the areas indicated in *Figure 2*.

2.2 The actors: the Sami (or Lapps?)

Since time immemorial, the boreal landscape of the study areas has been the home of the Sami and has mainly been affected by their land use, apart from the last few centuries. However, primary sources from the time period covered by this thesis (from the middle of the 17th century to the end of the 19th century, as will be defined in section 2.3) hardly never mention the word *samer*, i.e. Sami. Instead, they speak of *lappar*, i.e. Lapps. *Lapp* is a word of unclear origin that was commonly used in Swedish until the mid-20th century, also by the Sami, as shown by the titles of the first Sami organisation (Lapparnes Centralförbund) and the first Sami magazine (Lapparnes Egen Tidning). However, when the Sami civil rights activist Torkel Tomasson launched a new magazine in 1918, he called it Samefolkets Egen Tidning and made the following statement:

> "Same, pl. sameh, är det folk, som svenskarna kallat och kalla lapp, lappar. Folket självt kallar sig dock same, pl. sameh." (Lantto, 2000, p. 108) ("Same, pl. Sameh, is the people that the Swedish have called and call Lapp, Lapps. The people in question, however, calls itself Same, pl. Sameh.")

The Swedes were rather slow to pick up the new word, but once it was included in the Reindeer Herding Act of 1971, it also became common in everyday language (with the plural form *samer*). Today, the use of *lapp* in Swedish is most often considered derogatory and should be replaced by *same* (Svenska Akademien, 2015).

During the Girjas trials, however, the replacement of *lapp* with *same* was seriously questioned by the representatives of the Swedish state. According to them, *lapp* in historical sources from the 14th century onward did not signify the Sami but nomads of undefined ethnicity. Not until the late 19th century, argued the State's representatives, was *lapp* also applied as an ethnic label (Forssell, 2017).[1] In other words, the replacement of *lapp* with *same* would be anachronistic and incorrect in a historical perspective.

The parlance of the representatives of the Swedish state in the first instance court was enormously criticised. After the proceedings, 59 scholars of Swedish universities and museums signed an article where they stated that

> "the state takes the interpretive prerogative to redefine Sami ethnicity, by resurrecting the outdated and derogatory term 'Lapp'", and

1. "Svårigheterna med terminologin beror på, att den officiella svenska termen för nomader allt sedan 1300-talet har varit lappar (…) Det framgår av det här materialet att man skilde mellan lappar och bofasta utan avseende på den etniska faktorn. Under senare delen av 1800-talet kom man dock att tala om den lapska folkstammen, och det var i tidens anda av nationalism. Därmed avsågs alltså den samiska befolkningen. (…) Det här ledde till att termen lapp kom att beteckna både lapp och same (…)."

> "the state reverts to a linguistic usage and rhetoric which derive from the period of racial biology" (Allard *et al.*, 2015)[2]

Part of the intervention of one of the State's lawyers was even sampled for a music video produced by Sofia Jannok and Anders Sunna, called "We are still here" (Jannok & Sunna, 2016).

As a result of this harsh criticism, the State's representatives took some time in the appellate court to justify their usage and cited a number of scholars to their support. I think it would be useful to make a closer examination of what those scholars actually said.

When justifying their choice to use the word *lapp*, the State's representatives mainly invoked two widely read scientific works. Both are theses, the first one by the geographer Nils Arell (1977) and the other by the legal historian Kaisa Korpijaakko-Labba (1994). According to Arell, who treated Enontekis parish in Torne Sami district from the 1660s to the 1880s, the classification of nomads (*nomader*) and settlers (*nybyggare*) in fiscal records and court records was more a matter of subsistence than of ethnicity. In support of this argument, he cited examples from court records where individuals from Finnish peasant families were called *lappar* or were said to live as or like Lapps (*leva som lappar*). However, Arell also pointed out that the attribution that was made on the basis of subsistence closely followed the one based on ethnicity, and he chose for himself to write *same*, not *lapp*, as the equivalent of *reindeer nomad* (Arell, 1977, pp. 33ff).

The other scholar evoked by the Swedish state's representatives, Kaisa Korpijaakko-Labba, treated the Swedish Sami districts during the 16th and 17th centuries (Korpijaakko-Labba, 1994). Citing Arell, she concluded that *lapp* did then not allude to a person's ethnic origin but to his or her subsistence mode. On these grounds, but unlike Arell, she chose to use *lapp* and consistently contrasted Lapp businesses *(lappmannanäringar*) with peasant businesses (*lantmanna-näringar*) (Korpijaakko-Labba, 1994, pp. 53, 66f). However, it is obvious from the title and the content of the thesis that Korpijaakko-Labba herself saw her work as treating the rights of the Sami as an ethnic group.

When the Swedish state's representatives claimed that *lapp* had been equivalent to *nomad* in the Swedish language since the 14th century, they ignored the nuances and reservations of Arell's and Korpijaakko-Labba's works. Furthermore, their statement is simply not true. I will elaborate on this matter in section 5.3.3, but to put it shortly, one of the main Sami groups, the forest Sami (who were certainly called *lappar* in historical sources), have rarely been

2. The translation has been made by the authors and is published on the web site indicated in the References section.

nomadic during historical times. In the 16th century, the forest Sami made up more than half of the Sami population (Holmbäck, 1922, p. 9).

So, what did *lapp* signify, if not *nomad*? In his extensive volume on the northern peoples, first printed in 1555, Olaus Magnus described *lapparna* in such a way that the connection to the Sami of later times is obvious. They lived in the North, away from Swedes and Norwegians but often trading with them. They were diligent boat makers, using roots to sew cleaved boards together. They mostly lived on fish, but in the winter went hunting on skis. They had domesticated reindeer, which they milked and used for other necessities (Olaus Magnus, 1982 [1555]). Published about a century later, Johannes Schefferus' groundbreaking volume *Lapponia* dispels all possible doubts about *lapp* being used for the Sami as an ethnic group far earlier than in the late 19th century. Schefferus could even tell that *same* is the name that this people uses for themselves in their own language, and that no Sami likes to be called *lapp* (Schefferus, 1956 [1673], pp. 40f).

The works of Olaus Magnus and Schefferus prove that the Sami were perceived as an ethnic group in the 16th and 17th centuries and that *lapp* was the word used to characterise them. This does not exclude, however, that *lapp* has sometimes been used in a more restrictive sense. Since the Sami were usually not peasants but more commonly fishermen, hunters, and reindeer herders, *lapp* has been used as an antonym of *settler* or *peasant* just as indicated by Arell and Korpijaakko-Labba. This is not the only example, however. Since most of the Sami lived in a certain area, i.e. Lappland, *lapp* has been used to designate people from this area, for example in university registers, regardless of their ethnicity (Nordberg, 1973, pp. 107ff). Since the Sami had a language and customs that distinguished them from the Swedes and Finns, *lapp* has also been used to designate a person who held on to the Sami language, traditional dress and other customs as opposed to a person of Sami origin who had become assimilated into the Swedish or Finnish population (Læstadius, 1977 [1833], pp. 242ff). However, to choose just one of these restrictive senses and claim that this was the only one, as the State's representatives did during the Girjas trial, is not honest and borders on historical negationism.

Having mapped the genealogies of the population of Åsele and Ume Sami districts from the early 1600s until the early 1900s, I have no doubt that the Sami of the later period are the descendants of the *lappar* of the 1600s (Norstedt, 2011, and unpublished works). Of course, every single person cannot always be classified as a Sami or a non-Sami. The most common situation where doubt may arise is when a Sami has married a Swede or a Finn and settled down on a farm. Some of them may have maintained their Sami ethnicity, while others may not. Examples of the opposite situation, that Swedes or Finns would have

adopted the lifestyle of the Sami, as noted by Arell, are hardly known from the areas that I know best. In Jokkmokk, where these aspects were studied in great detail by Hultblad (1968, p. 194), the proportion of nomads of non-Sami origin was so small that it could not be shown in the graphics. Even in the Torne district, I found only single examples when I went through the same court records as Arell. In any case, the fact that people sometimes have passed from one group to another is hardly a proof that groups were not based on ethnicity.

At the same time, caution must be taken not to include too many in the historical Sami group. In a history thesis presented by Karin Granqvist (2004), all taxpayers registered in the Siggevaara community (*lappby*) in Torne Sami district during the 17th century are said to be *samer*. However, a number of settlers had by then moved into the area from neighbouring Finnish-speaking areas (Kuoksu, 2011; Hoppe, 1944), and their names are among the ones included in the Siggevaara community. As of 1695, I estimate the number of non-Sami tax payers in Siggevaara to be ten. This estimate is reasonable sure, but when studying parts of the eastern Sami districts the classification is often more difficult. This is particularly true of Kitka and Maanselkä where the immigration of Finnish settlers started already in the 1630s and rapidly became important (Tegengren, 1952, p. 55). On the western side, however, settling generally occurred later, and most of the process has been well mapped by genealogists, amateur researchers, and scholars. Although some of these settlers became the owners of *lappskatteland*, Sami taxlands, and payers of *lappskatt*, Sami taxes, they cannot be considered Sami only from these criteria. Origin was surely more important, and in most cases, origin is revealed either in the sources or in published literature.

To sum up, there is no doubt that the historical *lappar* as a rule corresponds to the *samer* of today. Since the usage of *lapp* causes uneasiness among the people concerned, especially when coming from people outside the group, it is natural for me to say and write *Sami*. I will, however, sometimes use compound words such as *lappskatteland* (Sami taxland), *lappmark* (Sami district), *lappby* (Sami community) and *Lappland*, since they to not designate people but phenomena. *Lappmark* and *Lappland* do not have any accepted substitutes in Swedish. *Lappby* could be replaced by *sameby*, but this is a modern association regulated by current Swedish law, and something quite different from the communities of the past, so I will not be using it in a historical perspective.

Finally, a few words on my spelling. There are mainly three English variants, *Saami*, *Sámi* and *Sami*. I see no reason to write *Saami*, since this is the Finnish spelling and the double "a" makes no sense in English. The second one, *Sámi*, could be an expression of respect, since the orthography of some Sami languages includes the "á". However, other Sami languages do not have the "á", and it is

also meaningless in English. Though both *Saami* and *Sámi* have the merit of being more searchable in databases than *Sami*, I consider this to be of minor importance. Therefore, I argue that the only reasonable English spelling is *Sami*.

Figure 4. A dead pine with an old scar from inner bark harvest. Since the tree survived long after the bark was taken, the scar was partially healed with new wood. Pines with bark peeling scars are very visible remains of Sami resource use. However, since the old pines were the first to disappear from the Swedish forest landscape through selective cutting, bark peeling scars are rarely found outside nature reserves. This photo is from the Leipipir area in Lule Sami district.

2.3 The time frame: autonomous land governance

It may seem risky for a natural scientist to include the word *governance* in the title of a thesis, so I will make it very clear from the beginning that I have no intention of applying governance theories of political sciences. Instead, *governance* or more precisely *land governance* is used in its lexical sense to designate the processes and institutions by which the access to, use of, management, and control over land are made, and to some extent also the reconciliation of competing land claims.[3]

Sami land use has for a long time been influenced by both opportunities for trade and obligations to pay taxes (see section 2.4). However, there was no or only slight active external interference in Sami land use by the Swedish state before the late 17th century. That is to say, the exploitation of the Nasa silver mine (1635–1659) certainly interfered on a large scale with the Sami of the surrounding districts, but once the mine had been destroyed, life went back to normal since no permanent and general measures had been introduced. Thus, the governance of Sami lands can be regarded as autonomous well into the 17th century and in some aspects even further.

During the following two centuries, the governance of Sami lands was transferred to the Swedish Crown. This was not done through conquest or concession but through a gradual process where different measures step by step limited the land-governing capacity of the Sami and expanded the one of Crown. This process sets the temporal limits of the thesis. For reasons that will be further explained in section 5.2, the thesis covers the time from the mid-17th century to the late 19th century.

2.4 The subject: resource use

The thesis is mainly a study of resources and resource use. However, what is considered a resource is subject to change over time, as thoroughly discussed by Odner (1992, pp. 21ff). As far as we know, the Sami were mainly fishers, hunters, reindeer herders, and plant gatherers during the period covered by this thesis, and the main natural resources concerned were thus fishing waters, game habitats, reindeer pastures, and plant sites. However, the relative proportion of each subsistence mode in the subsistence pattern (sensu Krupnik, 1993, p. 7) has varied, as well as the conditions. The introduction of hemp facilitated the making of fish nets and may have led to new fishing patterns. As bows and arrows were

[3] This phrase builds upon a definition of ”land governance”, which can be found on various web sites such as <https://en.wikipedia.org/wiki/Governance#Land_governance>, but to which I have failed to trace the origin.

increasingly replaced by firearms, the utilisation of the game resource must have become more effective and maybe more attractive. As for reindeer herding, it has been practised with different herd sizes, migration patterns, and social systems, and with changing emphasis on milk or meat production. All of these aspects, as well as innumerable others, have affected the perceived value of each resource and by consequence also resource use.

Furthermore, the Sami have not only been using resources for their own subsistence but also for trade. From the 14th century onward, there was a great demand for furs among the European nobility, and the Sami hunted both to pay taxes and to sell this highly praised merchandise (Olofsson, 1962, pp. 168ff). By the end of the 16th century, both fashion and tax systems changed, and the game resource became less valuable (Lundmark, 1982, pp. 88f). But furs were not the only goods traded by the Sami. Migrations to the Norwegian or the Swedish coast, where population was larger, allowed the marketing of down, root ropes, and other kinds of commodities. External demand then influenced what was considered a resource and whether it was worthwhile spending time exploiting it. Also, each individual Sami's own demand for external goods, such as woollen fabrics for clothing and tents, hemp for fishing nets, silver decorations, steel axe heads, iron cookware, salt, tobacco, fire arms and ammunition, would influence his or her urge to produce goods for sale and by consequence the recognition of what was perceived as resources.

In my thesis, I will focus on the basic natural resources needed for food extraction, mainly fishing waters, hunting habitats and reindeer pastures. This is a reduction of reality which is simplistic but nevertheless necessary for an analysis of selected questions. This analysis will be found in section 5.3.

2.5 The focus: the taxland

The basic unit studied in this thesis is the land. It is not a land in the sense of a country, but a more or less clearly delimited area, including lakes and streams, controlled by one or several households. More specifically, the land in focus is what is usually called a *lappskatteland* in Swedish ("Sami taxland" in a word-by-word translation). In 17th-century sources, these land units were simply called *land* in Swedish, but *skatteland* is first mentioned in 1658, and *lappskatteland* from then on became more and more common (Norstedt, 2011, p. 20).

In papers I and II, I called this land unit a *household territory*. It was correct in that context, where almost every taxland was controlled by one single household. However, when such lands are studied all over Fennoscandia, it turns out that they were in some areas usually shared by several households (section 5.1.3). I therefore do not want to stress the land as a household unit in the thesis.

In English, the *lappskatteland* has variously been called taxation land, taxland, or taxed land. I have chosen to follow the example of Hugh Beach (1981, p. 71) and use the short and simple *taxland*. It should be stressed, however, that the creation of such lands probably predates taxation. The characteristics of the taxlands are further discussed in section 5.1.

2.6 The conditions: ownership, or not?

The taxland was thus a land controlled by one or several households, and the holders possessed most of the taxland's resources (except minerals). Whether the *possession* of taxlands also implied *ownership* has been investigated thoroughly in works of legal history. Scholars more or less agree that the Swedish Sami until 1789 had the same rights to their lands as peasants (Päiviö, 2011, p. 102; Lundmark, 2006, p. 30; Bengtsson, 2004, p. 32; Korpijaakko-Labba, 1994, p. 466; Prawitz, 1967b, p. 29), or at least as certain peasants (Holmbäck, 1922, p. 50). However, while Kaisa Korpijaakko-Labba (1994, p. 230) clearly concludes that both peasants and Sami landholders were the owners of their lands, Lennart Lundmark (2006, p. 30) equally clearly refuses to apply the word *ownership* in this context. Lundmark's standpoint is based on the fact that land-ownership rights before 1789 were not the same as after that year. In earlier days, both the peasant's and the Sami's land should primarily be used to the largest possible benefit of the Crown, not of the holder, and if taxes had not been paid during three years, a homestead or a taxland could be handed over to some more able person or taken over by the Crown. Thus, neither peasants nor Sami could dispose of their land as freely as a landowner can today.

I have nothing to add to the academic discussion on land ownership. Therefore, I have chosen to speak of landholders rather than landowners, since *to hold* has a wider sense than *to own*. Nevertheless, all scholars seem to agree that the holder of a taxland was in control of most of the land's resources at the beginning of historical times. For this reason, it is adequate to consider the Sami taxland during the time of autonomous governance as *a land of one's own*.

3 Sources

Historians have been likened to detectives who leave no stone unturned in the search for proof (Cipolla, 1992, p. 25). This approach was successfully applied in early studies of boreal forest history where data from historical maps and other kinds of archive sources were combined with data collected in the field, for example dendrochronological dating of fire scars, mapping of cultural remains, and measurements of stand structure (Tirén, 1937). These interdisciplinary methods have been further developed and are now regularly used by natural scientists in studies of forest history (e.g. Rautio, 2014; Jamrichová *et al.*, 2013; Berg, 2010; Josefsson, 2009; Lindbladh *et al.*, 2007; Andersson, 2005; Hall *et al.*, 2002; Axelsson, 2001; Niklasson, 1998; Östlund, 1993; Foster *et al.*, 1992; Ågren, 1983; Zackrisson, 1979, 1978). Since each kind of source has its own perspective, they create a multifaceted picture together. In my research, I have combined a number of primary historical records with narrative sources, cultural remains, modern land survey data, and data sets collected through airborne laser scanning. Often, these sources are complementary and fill in some of each other's lacunae. Other sources are overlapping and independent enough to allow verification.

A disadvantage of my sources is that they are rarely of Sami origin, since the Sami did not document their own culture in writing before the 20th century. Also, the creators of official records and registers have generally been non-Sami, apart from a few priests. Observers from outside generally lack the deep insights of people who live a certain life, and the sources that outsiders create may omit information that would have been mentioned by an insider. However, history is often written from patchy documentation, and all we can do is to analyse the available sources critically and with consideration of the context in which they were created. Most of my sources have been used in previous studies and their authenticity is rarely questioned. However, the reliability of each one must be assessed in relation to the data that will be extracted from it. In the following chapter, I discuss each kind of source and assess its value for my research.

3.1 Maps

3.1.1 Gedda's map of Ume Sami district

The single most important historical map in my research is the one of Jonas Persson Gedda (Gedda, 1671), which I used in papers I and II (*Figure 5*). Gedda was a trained land surveyor who was sent out in the summer of 1671 to map Ume Sami district together with a clerk, Anders Olofsson Holm (Norstedt, 2011). At this time, there were only very few agricultural settlements in the Sami districts (Arell, 1979, p. 25; Tegengren, 1952, p. 60), and none in this particular area (Göthe, 1929, p. 271). The county governor, Johan Graan, presumed that tax incomes could be raised if more settlements were established, but he could not encourage people to move in without knowing more about the conditions. Therefore, he sent out the two men to voyage back and forth, interview the Sami population, and map sites suitable for cultivation.

Once he was back, Gedda drew a map of almost 18 000 km^2 (Gedda, 1671), while Holm edited a detailed account of the area (Holm, 1671). For my research, the relevance of these documents lies in the information they contain on the Sami population and their life. Gedda's map shows how the area was subdivided into 37 taxlands, provides the names of both lands and holders, and indicates more than 600 named lakes and 38 Sami settlement sites. In Holm's account, each taxland is described with its available resources. No other sources to such detailed geographical information about Swedish Lappland exist from either the 17^{th} or the 18^{th} century.

Despite its uniqueness, however, the information must be treated with caution. It has sometimes been claimed that Gedda's map describes the boundaries of taxlands exactly and in detail (Korpijaakko-Labba, 1994, pp. 325ff, 379ff), but this is not true since the map is not based on measurements but is more of a sketch (Norstedt, 2009). Nevertheless, when locations on the map are seen in relation to places that can be identified, such as an occurrence of natural hay close to the outlet of a stream, they are usually mapped with an accuracy of a few hundred meters. Also, when other sources are used to verify the content, it is clear that both Gedda's map and Holm's account contain very reliable information on the extension of each taxland and the identity of its holder (Norstedt, 2011).

Figure 5. A section of Gedda's map showing a taxland located in Lycksele Municipality close to the border to Åsele Sami District (red line to the left). The rivers are Granån in the lower part and Norrån in the upper part. The taxland's name (Stöttingz Landh) is given as well as the holder's (Lars Mattsson). Small yellow triangles indicate Sami settlement sites, while red dots are proposed farming settlements. The green, dotted areas are natural hay meadows. Most lakes are named and can be located on a modern map. © Swedish National Archives.

I used Gedda's map and Holm's account to extract data on the size and resource content of each taxland (paper I), and on the summer settlement pattern (paper II). The size of each taxland is approximate, given that land boundaries were not based on measurements, but can nevertheless be rather accurately assessed through the identifiable lakes and other locations that are included in each land. The gathering of information on resource content was one of the aims of the mission and was therefore given much attention. It was done partly through the trained surveyors' own observations, partly through interviews with the taxlands' inhabitants, and can be assumed to be reliable. As for the information provided on Sami settlement sites, it is also of good quality but certainly not exhaustive since this was not the purpose of the mapping.

3.1.2 Other historical maps

A number of other historical maps were also used. In paper I, I used a forest map of Lycksele and Åsele Sami districts from around 1940 (Malmström, 1949). On this map, volume proportions of Scots pine, Norway spruce, and deciduous trees (mostly birches) are indicated on a large number of sites. It is a compilation of data from forest maps established in the field 1932–1941 and can be considered very reliable. I used this map as proxy data to calculate areas of winter reindeer pastures, as described in section 4.2.

In paper IV, a number of historical maps concerning the villages in the study area were used (Lantmäteriet, 2018a). In this case, the maps were not essential to the study but served as complementary sources for the understanding of former land use and the interpretation of certain cultural remains.

3.1.3 Land survey data

Modern land survey data from the Swedish National Land Survey is included under "maps" since the data was intended for map production. In paper I, land survey data was used to analyse the areas of alpine reindeer pastures, water, and lengths of river stretches in each taxland on Gedda's map (see section 3.1.1). This data is very reliable for the present time, but conditions were not necessarily the same in 1671. Water areas have been changed when rivers have been exploited for the production of electricity, but existing reservoirs are well known and such changes were accounted for in the study. As for the areal extent of mountain summer pastures, it is influenced by the long-term dynamics of the tree line. However, the available data suggests that changes have not been so important since 1671 as to influence the study to any considerable extent (Kullman, 2005).

3.2 Official documents

3.2.1 Legislative acts and related documents

A number of acts and documents are primary sources to the actions taken by Swedish kings, governors, governments and their subordinates in relation to the Sami population. Most of these documents have been published. Among the ones that have been essential for my understanding of the area's history are regulations installing new tax systems (Charles XI, 1915 [1695]; Duke Charles, 1915 [1602]), documents concerning the creation of church places in the Sami districts (Hjorth, 1973 [1606]; Charles IX, 1858 [1606]), proclamations regarding the settlement of the Sami districts (Gustav III, 1872 [1749]; Charles XI, 1872 [1695], 1872 [1673]) and the first Reindeer Grazing Acts (SFS 1886:38; SFS 1898:66; SFS 1928:309).

Related to the legislative acts are inquiries and investigations on the conditions of the Sami population, especially the part occupied in reindeer husbandry. For paper III, I made use of two documentations from the early 20th century. The first was a report from an inquiry undertaken among reindeer herders in 1912–1913 to gather information for the ongoing negotiations with Norway on transboundary reindeer herding (Montell *et al.*, 1913). The other consists of protocols from meetings held with the Sami population in the 1920s by a committee whose purpose was to secure the conditions of Sami reindeer herding (1919 års lappkommitté, 1920–1921). I searched these documentations for very specific information on the use of barrier fences, and I believe that the information that I found is reliable but not exhaustive.

3.2.2 Fiscal records

Fiscal records of the Sami population in Sweden exist from the 16th century onward. Gustav Vasa was the first king to install a system of direct taxation of the Sami through his sheriffs (*lappfogdar*). Both the currency and the principles of taxation changed several times during the 16th and 17th centuries (Wheelersburg, 1991; Lundmark, 1982, pp. 78ff; Tegengren, 1952). Having been essentially a tax of Sami households, each usually represented by a married man, the system was reformed in 1695 into a more long-lasting system where the community (*lappby*) was collectively liable for a fixed sum (Kvist, 1990; Göthe, 1929, p. 261). Even after this reform, however, each head of household was listed in the fiscal record along with the sum that he (or rarely she) had paid.

Swedish fiscal records are easily available on the Internet as image files. Although it has been said that historians are justifiably suspicious of data drawn

from fiscal documents (Cipolla, 1992, p. 43), these records are considered as rather reliable (Brännlund, 2015, p. 54; Lundmark, 1982, pp. 84ff). The Sami population was small and mostly well known by the sheriffs. If someone did not show up for taxation, the sheriff had no means to force him, but then this person would also have to refrain from going to the market and to church services. Sooner or later, the person was likely to show up, and he would then be made to pay also for the years of absence. Furthermore, when fiscal records can be cross-checked against parish registers from around 1700 onward, it can be shown that the records are highly consistent.

Household tax levels retrieved from fiscal records (*Mantalslängder*, 1669–74) were used in paper I to evaluate the quality of the taxlands in Ume Sami district in 1671. This was not an evident use of the sources, because it is not known on what grounds taxes were decided. However, since taxes were not equal, it seems reasonable to assume that they reflected the wealth of each household as perceived by the tax collector. A household that held a taxland where crucial resources were abundant must have had better opportunities to become wealthy than a person with a "poor" land, and tax levels should therefore reveal something about the quality of the land.

Fiscal records were also used for the study presented in section 5.1 on the distribution of taxlands and their relation to territoriality. This study is based on the *1695 cadastre*, the land register that was established for the reformed Sami tax system (Wrede *et al.*, 1698). In this register, taxpayers and taxlands were listed for all Sami communities that paid taxes to the Swedish Crown. The 1695 cadastre thus gives an overview of all Sami communities under Swedish jurisdiction, including those located in nowadays Finland and parts of northern Norway. The advantages and disadvantages of the 1695 cadastre are discussed in further detail in Appendix I.

3.2.3 Court records

Regular district court proceedings were introduced to the Swedish Sami districts in the mid-17th century. The court assembled once a year on the Sami church places during the winter markets and settled whatever dispute was brought before it. As will be further discussed in section 5.2.2, Sami lay judges were an integrated part of these courts, and Sami customary law played an important part well into the 18th century.

The courts treated most aspects of human life and the records therefore contain a wealth of information on contemporary conditions. This is one of the few types of early sources where the voice of the Sami can be heard. Although records were edited by Swedish clerks, arguments from the participants were

rendered in great detail. Apart from court cases, documents on taxland concessions (*inrymningar*) are of particular interest. They were issued to document taxlands on the demand of holders who wanted to prove their customary rights (see section 5.2.2). Concessions were issued from the 17th century onward by the sheriffs or the district courts, and later by the County Administrative Board (CAB). Even when cases were handled by the CAB, though, protocols from land inspections were often included in court records, containing detailed information on land boundaries and land use. In a few cases, there are even maps (Winka, 2014).

Despite all the information that can be extracted from court records, it is evident that the cases taken to the court do not represent an unbiased and random sample from everyday life, and that absence of cases concerning certain activities does not prove that such activities did not occur. With this kept in mind, the source value of district court records is considered to be very high (Korpijaakko-Labba, 1994, p. 61; Arell, 1977, p. 43; Bylund, 1956, p. 21).

Regrettably, court records are difficult to use. They are long and tedious to read, and although some have been scanned and are available through the Internet, most can only be found on blurry microfiches in a library. In the study of whole-tree fences presented in paper III, I therefore made use of records that had been transcribed by a fellow researcher, Stefan Sandström (Arjeplog district court, 1798–1860). Since these records contain information on Sami land use, I assumed that they could contribute to my understanding of the context in which the fences had been built. My expectations were surpassed. Not only did the records contain information on conflicts regarding the area where the fences had been built, they also mentioned fences in other locations, some of which could be discovered in the field.

3.2.4 Parish registers

In the Swedish Church Law 1686, it was prescribed that each parish vicar must keep record of all births, baptisms, marriages, deaths, and burials (Nordin, 2009, p. 44). Parish registers from the Sami districts were established at some time after this year and have been more or less well preserved. The quality of the information registered on the Sami population was less good than for other citizens in Sweden, especially in the beginning, and important data such as birth years may be lacking (Wisselgren & Silversparf, 2016). Nevertheless, parish registers are considered to be the most reliable source available for information on the Sami population (Nordin, 2009, p. 43).

All preserved parish registers have been scanned and made available through online services. I have not systematically analysed such registers in any of my

studies, but I have frequently used them to check the identity of individual Sami mentioned in other sources and to understand their family connections (*Arkiv Digital*, 2018).

3.3 Narrative sources

3.3.1 Primary sources

Among the earliest narrative sources that are essentially primary are the so-called "clerical relations" (*prästrelationerna*), written in the 17th century by clergymen who lived and worked among the Sami, and used as the principal sources for Johannes Schefferus' extensive work *Lapponia* (Schefferus, 1956 [1673]). There are six such relations written by people with experiences from different Sami districts. The oldest text was written in the first half of the 17th century while the others were created in the 1670s. One of the authors, Nicolaus Lundius, was the son of the first Sami priest in Sweden and identified himself as a Sami, while the others were non-Sami vicars. On the whole, the clerical relations are considered to be reliable sources (Fjellström, 1983). The four texts concerning the Sami districts west of the Gulf of Bothnia were important sources for papers I and II (Niurenius, 1983 [ca. 1640]; Lundius, 1983 [ca 1674]; Graan, 1983 [1672]; Rheen, 1983 [1671]), but information from all six (also Tuderus, 1983 [ca 1675]; Tornæus, 1983 [1672]) is included in the section on autonomous Sami governance in the thesis (5.2.1).

Of the same rank as these early writers with deep first-hand knowledge of Sami life was Petrus Læstadius, who was raised in Kvikkjokk and learned to speak Sami in his childhood. Petrus Læstadius worked as a missionary in the Pite district 1828–1832 and made numerous visits to Sami settlements all over the area. Based on his experiences, Læstadius published two books with innumerable interesting observations (Læstadius, 1977 [1833], 1977 [1831]).

Also, a number of travellers have spent some time among the Sami and described their findings afterwards. Carl von Linné is the most well-known, but unfortunately his famous *Iter Lapponicum* only rarely treats subjects related to the Sami of the boreal forest (Linné, 2003 [1732]).

After the turn of the 20th century, narratives by Sami writers began to appear, and information found in a couple of such works was useful for article III (Turi, 1987 [1917]; Skum, 1955; Pirak, 1933).

3.3.2 Secondary sources

A large number of scholars and other authors have published works on Sami life and land use. These works may to some extent be primary sources, since many of the authors describe things that they have seen with their own eyes, but they usually also contain information gathered from others, and I have therefore chosen to gather all ethnographic and geographic works in this section.

There are no works worth mentioning before the *History of the Northern Peoples* by Olaus Magnus (1982 [1555]). He did not, however, apply any rigorous source criticism and should therefore be treated with caution. Much higher standards apply to *Lapponia* by Johannes Schefferus (1956 [1673]), who based his work mainly on the generally reliable clerical relations mentioned in the previous section and who was very careful to cite his sources correctly. A limited but still interesting contribution was made by the Crown's sheriff Anders Hackzell (1910 [1738]), who wrote a detailed description of Torne and Kemi Sami districts, including a register of the first settlers. The document on Sami and settlers compiled by Lorentz Kristoffer Stobée (1919 [1746]) for the border negotiations with Norway is equally interesting. An extensive and very trustworthy work on all Sami districts was published by the clergyman Pehr Högström (1980 [1747]), who lived and worked in Gällivare 1742–1749.

From the late 20th century onward, Sami life attracted more and more interest from an ethnographic perspective, and a large number of works were produced. The ones that have been of great use to me are by Gustaf von Düben (1977 [1873]), K.B. Wiklund (1947, 1921, 1901), Sigrid Drake (1979 [1918]), Väinö Tanner (1929), Samuli Paulaharju (2009 [1921], 1977, 1937), J.G. Ullenius (1937), Ernst Manker (1968, 1961, 1960, 1957, 1939, 1934), Israel Ruong (1945, 1944, 1937), Filip Hultblad (1968, 1944, 1936), T.I. Itkonen (1948a, 1948b), Karl Nickul (1948), and Helmer Tegengren (1952). Of these, the works of Israel Ruong are of particular interest since he was himself a Sami, born in a settled family in the Pite district.

Beside these works on Sami life, I would like to highlight the importance of a broad literature search. In my studies, I have for example found the works of Ossian Egerbladh (1972a, 1972b, 1967a, 1967b, 1965, 1963a, 1963b) and Henning Larsson (1988) very useful. The latter is an example of a kind of literature that is often denigrated because it is written by non-academic writers and deals with local history. Such works are often full of details and should not be overlooked, but treated with the same methods of source criticism as those applied to works by well-known scholars.

3.4 Cultural remains

As noted by Carlo M. Cipolla (1992, p. 25), every item of evidence, whether written, oral or archaeological, constitutes a "document" and thus a primary source to the historian. Unlike most sources, cultural remains are true documents of the people that actually spent their time in the area, not observations noted by foreigners. Archaeological artefacts and other cultural remains are relics and as such generally considered to be more reliable sources than the testimonies of a written document (Thurén, 2013, p. 8).

However, while the reading of a written document normally does not present any problems for a person familiar with the language and with ancient handwriting, we are rarely fluent in the "language" of an archaeological artefact. Therefore, already the deciphering of an artefact requires a certain amount of subjective interpretation, whereas a written document in most cases can be deciphered objectively and then interpreted in the next step.

For example, the remains of an old fence in the forest (paper III) is an authentic and highly reliable primary source. However, the only objective way to describe these remains is as an assemblage of old pine trunks and boulders. As soon as we read them as a fence, we have already been influenced by other sources which describe similar installations. If we then go on to decide that the fence was built for herding, not for hunting, we have most likely involved even more sources. In other words, the deciphering of an archaeological artefact is almost always done under the influence of other sources, whose reliability must then also be evaluated.

Documents consisting of cultural remains residing in the forest have the additional disadvantage of being susceptible to destruction and decay. Furthermore, their detectability is heavily related to the vegetation that has grown on a site since the activity ceased, which is in turn related to the presence of water and nutrients in the ground. Cultural remains are therefore much easier to detect in some locations than others. For these and many other reasons, patterns of known cultural remains are "heavily influenced by many factors, least of which may be the activities of people in the past" (Cowley, 2016, p. 147).

I have used cultural remains as sources mainly for paper III, where the whole-tree fences that we discovered and described form the basis of the study. To overcome the abovementioned challenges, I turned to several other reliable sources to understand the fences' function and context, and I used dendrochronology (section 4.5) to date one of them. Paper IV was also focused on cultural remains, but then as observations, not sources, since the work was aimed at the methodology of detection and mapping. However, the remains that were registered can serve as sources in future studies.

3.5 ALS data

Data collected through *airborne laser scanning* (ALS) or *airborne lidar* was the basis of paper IV. ALS is a method where laser pulses emitted from an airborne scanner hit the landscape below and are reflected back to a receiver. The exact location of the point where each pulse was reflected is registered, including its elevation. Together, these points form a three-dimensional *point cloud*. After sampling, points are classified into ground or non-ground, and sometimes into more detailed categories such as bridges, water, and buildings. The point cloud can then be processed to interpolate different kinds of raster surfaces known as *digital elevation models* (DEMs). If all points are used, a *digital surface model* (DSM) is created of the earth's surface including rooftops, vegetation, etc. If only ground points are selected, the result is a *digital terrain model* (DTM), or *bare-earth model* (Opitz, 2013; Jansson *et al.*, 2009) (cf. *Figure 6*, p. 46).

The collection of ALS data is a costly procedure which is mostly done for purposes such as the creation of national elevation models. Nevertheless, it has become very useful for archaeologists. This is particularly true for forested areas, which have previously only been surveyed from the ground. By creating a DTM from ground points, the archaeologist can look beneath the trees without visiting the site. In 2004, ALS data was used to analyse overgrown medieval fields in a forested landscape near Rastatt in Germany (Sittler, 2004). This was the start of a rapid development where ALS data was being applied for archaeological investigations in forests all over the world. Among the most spectacular examples are the mappings of a Maya settlement in Belize (Chase *et al.*, 2011) and the Khmer temple complex Angkor in Cambodia (Evans *et al.*, 2013).

Most of these investigations, however, have been performed in secondary forests, which cover remains of relatively large and distinct structures that were established in an open landscape. By contrast, the boreal forest is mostly primary and land use has mainly been going on in the forest context. Until fairly recently, forests were generally used through small-scale structures that left discreet traces. Nevertheless, studies and surveys in Norway, Finland, and Sweden have shown that ALS data can be used in boreal forests to detect stone age hut foundations, hunting pits, remains from pre-industrial charcoal and tar production, roads, and 20th century war remains (Olofsson, 2017; Willén & Mohtashami, 2017; Olofsson, 2016, 2015; Andersson, 2014b, 2014a; Pilø, 2013; Koivisto & Laulumaa, 2012; Schultz, 2012; Seitsonen, 2011; Kurri & Haimila, 2010; Alexander, 2009; Jansson *et al.*, 2009; Risbøl *et al.*, 2008, 2006).

When it comes to remains of Sami land use, I have only managed to find one ALS study on the subject, and it was carried out in relatively open subalpine woodlands of mountain birch and willow in north-eastern Norway (Risbøl, 2009). Methods have not yet been tried out to detect remains of Sami land use

in the boreal forest. In the USA, however, it has been shown that ALS can be used in such environments to map food caches and living structures installed by pre-Columbian hunter-gatherers (Howey *et al.*, 2016; Krasinski *et al.*, 2016). ALS should therefore also be usable to detect remains of former Sami land use in Swedish boreal forests. In the study presented in paper IV, I set out to explore how this could be done.

3.5.1 Data sets

The study of paper IV was shaped by the fact that I had access to an ALS data set of extraordinary high resolution, ordered for research purposes by the Department of Forest Resource Management at the SLU. The scanning covered about 100 km^2 around Krycklan research catchment in Vindeln Municipality (Laudon *et al.*, 2013). This is an area located east of the Lappland border where the Sami have not been dominating during recent times (*Figure 2*, p. 20). However, they probably did so at least until the Middle Ages, since there are no place names indicating earlier Swedish presence (Holm, 1970). Also, migratory reindeer-herding Sami have long been present during winters (CAB Västerbotten, 2007; Zetterstedt, 1980 [1833], p. 48). It therefore seemed reasonable that there could be detectable remains connected to Sami land use in the area.

The usefulness of an ALS data set for archaeological investigations is highly dependent on its resolution, or more specifically its ground point density (Bollandsås *et al.*, 2012). First and foremost, ground point density is determined by the scanning procedure, but also by topography and vegetation, since this affects the proportion of points that reach the ground. When the data is further processed, ground point density is influenced by classification, as will be discussed in section 4.3.1. In the Krycklan data set, the final ground point density was on average about 13 points/m^2.

Since the acquisition of high-resolution data sets is expensive, they only cover limited parts of the landscape. I was therefore interested in comparing the Krycklan data to the set currently being produced by the Swedish National Land Survey. The aim of the latter is to provide data for a new national elevation model, and it is of low resolution, about 0.5 ground points/m^2 in forested areas (Lantmäteriet, 2016b). However, the data set's low resolution is to some extent balanced by a complete coverage. After the field season of 2017, most of the Swedish territory has been scanned, including almost all boreal forest (Lantmäteriet, 2017). If the national data set would allow the detection of at least some remains of Sami land use (as defined in section 6.1), it would mean a huge potential for efficient surveys of vast areas.

4 Methods

Research based on sources of many different kinds requires an array of methods, each designed to extract the desired information in the most effective way. The acquired results must then be combined to create a meaningful synthesis. In this chapter, I provide an overview of the methods that I have used with special attention to the processing of ALS data. I will end the chapter with some general considerations on the combination of different types of sources.

4.1 Critical reading and treatment of written sources

All written sources were studied closely, with attention to details that might contribute to the focus of each study, but also critically, with consciousness of the circumstances under which each document had been produced as well as the limitations discussed in the previous chapter. Much more sources were read than cited.

Some qualitative data from Gedda's map and Holm's account (see section 3.1.1) was standardised into quantitative data for paper I. Fiscal data was entered into a spreadsheet where each person could be followed over the years. Also, all data connected to individuals was compiled in a genealogical database to facilitate the understanding of life stories and family relations. Since my studies do not go further than to the beginning of the 20th century, the data includes no living persons and is thus not within the scope of the Personal Data Act (*personuppgiftslagen*, 1998:204), nor the new General Data Protection Regulation, which enters into force on the very day of the defence of this thesis.

4.2 Spatial analyses

I have applied a number of techniques for spatial analysis in my research using the softwares ArcView GIS 3.3 (with the spatial analysis extension) and ArcMap

10.3.1. Paper I was based on a reconstruction of the boundaries of all taxlands on Gedda's map (see section 3.1.1). These boundaries could not be digitised directly from the map, since it is not based on measurements. Instead, they were reconstructed to include all identifiable geographical locations (mostly lakes) belonging to each taxland. Once boundaries had been reconstructed, I could calculate the area of each land.

Furthermore, I could calculate each taxland's content of critical resources. Data on reindeer summer pasture areas, lake areas, and river lengths, was retrieved from modern land survey data in much the same way as described by Josefsson et al. (2010a). Areas of reindeer winter pastures were estimated through an analysis of Malmström's forest map from around 1940 (see section 3.1.2). The logic behind this approach was that reindeer are in winter mainly dependent on ground lichens, especially of the genera *Cladonia* Hill ex P. Browne and *Stereocaulon* Hoffm (Skuncke, 1958), which preferentially grow in pine-dominated forests. Malmström's map shows the frequency of pine before the onset of the industrial forest era with extensive plantations.

On Malmström's map, there are points indicating the volume proportion of different tree species on each location. These points were digitised and then used to interpolate a grid of surfaces representing different proportions of pine. The surfaces were converted to polygons, and surfaces with at least 70 % pine were considered to be forests rich in ground lichens and by consequence good reindeer habitat in winter. The total area of lichen pastures could thus be calculated per taxland (*Figure 12*, p. 79). This analysis is based on a number of assumptions and approximations, and would therefore appear to be risky. However, the proportion classified as winter reindeer habitat in the whole area was within the interval calculated in an official report (Tottie, 1966, p. 233), so the result is confirmed by an independent source on a general level. Nevertheless, estimates may diverge from reality locally.

The polygons of pine-dominated forests that were created from Malmström's map were also used to test whether the settlement sites indicated on Gedda's map were preferentially located in lichen-rich forests (paper II).

Furthermore, spatial analysis techniques were applied for the study of the 1695 cadastre presented in section 5.1. The cadastre contains the names of taxpayers and their taxlands, which were named after some location on the land. I identified these place names, marked them as points in ArcMap, and then used the coordinates to generate Thiessen polygons, i.e. surfaces whose outer lines are created halfway between neighbouring points. Each such polygon represents a taxland, although its boundaries have little to do with reality. Using these polygons, I could calculate average taxland areas and visualise differences

between communities (*Figure 9*, *Figure 10*). The processing of the data from the 1695 cadastre is presented in further detail in Appendix I.

4.3 ALS data processing

The two ALS data sets described in section 3.5.1 were used in paper IV to compare the detectability of cultural remains in the sets, and then for a survey of the whole study area. A number of technical procedures were applied in the processing of the data, as described in the following.

4.3.1 Point cloud classification

A correct classification of the point cloud is crucial when ALS data is used for archaeological purposes (Ludwig Boltzmann Institute, 2017a). Since the high-resolution Krycklan data set had not been classified before delivery, this was the first step of the procedure. I tried various classification softwares and finally opted for LAStools, a package which includes tools for bare-earth extraction with the possibility to vary several parameters (Rapidlasso GmbH, 2018; Ludwig Boltzmann Institute, 2017b). To investigate how parameters affected the visibility of cultural remains, I tried them out on some of the few remains that were previously known, mainly hunting pits and tar kilns (*Figure 6*). Most of them were located on a recent clearcut, while one tar kiln was overgrown by dense vegetation. My aim was to search for parameters to achieve maximum visibility of all types of cultural remains under different conditions.

Several classifications with various parameters were done, and each outcome was analysed with the "profile analysis tool" of the software Quick Terrain Modeler (QTM), version 8.0.6.3. I soon realised that the choice of parameters was rather unimportant for the remains on the clearcut, where vegetation was sparse and almost all laser pulses were reflected from the ground. The result was excellent regardless of the parameters chosen. By contrast, where vegetation was dense and few points reached the ground, the choice of parameters had a significant influence on the result. If parameters were set to include only true ground points, there were empty areas that would have to be interpolated in the DTM. If the parameters were set to be more generous in the sense that they included also some reflections from the ground vegetation, this emphasised the shape of the ground and filled in some of the empty spaces (*Figure 7*). I therefore finally applied relatively generous parameters (LAStools, lasground_new: step=3.0, off-set=0.1, spike=1). Some above-ground features such as buildings and wood piles were then included, but this is not a problem in a study aimed at the detection of cultural remains.

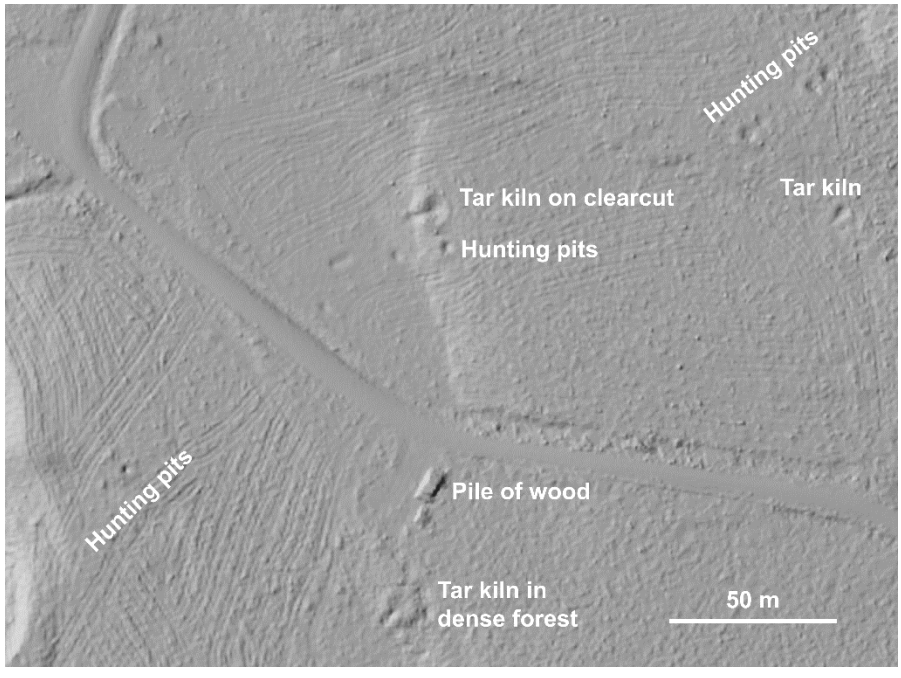

Figure 6. Section of the high-resolution DTM of the Krycklan study area, showing the cultural remains that were used for testing the parameters. The image shows the DTM as it was finally generated from a point-cloud that had been classified with relatively generous parameters, as shown by the wood pile by the road.

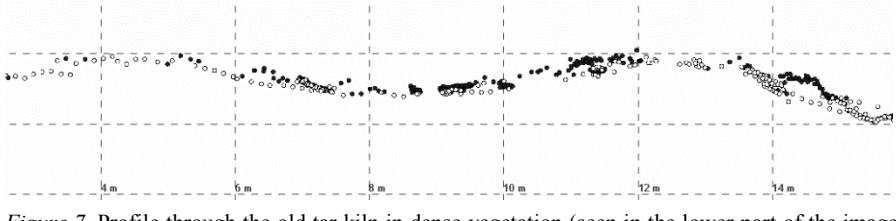

Figure 7. Profile through the old tar kiln in dense vegetation (seen in the lower part of the image above). The profile has been produced from the ground points of two superposed ALS data sets classified with different parameters. The white points are from a point cloud where relatively few points have been classified as ground points (LAStools, lasground_new: step=3.0, off-set=0.01, spike=1). When more generous parameters are applied (same except that off-set=0.1), the black points are added as ground points. In an area covered by dense vegetation, the additional points may emphasise the shape of the ground and fill in some empty spaces. The visibly higher point density in the right part of the profile is due to overlapping flying strips. Software: QTM.

Another aspect that should be considered in classification is geomorphology. Generous parameters may cause problems in a till-dominated landscape where stones and boulders will be clearly visible and disturb the detection of anthropogenic anomalies. On sedimentary deposits, this matters less. If the geomorphology of the study area is variable, different data tiles could be classified using different parameters. Apart from these environmental factors, it may be wise to consider what types of cultural remains are expected and try out parameters that reveal them in the best way possible.

In short, there is no single set of parameters that works best in all situations, and it is preferable to test the outcome of various parameters for each study area. A data set that has been classified for other purposes than archaeological surveys cannot be expected to be optimal for the detection of cultural remains.

4.3.2 Generation of DTMs

After classification, the next step of the study of paper IV was to generate digital terrain models (DTMs) of both data sets. This was done with Quick Terrain Modeler, since this software has earlier proved to be fit for archaeological purposes (Jansson *et al.*, 2009; Risbøl *et al.*, 2008). One of the basic options in the generation of a DTM is the grid cell size. It has been recommended that cells should not be larger than the resolution of the data capture, as some information is then discarded. On the other hand, creating cells smaller than the actual resolution can produce images that appear to be sharper, but since this is due to addition of artificial data, the procedure should not exceed a doubling of data (corresponding to a grid of 0.5 m cells if 2 points/m^2 were initially captured) (Crutchley & Crow, 2009). I assessed various grid cell sizes according to what "looked" best, and finally set the DTM grid to 0.4 m for the high-resolution data set, and 0.7 m for the low-resolution set (*Figure 21*, p. 103). These grid cell sizes closely correspond to the average resolution of the data capture.

Also, there are a number of parameters in QTM for the interpolation of the grid surface of the DTM. According to the recommendations of the software, the best parameters for a bare-earth surface is adaptive triangulation with mean-Z algorithm, antialiasing applied, and no smoothing filter. Having tried out various settings, I finally chose to follow the recommendations except for the algorithm, where I applied min Z instead of mean Z. With min Z, the elevation of each grid cell is represented by the lowest value in the cell, while with mean Z, it is an average of all the cell's elevation values. The mean-Z algorithm gives a smoother surface, but when the aim is to detect small anomalies this is no advantage. For my purpose, the min-Z algorithm gave a better result.

Geo-registration was set to WGS 84/UTM zone 33N in order to comply with the Swedish reference frame SWEREF 99.

4.3.3 Interpretation of DTMs

When DTMs are used for archaeological purposes, they are commonly exported as images, and a number of visualisation techniques have been developed to facilitate interpretation (Willén & Mohtashami, 2017; Kokalj *et al.*, 2011; Devereux *et al.*, 2008). However, regardless of the method used, each image can never show the DTM in more than one single way. When I worked with the software QTM for paper IV, I saw that anomalies with low visibility could suddenly appear as I was zooming back and forth, and flipping the light from one direction to another. Therefore, all interpretation was done in QTM. A standard light setting was defined as azimuth 315° and elevation 50°, but during interpretation, light conditions were changed repeatedly to enlighten features of different orientation. As for the height scale, the default setting (=1) was mostly used, but the scale could be changed to 1.5 or 2 in order to reveal smaller features.

In the comparative study carried out in parts of the study area, a 100x100 m grid was superposed on the DTM and each square was scrutinised one by one. Since this was very time consuming, no grid was used for the survey of the whole area. However, this more superficial analysis led to some anthropogenic anomalies being overlooked, so the use of an interpretation grid was clearly more effective. Regardless of the method, all anomalies that seemed to be anthropogenic were marked as points and exported in shapefile format.

4.3.4 Portability of data

All anomalies that were presumed to be anthropogenic were checked in the field during the comparative study, whereas a selected proportion was checked during the total survey (see details in paper IV). Bringing DTMs on a tablet into the field proved to be very useful. Before exporting data to the tablet, I used the computer-based software QGIS to create projects containing a black-and-white raster image in tiff-format of the DTM with standard light setting, and the shape-file with marked anomalies. I then exported these projects along with the necessary files to the tablet where Qfield was used to view the image and the anomalies, and to register the classification of each anomaly directly in the shape file. Some cultural remains that had not been noticed at the desktop were detected when the tablet was used in the field.

During the whole ALS study presented in paper IV, DTM interpretation and field verification were alternated so that the experience of how a certain anomaly appeared in the DTM and what it looked like in the field was repeatedly carried back to influence and improve desktop interpretation. For example, there was no need to inspect each and every one of the stump pits that were frequent in certain areas, and most of the charcoal burning platforms and tar kilns were so distinct that they could with some experience be classified already at the desktop.

4.4 Field work

Field work was carried out for papers III and IV. In the study presented in paper III, I searched for remains of old fences that had either been registered in previous studies or mentioned in historical sources. When I found such remains, I measured, described and photographed them (*Figure 8*). I also collected wood samples to date one of the fences with dendrochronology (section 4.5).

Figure 8. Part of the fence in Tjieggelvas that was described in detail for paper III.

In the study presented in paper IV, I did field work to check anomalies that had been detected in DTMs generated from ALS data (see section 4.3) and that seemed to be anthropogenic. As described in section 4.3.4, the DTM was brought into the field as a raster image on a tablet where the anomalies were also shown. A GPS receiver was used to navigate to each location, and the anomaly was investigated briefly and photographed. If needed, a soil probe was used to check the soil profile including the presence of charcoal. Each anomaly was classified as natural or anthropogenic, and in the latter case also as a specific type. The information gathered was entered directly into the shape file on the tablet.

4.5 Dendrochronology

In paper III, I used dendrochronological crossdating to find out which year one of the investigated fence systems had been built. Dendrochronology is a standard method for dating culturally modified trees and other wooden features (Rautio *et al.*, 2014; Zackrisson *et al.*, 2000; Niklasson *et al.*, 1994; Swetnam, 1984; Zackrisson, 1979). My samples were taken with handsaw or increment borer (Ø 12 mm). In the lab, distances between tree rings were measured with a LINTAB™ 5 measuring station with 10 µm resolution, and the resulting ring sequences were compared to master chronologies using TSAP-Win™ software and statistics (version 0.59). Primarily, a local master chronology from the Tjieggelvas area was used, with two chronologies from Lycksele (64°N, 18°E) and Torneträsk (68°N, 19°E) as supplements. Since the outermost layers of the logs and stumps were eroded, the result was an approximate dating of the year of death of each tree.

4.6 Statistical analyses

Apart from the statistics applied for the interpolation of surfaces as described in section 4.2, the statistics that I have applied are simple and basic, including correlation coefficients (Pearson's r and Spearman's rank), Student's t-tests, chi-square tests, and Wilcoxon signed-rank test. The softwares used for statistical analyses were Minitab and R.

4.7 Methodological considerations

Once data has been extracted from all kinds of sources with adequate methods, the results must be combined into a meaningful synthesis (cf. Östlund & Zackrisson, 2000). This can be done for different purposes. If the aim is to

understand the present-day landscape, an effective way is to consider the sources in order of time-depth, starting with long-term records and going forward (Josefsson, 2009, p. 48). In this thesis, however, I have been more interested in understanding how resources were used during a certain period in history, and my sources have either been contemporary and describing the period of interest, or posterior and used to assess earlier conditions. Here, I will discuss some aspects that I have had to consider when sources have been combined.

In historical research, contemporary sources are generally preferred since they are closer to the study object. However, most historical time series suffer from a "fading record" problem, meaning that older records are often missing, patchy, or altered (Swetnam *et al.*, 1999). This is obvious when it comes to ethnographic data. Nevertheless, it might be tempting for a scholar whose favourite ideas are confirmed by a single statement to promote this statement as a universal truth. Care must therefore be taken not to be deceived by an absence of contradiction that is in reality caused by a fading record. The interdisciplinary approach is one way of solving the problem, since more disciplines involved means more independent sources available. For example, when it comes to land-cover data, records are fading to the extent that they are non-existent from my study period. I therefore used posterior maps and land-survey data as proxy data to estimate land-cover areas in paper I. Since the data is highly reliable in itself, this is a reasonably safe way of using posterior data, provided that possible changes in land cover are considered.

Also, contemporary sources that are highly reliable but contain insufficient information can be combined with posterior sources that provide more information but whose reliability can be questioned. For example, I used sources on eastern Sami in the 19th and early 20th century to analyse subsistence patterns in Ume Sami district in the 17th century (paper II). Such analogies can contribute to a deeper understanding of certain aspects, but great care must be taken not to overestimate the explicative power of sources that do not directly concern the area and the time of study.

In lucky cases, there is more than one contemporary and independent source treating the same object. The description of fences included in court records, which enabled me to detect remains of the same fences in the field, is an example of successful cross-validation of contemporary and independent sources (paper III). More commonly, there might be a fiscal record, a parish register and a court record concerning the same individual, so that data can be cross-validated in the way described by Marklund (2015, p. 18).

Cross-validation is the ideal way of combining data gained from different sources. But what if the results are not validated but rather contradicted by independent sources? There are some criteria for the treatment of contradictory

sources, which were elaborated already in the late 19th century and which are still very useful (Howell & Prevenier, 2001, pp. 70ff). Most importantly, the source with the most "authority" is preferred, i.e. the source created by an eyewitness or an expert. If there are no other clues, priority is given to the source that is most in line with common sense.

When such considerations are applied, data from various sources which have been treated with methods from different academic disciplines can be successfully combined into a picture where the study object is understood from several different perspectives.

5 The taxlands

In this chapter, I will describe the taxlands in a number of ways. First, I will give an overview of their general characteristics, using both existing publications and a new analysis of all taxlands registered in 1695. Secondly, I will summarise what is known of autonomous Sami land governance and of the process through which governance was transferred to the Swedish state. Thirdly, I will discuss the use and management of the taxlands' resources during autonomous Sami governance, mainly based on the papers included in this thesis. Through this logic, I want to provide a context of Sami resource use during a certain time.

5.1 Characteristics of Sami taxlands

I will start with an overview of the taxlands under Swedish jurisdiction in 1695, which includes today's Finland and the inner parts of Finnmark fylke in northern Norway. 1695 is the only year when a reasonably complete overview is possible. In that year, Charles XI introduced a new Sami tax system based on a land register established by his sheriffs (Charles XI, 1915 [1695]; Wrede *et al.*, 1698). In this register, hereafter called the *1695 cadastre*, taxpayers and taxlands were listed for all Sami communities (*lappbyar*) that paid taxes to the Swedish Crown. In the following, I will present a new analysis of the 1695 cadastre. More information on how the analysis was done is found in Appendix 1.

5.1.1 Distribution and size

There are indications of taxlands in 23 of the 33 Sami communities in the 1695 cadastre (*Figure 9*). However, in Ran, only two taxpayers have lands, whereas it is explicitly said about the others that they roam the mountains hither and thither ("har intet något wist landh uthan flyter af och an på fiällen så wähl som alla hans grannar"). In Norrvästerbyn, only one taxpayer has a land, while there

is a similar statement as in Ran about the others ("har intet wisst landh, uthan flytter tillijka med sina grannar omkring fiällen"). In Tingevaara, 72 members were registered as holders of three of the community's four taxlands. These lands – Rautasvuoma, Saarivuoma, and Talma – were in fact developing into separate communities that would soon incorporate the neighbouring Siggevaara (Ruong, 1937). Tingevaara, Norrvästerbyn and Ran can be regarded as communities basically without territorial division. When these aspects are considered, taxlands were thus indicated for 20 of the 33 communities included in the 1695 cadastre.

Most of the communities that were not divided into taxlands were located along the western and northern rim of the area, i.e. the alpine and subalpine parts of the Scandes, where the border to Norway was to be defined (*Figure 9*). By contrast, most of the communities that were divided into taxlands were located to the east and south of the Scandes, in the boreal forest. There are some notable exceptions, with three mountain communities (Vapsten, Sirkas and Kaitum) being divided into numerous taxlands, and two forest communities (Peltojärvi and Kemikylä) not being divided at all. These special cases will be discussed in section 5.1.3.

As for the size of the taxlands, variation is large. When averages are calculated per community, the smallest lands are found in Arvidsjaur and Gran, with close to 290 km^2 in both cases. The largest average taxland area is found in Tingevaara (1720 km^2), but as already mentioned, these lands were more like communities. The next largest taxlands are in Inari (1480 km^2), Sompio (1100 km^2), Sodankylä (960 km^2), and Kuolajärvi and Kittilä (both ca 770 km^2). In Inari, most of the taxland names were clustered around Lake Inari, whereas those in Kittilä and Sodankylä were mostly located in the south. In the Saariselkä area in between, no taxland names have been identified. Whether this space was a common or divided among neighbouring lands is unclear. A map drawn about a century later (Wahlenberg, 1804) shows the whole Inari community as being divided into taxlands (or rather communities, since they are called *byalag* in the text), whereas both Kittilä and Sodankylä are undivided. In my analysis, I have divided the whole area among taxlands, and the resulting lands are therefore vast. However, each of these large taxlands was used by several taxpayers, as will be further discussed in section 5.1.3.

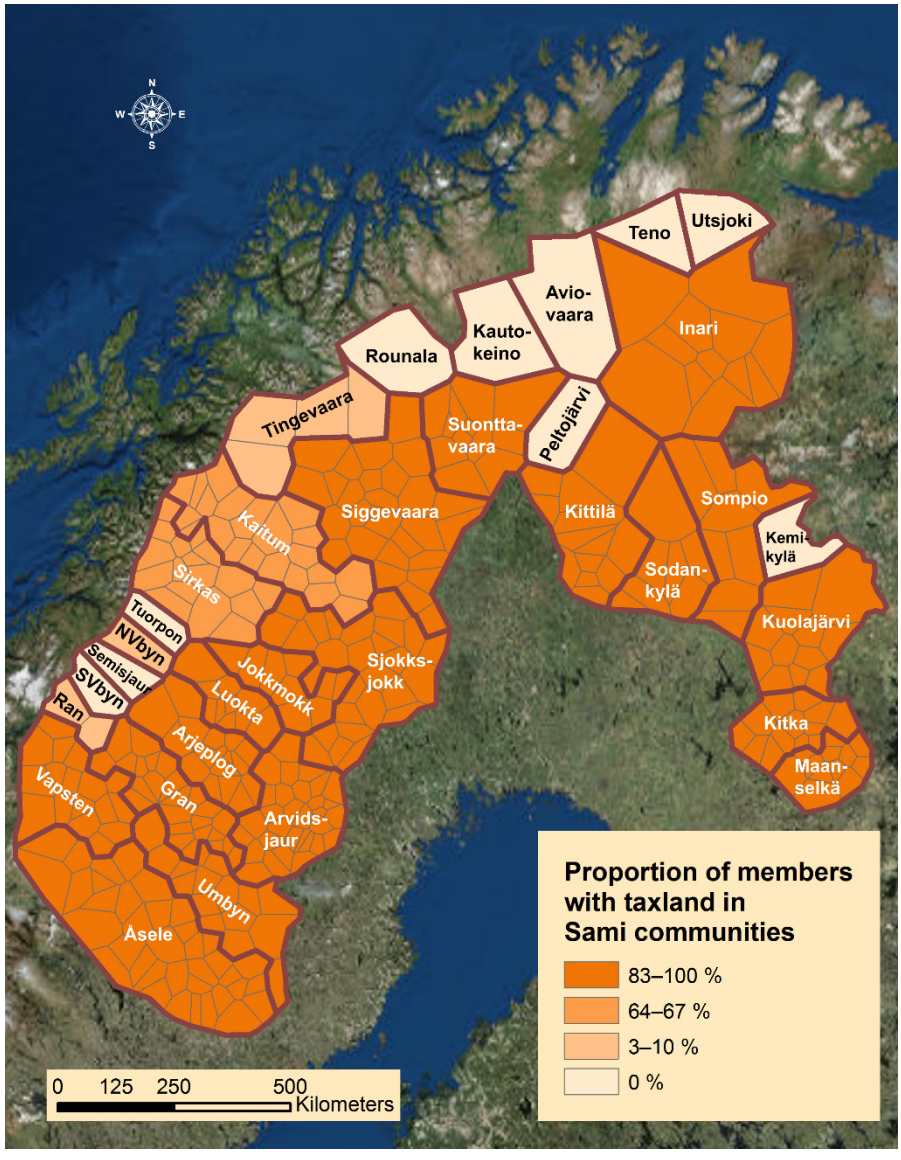

Figure 9. Proportion of community members with taxlands indicated in the 1695 cadastre (NVbyn=Norrvästerbyn, SVbyn=Sörvästerbyn). Thin lines show the lands of each community as Thiessen polygons generated around points representing the location of the lands' names. Thus, *lines do not indicate actual boundaries* of either taxlands or communities, since they have been generated halfway between neighbouring place names. However, the number of taxlands and their average area should be correct. For Norrvästerbyn, only one taxland is indicated, and for Ran only two. In Tingevaara, three of its four "taxlands" would develop into separate communities shortly after 1695, and the members registered for those lands have therefore not been counted. For further information on how the data from the 1695 cadastre was processed, see Appendix I. Background image: Esri World Imagery.

It can be questioned whether the 1695 cadastre is a true and relevant representation of Sami taxlands. The overall picture, that some communities were divided into taxlands while others were not, is confirmed by other sources. No taxlands have ever been recorded from Kautokeino, Aviovaara or Teno (although some fishing sites were used with exclusive rights), despite extensive searches of fiscal records and court records (Jebens, 1999, pp. 284f). By contrast, Åsele, Umbyn, Gran, Vapsten, Arvidsjaur, and Arjeplog were already in the 1670s described as being divided into household lands (Graan, 1983 [1672], p. 33; Otto & Grubb, 1909 [1670]; Gedda, 1671). In these communities, taxlands then existed continuously into the late 19th century, which is true also for Sjokksjokk, Jokkmokk, and Sirkas (Committee report, 1883). In these cases, the notions of the 1695 cadastre are confirmed by other sources.

There are other communities, however, for which sources are contradictory. In Torne Sami district, no taxlands were included for Rounala and Peltojärvi in 1695, and just a few heavily populated lands in Tingevaara. Nevertheless, taxlands in these communities are mentioned in fiscal records from the early 18th century. In Tingevaara, 40 lands have been identified (Päiviö, 2011, pp. 131ff), and in Peltojärvi, four (Arell, 1977, pp. 239ff). As for Rounala, Arell (1977, pp. 239ff) found notions of almost 40 taxlands but Korpijaakko-Labba (1994, p. 148) only 15. The unclear number of taxlands is most likely a reflection of a system that was not stable and well defined. In fact, it was a system that was about to disappear, since no taxlands are documented from Tingevaara after 1745 (Päiviö, 2011, p. 134), or from Rounala and Peltojärvi after 1775 (Arell, 1977, p. 250). This was due to a development towards reindeer herding through collective land use that started earlier in Torne Sami district than in other areas (Päiviö, 2011, p. 134; Arell, 1977, p. 169; Holmbäck, 1922, pp. 17f). I believe that the reason why the 1695 cadastre contains no taxlands for Rounala and Peltojärvi, and almost none for Tingevaara, is that this development was then already a reality. Therefore, I argue that the 1695 cadastre reflects the situation in Torne Sami district in a relevant way.

When it comes to the other areas, contradictions are more difficult to explain. About Ran, it is explicitly said in the 1695 cadastre that all but two of the community's members did not have any specific lands, but two decades earlier, seven lands had been recorded for its 16 members (Otto & Grubb, 1909 [1670]). As for Tuorpon, no taxlands were indicated in the 1695 cadastre, but Hultblad (1968, p. 89) identified 15 taxlands in 18th-century sources. Furthermore, when fiscal records from the 1830s are browsed, they do in fact list taxlands not only for most members of Ran and Tuorpon, but also for Norrvästerbyn,

Sörvästerbyn, and Semisjaur, where (almost) no taxlands were registered in 1695 (*Uppbördsböcker*, 1774–1834).[4]

So, is the 1695 cadastre relevant for research, or are the contradictions too many, too disturbing? Since it seems unlikely that taxlands would have been made up if they did not exist, possible faults are more probably related to omission of taxlands from communities where they actually existed. As for the communities of the Torne district, I have already explained why I find the 1695 cadastre relevant. There are then only a handful of communities left for which sources are contradictory. I therefore believe that the absence of taxlands is not due to omission but to reasons that might be revealed by future research. In other words, I regard the 1695 cadastre as a sufficiently trustworthy reflection of the situation at that time. Nonetheless, the data cannot be used without certain methodological considerations. Since this is not discussed in any of my papers, I have summarised these considerations in Appendix 1.

The analysis of the 1695 cadastre thus shows that taxlands existed on both sides of the Gulf of Bothnia, mainly in the boreal forest but to some extent also in the subalpine and alpine mountains. Sizes differed widely, from less than 300 km^2 in Arvidsjaur and Gran to more than 900 km^2 in Inari, Sompio and Sodankylä. However, the largest taxlands were used by several taxpayers. The 1695 cadastre gives a good overview of the situation in this particular year and can be used for several analyses, as will be shown in the following.

5.1.2 Origin

It has sometimes been assumed or proposed that the Sami taxlands were originally installed by the Swedish Crown (Bylund, 1981; Högström, 1980 [1747], p. 242). This assumption is based on a regulation issued by Duke Charles in 1602, proscribing that his sheriffs should note how many lakes there were in each Sami district and then distribute them among the Sami so that no one would possess more than he could use (Duke Charles, 1915 [1602]). As a consequence, a register of the number of fishing lakes and reindeer possessed by each tax payer

4. Fiscal records from the 1830s do not include communities in today's Finland and Norway, since they no longer belonged to Sweden. The last Swedish document including Finnish communities (from 1809) shows that there had by then been radical changes on that side of the Gulf of Bothnia (*Uppbördsböcker*, 1774–1834) due to extensive settling by mainly Finnish but also Sami peasants (Tegengren, 1952). Only Rounala, Inari, and Utsjoki (including Teno) were in 1809 dominated by payers of Sami taxes. Suonttavaara, Peltojärvi, Kittilä, Sodankylä, Sompio, and Kemikylä were included in the fiscal records from the Sami districts, but apart from Suonttavaara, where there were three payers of Sami taxes, all members paid settler taxes. Kitka and Maanselkä were around 1776 separated from the Sami district (Tegengren, 1952, p. 149). Kuolajärvi is said to have remained, but there is no sign of this community in the fiscal records of 1809.

was established for the Åsele and Ume districts (Carl Unesson, 1602). However, nothing is said in the register about a new distribution having been done, and no similar registers were established for the rest of the districts. Instead, the county governor Johan Graan initiated a number of inquiries during the 17th century to investigate the distribution of Sami land and waters (Anon., 1909 [1671]; Otto & Grubb, 1909 [1670]; Gedda, 1671). These actions clearly reveal a lack of knowledge that is not consistent with the assumption that taxlands should have been installed by the Crown. It is therefore not surprising that almost all scholars agree that the taxlands originated from within the Sami community (Lundmark, 2006, p. 45; Päiviö, 2001, p. 23; Korpijaakko-Labba, 1994, p. 351; Kvist, 1990, p. 15; Arell, 1977, pp. 67f; Hultblad, 1968, p. 82; Schefferus, 1956 [1673], p. 63; Solem, 1933, p. 84; Holmbäck, 1922, p. 28).

Why, then, are taxlands so intimately connected to the Swedish taxation system? Norwegian scholars Lars Ivar Hansen and Bjørnar Olsen have launched a theory to explain this. Although they acknowledge that land division originated inside the Sami society, they suggest that it had been loose and subject to change until Duke Charles' regulation of 1602, which presumably strengthened and stabilised the system. The Swedish Sami's strong sense of individual attachment to certain land areas would thus at least partly be an effect of this reform (Hansen & Olsen, 2012, pp. 292ff).

It is, however, difficult to find facts in support of that theory. True enough, Duke Charles changed the tax system through his 1602 regulation, but the main consequences were that taxes would no longer be paid in furs but in dried fish or reindeer (Lundmark, 1982, p. 90ff). Apart from the currency, fiscal records remained very much the same, listing nothing more than the names of the taxpayers and the amount paid by each one. Records contain no references to individual taxlands until the 1695 cadastre. It is therefore difficult to imagine how Duke Charles' regulation could have acted to stabilise the territorial division of the Sami. Furthermore, if the division of communities into taxlands was related to the tax system, why was it not applied to more than two thirds of the communities registered in the 1695 cadastre?

My conclusion is that the perceived difference between Norway and Sweden is not related to Duke Charles' regulation from 1602. The most parsimonious explanation for the origin of the taxlands is that the lands were created by the Sami themselves as functional units for the division of certain resources. Therefore, the difference between the two countries should also be related to resources. I will further explore these subjects in the next section.

5.1.3 Territoriality

The division of Sami communities into smaller land units, so apparent in the 1695 cadastre, can be regarded as an expression of *territoriality*. Rada Dyson-Hudson and Eric Alden Smith (1978) developed a model to explain human territoriality with ecological variables. Their model is focused on economic defendability, meaning that territoriality is expected to occur where the benefits to an individual or a group of defending an area against others is larger than the costs. Dyson-Hudson and Smith identified two main parameters: predictability and density of resources (*Table 1*).

Table 1. *Relationships between resource distribution on one hand, and resource utilisation and degree of nomadism on the other, according to Dyson-Hudson & Smith (1978).*

	Unpredictable resources	Predictable resources
Dense resources	Sharing of information, high degree of nomadism	Territories, low degree of nomadism
Scarce resources	Dispersion, very high degree of nomadism	Home ranges, low–medium degree of nomadism

According to Dyson-Hudson and Smith, only predictable resources are efficiently exploited through a territorial system. This can be organised in two main ways depending on resource density. If resources are predictable and dense, the economic defendability is high and exclusive territories are likely. The degree of nomadism will then be low. If resources are predictable but scarce, resource use is likely to be organised through *home ranges*, i.e. areas that are not necessarily exclusive, and a low to medium degree of nomadism. If, on the other hand, resources are unpredictable, territoriality is unlikely to occur and nomadism is expected. Resource predictability and density would thus be the main variables explaining both human territoriality and nomadism.

Partly inspired by the model of Dyson-Hudson and Smith, Priscilla Renouf (1984) showed that northern coastal hunter-fishers (including Stone Age groups of Varangerfjord in northern Norway) were in several respects different from other hunter-gatherers. They were less mobile, in many cases sedentary, and had well defined territorial boundaries. Just like predicted by Dyson-Hudson and Smith, the territorial and sedentary groups studied by Renouf were dependent on dense and predictable resources. Renouf's findings were picked up by Gisli Pálsson (1988), who performed a more extensive analysis using G.P. Murdocks *Ethnographic Atlas* (1967). Pálsson statistically tested a number of hypotheses on data from 220 societies where agriculture and animal husbandry were minimal. He found a strong positive association between reliance on fishing and permanence of settlement, while the opposite was true for hunting and gathering.

By contrast, the association between fishing and "restrictions of access to land", which was the variable closest to territoriality, turned out to be weak. However, the correlation between "restrictions of access to land" and fishing was positive, whereas it was negative for hunting and gathering. Although only the correlation to hunting was statistically significant below the 0.05 level, fishing seemed to imply a higher level of territoriality than hunting or gathering.

The idea that fishing is a subsistence mode that is closely associated with permanence of settlement contradicts an old view, expressed for example by Solem (1933, p. 84), that ownership of land would be unknown to "primitive people living on hunting and catching" since there would be no need to own land if it was not cultivated and settled (cf. Jebens, 1999, pp. 125ff). In fact, Renouf concluded that the hunter-fishers that she studied had more in common with agricultural societies than with other hunter-gatherers. Sadly to say, the old view has had a negative impact on non-cultivating peoples' land rights in many parts of the world (Tuori, 2015), and probably also for the Sami, as will be further explained in section 5.2.3.

If we return to the data from the 1695 cadastre, and analyse it with the theory of Dyson-Hudson and Smith in mind, the first pattern that emerges is the one already noted in section 5.1.1: most communities without taxlands were located in the alpine and subalpine mountains, whereas most communities with taxlands were located in the boreal forest. This corresponds to a well-known division between *mountain Sami*, who relied first and foremost on reindeer husbandry, and *forest Sami*, who combined a smaller-scale reindeer husbandry with fishing and hunting (Schefferus, 1956 [1673], pp. 242ff). Although this classification is much simplified (cf. Hultblad, 1968, pp. 124ff), it is useful for understanding the pattern in *Figure 9*. Forest Sami spent all seasons in the boreal forest, where communities were usually divided into taxlands, whereas mountain Sami spent the snowless season in the mountains, where communities were rarely divided into taxlands. Despite a few exceptions, which will be discussed below, there seems to have been some kind of association between resource use and subsistence patterns on one hand and territorial division on the other.

What do we know of the mountain and forest Sami in these respects? To begin with the mountain Sami, they relied primarily on reindeer husbandry and by consequence on pasture resources. These are relatively unpredictable because their quality and usability is affected by factors such as wind, snow-depth, ice-crust formation, overgrazing, and predators (Brännlund & Axelsson, 2011; Kitti *et al.*, 2006). Whether pasture resources are dense or scarce probably varies depending on the area and the season. Regardless of resource density, however, unpredictable resources should lead to a high or very high degree of nomadism according to the model of Dyson-Hudson and Smith. The absence of

territoriality in most mountain Sami communities, according to the 1695 cadastre, thus fits well into the model.

It should be stressed, however, that absence of territoriality should not be interpreted as if the mountain Sami had no connections whatsoever to any parts of the land. Just as the reindeer herding Evenki of Eastern Siberia speak of "good places" that "suggest themselves" for certain activities (Anderson *et al.*, 2014), the mountain Sami most certainly had traditional settlement sites and other locations to which they felt a deep affinity (cf. Brännlund, 2015, pp. 37ff). In the late 19th century, it was described how reindeer herding Sami households who used common pastures nevertheless had at least one main camp, primarily used in spring and autumn, which was "as beloved to the Sami as the home of a settled person". In these camps there were permanent huts and storage facilities, and other reindeer herders avoided to intrude nearby (Committee report, 1883, pp. 25, 40).

If we turn to the forest Sami, who were more territorial according to the 1695 cadastre, they probably relied more on fishing than on hunting or reindeer husbandry at that time, and they can be classified as semisedentary (see section 5.3.3). In accordance with previous research (Andrews, 1994; Pálsson, 1988; Renouf, 1984), preponderance of fishing seems to have been associated with a high degree of territoriality and permanent settlement also among the forest Sami of 1695.

The general territoriality of the forest Sami and the non-territoriality of the mountain Sami are not the only features that can be analysed through the 1695 cadastre. Another aspect is the number of households registered for each taxland. In most communities, there was usually only one household per land, or occasionally two or three, rendering an average lower than two (*Figure 10*). All communities in the boreal forest on the western side of the Gulf of Bothnia belonged to this group, except for Siggevaara (average = 2.1). On the eastern side, only two of the forest communities, Kitka and Maanselkä, had less than two households per land on average, whereas the rest had between two and five, the highest being Inari and Sodankylä. Although taxlands with five households might have been defended just as strongly as lands with just one, territoriality can be considered to be stronger where each household has its own territory than where territories are shared.

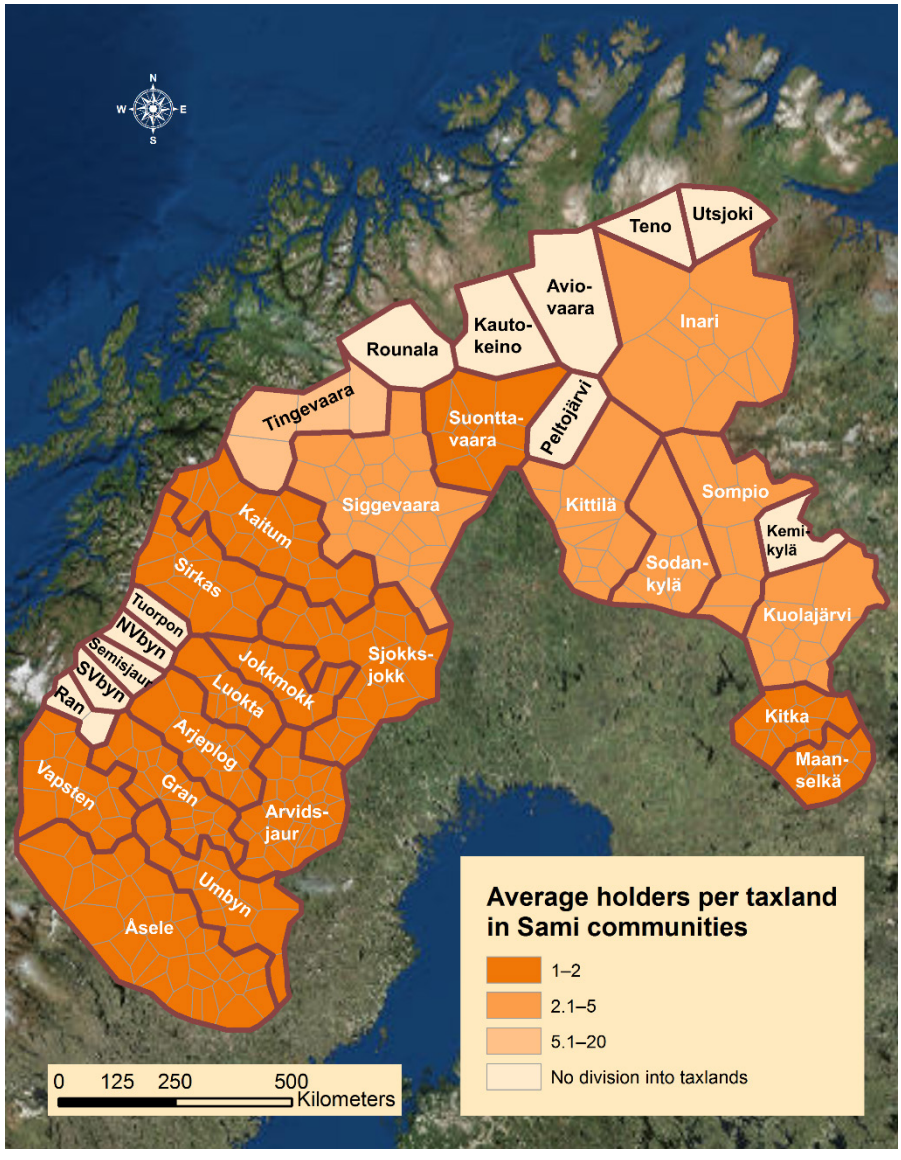

Figure 10. Average number of holders or households per taxland in the Sami communities included in the Swedish 1695 cadastre. For details on how the map was produced, see Appendix 1. Background image: Esri World Imagery.

What do we know about resource availability and resource use in communities with different average numbers of households per taxland? If we look at the eastern side of the Gulf of Bothnia, we can see that the two southernmost communities, Kitka and Maanselkä, had among the lowest numbers of households per land, whereas the rest had considerably more (*Figure 10*). As a matter of fact, these two eastern groups were also quite special in terms of resource availability. In an overview from the 1730s, Kittilä, Sodankylä, Sompio, and Kemikylä were described as relying heavily on hunting of beaver and wild reindeer, whereas fishing was generally poor. In Inari and Kuolajärvi, both fishing and hunting were good, whereas Kitka and Maanselkä were characterised by good fishing but poor hunting (Hackzell, 1910 [1738]). In other words, the two communities with the lowest numbers of households per land and the highest degree of territoriality, were also the only two communities that depended more on fishing than on hunting. The connection between territoriality and fishing seems to be accountable also for differences between forest Sami communities.

Hunting thus prevailed over fishing in several communities on the eastern side of the Gulf of Bothnia. As far as we know, this was not the case on the western side. The reason for this was probably not lack of game, since wild reindeer was common and beaver sometimes too, at least in Ume Sami district (Norstedt, 2011, pp. 38f). Instead, there were fishing lakes almost everywhere, much more than in Kittilä, Sodankylä, Sompio or Kemikylä, where hunting was therefore relatively more important. Also, hunting was organised differently among the Sami east of the Gulf of Bothnia. Wild reindeer were often hunted by the whole community together, and catches of both reindeer and beaver were shared among all members (Tegengren, 1952, pp. 105ff). By contrast, sources concerning the western side of the Gulf of Bothnia say nothing of communal hunting or sharing (Niurenius, 1983 [ca. 1640], pp. 17ff; Lundius, 1983 [ca 1674], p. 26; Graan, 1983 [1672], p. 42; Rheen, 1983 [1671], p. 23; Högström, 1980 [1747], p. 85; Drake, 1979 [1918], pp. 5ff). The relatively higher importance of hunting and the customs of sharing probably explains the lower degree of territoriality in the east.

Only one of the western forest Sami communities, Siggevaara, had on average more than two households per land. Although the value is still rather low (2.1), it is closer to the nearest higher one (Kittilä, 2.25) than to the nearest lower one (Luokta, 1.7). Unlike other forest Sami communities, Siggevaara was already in 1692 described as being focused on reindeer husbandry (Kammarkollegiet, 1910 [1692], p. 245). The number of reindeer was, however, lower than in the neighbouring mountain Sami community, Tingevaara (Hackzell, 1910 [1738]). Some scholars believe that Siggevaara had by then

already become a mountain Sami community, pursuing summer migrations all the way to the Norwegian coast, just like the Sami of Tingevaara (Ruong, 1937, pp. 19f; Tanner, 1929, pp. 43f). A relatively high number of households per land could therefore reflect a decreasing importance of territories.

As for the obvious mountain Sami communities, no territorial division (or only single cases) was present in eleven out of 14. These communities were not only characterised by a low level of territoriality but also a high level of nomadism. The interpretation of the three that were divided into taxlands in the 1695 cadastre – Vapsten, Sirkas, and Kaitum – is more challenging. If the data is trustworthy and the model of Dyson-Hudson and Smith holds true, the territoriality of these mountain Sami communities should indicate that they were dependent on more predictable resources than the others. An additional and interesting fact is that these three extended much further to the east than other mountain Saami communities and thus not only included alpine and subalpine mountains but also some boreal forest. Did they rely more on fishing and/or hunting, and less on reindeer husbandry, than the other mountain Saami communities? Or did they just practise another form of reindeer husbandry?

Furthermore, Sirkas and Kaitum are special in that no taxlands are indicated for about one third of their members, whereas all members of Vapsten have taxlands in the 1695 cadastre (*Figure 9*). Sirkas and Kaitum seems to have been half-way between the territorial and the non-territorial communities, whereas Vapsten was fully territorial. Does this reflect a difference in resoure use? Only further research can answer these questions.

Most of the data from the 1695 cadastre is compatible with the theory of Dyson-Hudson and Smith, but one case is not. This is the large difference in territoriality between Suonttavaara (1.5 households per land) and the neighbouring Peltojärvi (no territorial division). Both communities were in the 1690s described as relying mainly on reindeer husbandry (Kammarkollegiet, 1910 [1692], p. 245). They differed, however, in their degree of nomadism, as the herders of Suonttavaara had been making summer migrations to the Norwegian coast since the early 1600s, whereas the herders of Peltojärvi spent all seasons in the forest (Gjessing, 1956, p. 199; Tanner, 1929, p. 43). The Sami of Peltojärvi were thus not only less territorial but also less nomadic, which is the opposite of what would be expected from the model.

Despite the lack of consistency in this particular case, I find the theory of Dyson-Hudson and Smith to be a useful tool for detecting and analysing associations underlying the patterns of the 1695 cadastre. No model can be built without considerable reduction of complexity, and I therefore do not expect this one to offer a perfect reflection of reality. Still, the model can contribute to a deeper understanding of differences related to resource utilisation. It can also

shed some light on the origin of taxlands. I have already mentioned the theory launched by Hansen and Olsen (2012, pp. 292ff), according to which the Swedish Sami's strong sense of individual attachment to delimited land areas would be connected to the tax reform of Charles IX in 1602. While I have found no facts in support of that theory, Dyson-Hudson's and Smith's model can explain a great deal. The landscape where the Swedish Sami were really territorial was the boreal forest with its many lakes of different sizes. My conclusion is that taxlands were created as a way to defend predictable and dense resources, especially fishing resources. This kind of landscape is very rare in Norway, and I believe that this is the reason why no taxlands were created there.

To sum up, Sami taxlands existed in 1695 on both sides of the Gulf of Bothnia. They were a reality in almost all forest Sami communities and also in some mountain Sami communities, and there are no indications that they would have been introduced or maintained by the Crown. Instead, territorial division through taxlands most likely was installed by the Sami themselves to achieve a satisfactory division of predictable and dense resources, primarily the lakes and river stretches that were the basis of their subsistence.

5.2 Governance of Sami lands

Having defined and described the characteristics of Sami taxlands, I will now turn to the subject of how they were governed. An understanding of who could decide on the access to and control of taxlands, and how decisions were made, is crucial for the understanding of how resources were divided, used and managed in the Swedish boreal landscape. Since the governance of Sami lands has undergone profound changes during historical times, I will start with an overview of what is known of autonomous Sami governance. Then, I will try to capture the process through which land governance was transferred to the Swedish state, a process that was completed by the end of the 19th century.

5.2.1 Autonomous Sami governance

In the early 14th century, the traditional Sami settlement area became a border zone between three expanding states, Sweden, Norway (soon to be dominated by Denmark) and Novgorod (succeeded by Muscovy and Russia). The first formal border agreements were settled in the 1320's between the Novgorod Republic and the kingdoms of Sweden and Norway, respectively (Hansen & Olsen, 2012, pp. 170ff). Large parts of the traditional Sami settlement area were inside the Swedish zone, and from this time on, Swedish kings actively claimed supremacy of the area and its population (Olofsson, 1962).

In the absence of public administration, the actions of the Swedish kings towards the Sami during the following two centuries were mostly limited to strengthening the connections with the long-established tradesmen, the *birkarls*, in order to control the profitable fur trade. A firmer grip was taken in the mid-16th century, as King Gustav Vasa sent his sheriffs to collect taxes directly from the Sami. His son, Charles IX, went one step further as he founded four church and market places in 1606: Lycksele, Arvidsjaur, Jokkmokk and Enontekis (Charles IX, 1858 [1606]). During the rest of the 17th century, they were followed by a number of similar institutions (Norstedt, 2016). The Swedish Crown had established permanent footholds in the Sami area.

Although Sami resource-use decisions during this period were most certainly influenced by opportunities for trade and obligations to pay taxes, there are no indications of active external interference. Thus, the governance of Sami lands can be regarded as autonomous well into the 17th century. How, then, was governance organised in the area in focus of this thesis, i.e. the area that today belongs to Sweden? For a long time, most scholars agreed that the question had been answered through Väinö Tanner's (1929) study of the Skolt Sami of the Pechenga area, where he developed an idea originally launched by K.B. Wiklund (1922). According to Tanner, the fundamental structure of the Skolt Sami society was the *sit*, a number of people who as a group had customary rights to a certain land area and who spent the winters together in a common village. The *sit* was ruled by the village council, the *norrāz* or *sobbar*, where each household was represented by its senior member. The *norrāz* exercised a detailed governance of resources, assigning every lake and every river stretch to a certain household. No individual customary rights existed, and therefore no priority was given to a household because of earlier use. When it came to hunting grounds, they were regulated according to the game. Wild reindeer, for example, were hunted collectively and the catch was shared among all households. Tanner argued that this kind of resource governance had been the rule among the Sami people as a whole for at least two millennia, maybe even since the Stone Age.

Tanner proposed a neat explication of the original Sami society, and his ideas offered a fertile soil for further studies. As a consequence, most scholars were ready to accept that the Sami had from time immemorial been organised in *sit* or *siida* communities (from the 16th century onward appearing in Swedish fiscal records as *lappbyar*) where land and waters had been collectively owned and resource governance had been exercised by a village council (Sara, 2009; Westerdahl, 2008, p. 86f; Lundmark, 2006, pp. 20ff; Jebens, 1999, pp. 64f; Mulk, 1994, pp. 10ff; Sköld, 1992, p. 23; Kvist, 1990, pp. 14ff, 1989, p. 15; Ruong, 1982, p. 51; Vorren, 1980, p. 237; Bergsland, 1975, p. 475f; Hultblad, 1968, pp. 69ff; Solem, 1933, p. 86).

Very few scholars thought otherwise. In 1987, Kerstin Kuoljok published a brief paper on the subject, proposing that the *sit* described by Tanner was a recent product of Russian legislation (Eidlitz Kuoljok, 1987), but her objections largely went unnoticed. Some years later, a more elaborate criticism was advanced by Edel Berg (2001), who showed that the Skolt Sami society had been affected by religious, economical and geopolitical influence from surrounding societies during a long time, just like any other Sami community. This incited Kuoljok to approach the subject once again and to publish a new and much expanded study. Thanks to her knowledge of Russian sources, she could show that the customs of the Skolt Sami communities were neither ancient nor original. Instead, the governance of the *sit* as described by Tanner was executed according to a regulation from 1861 on the autonomous rule of Russian villages (Eidlitz Kuoljok, 2011). Recently, the "winter village" part of Tanner's theories has also been thoroughly reviewed and rejected (Wallerström *et al.*, 2017).

In light of this well-founded criticism, the Skolt Sami *sit* can no longer be used as a model for Sami communities in general. Instead, it is necessary to turn to sources relevant for each area to understand how autonomous governance was organised. As long as we stay on the eastern side of the Gulf of Bothnia, there are in fact some evidence supporting the existence of a collective resource governance like the one described by Tanner. From Kemi Sami district in the 17th and 18th centuries, there are several records about collective hunting of reindeer and of communal sharing of beaver catches, which imply some degree of collective governance (Korpijaakko-Labba, 1994, pp. 335ff; Tegengren, 1952, pp. 104f, 116; Solem, 1933, pp. 87ff). The communities where this has been documented are communities where taxlands were shared among a relatively large number of households (2–5) in the 1695 cadastre (*Figure 10*).

Also, according to one record from Kemi Sami district in the 1670s, the whole community used to gather to settle land-use conflicts (Tuderus, 1983 [ca 1675], p. 22f). It is somewhat confusing, however, that these gatherings were said to take place in "lantmannens kåta". *Lantman* is a older Swedish word for peasant (*Svenska Akademiens ordbok*), and in areas where Finns and Sami have long lived side by side, the Finnish equivalent *lantalainen* is commonly used in opposition to *lappalainen*, i.e. the older word for Sami (Korpijaakko-Labba, 1994, p. 53; Paulaharju, 1937). Did the Sami community gather to settle internal conflicts in the dwelling of a visitor from outside, maybe a Finnish merchant? Since unsettled conflicts were said to be taken to the priest for further investigation, this record does not necessarily reflect autonomous Sami governance.

More elaborate are the records about the *kåta kärreg* (Finnish: *kotakäräjät*) or Sami court in Inari. This institution is mentioned several times by Jakob

Fellman, who was a vicar in Utsjoki 1819–32. According to him, the Sami of Inari only rarely brought their internal conflicts to the district court but preferred to settle them in their own way. The Sami court assembled every time the Sami gathered on the church place, which happened five times a year. The court was presided by the *bylänsman*, the Sami who had been appointed by the Crown's sheriff to collect the community's taxes. The rulings of the Sami court were almost always respected by the community, but some cases were later brought to the district court (Fellman, 1906, p. 351). Since Fellman took part in the meetings of the Sami courts himself, there is no reason to question that the institution existed in Inari (but see Korpijaakko-Labba, 1987).

When we turn to the western side of the Gulf of Bothnia, however, records are scarce on Sami courts. One of the very few is a report written by the Danish-Norwegian military Peter Schnitler about the Sami of Tydal in 1742. According to him, these Sami never brought their matters to the Norwegian district courts but instead turned to a couple of elders. Thieves and other offenders were punished in a severe way that is not otherwise known from a Sami context: if the convicts did not have enough reindeer to pay their fines, they were whipped on their naked body or tied to a tree to be plagued by mosquitoes. According to the same source, the Sami also divided inherited property without assistance from district courts (Schnitler *et al.*, 1962, p. 57).

A second record, from Åsele Sami district on the Swedish side, is quite similar. In this area, conflicts over land were in 1819 said to have formerly been resolved by a judge (*duobmar*, from Sw. *domare*), a wise elder who tried to find a settlement between the parties. This was told by the local police officer Johan Edin, who in his childhood (he was born in 1730) had witnessed such a judge in action, assisted by two other knowledgeable men. Thanks to these elders, the Sami of the area rarely brought their conflicts regarding land or sharing of deceased persons' property into Swedish district courts during the 18th century (Drake, 1979 [1918], p. 227).

A third record from the western side of the Gulf of Bothnia is from Pite Sami district in the 1830s, where it was said that the Sami courts had only recently been abolished, and that all matters were now treated by Swedish district courts (Læstadius, 1977 [1833], p. 311). This is a notion that has been cited as an example of surviving Sami customs (Marklund, 2015, p. 85; Westerdahl, 2008, p. 87; Lundmark, 2006, p. 22f). However, when the passage is read in its entirety, it is clear that the Sami courts in question are the ones established through the *Lapp Codicil of 1751*, an addendum to the treaty on the Norwegian-Swedish border. Thus, this notion does not contribute to our knowledge of autonomous Sami land governance.

To sum up, there are only two records, one from Tydal and one from Åsele, supporting the existence of Sami courts west of the Gulf of Bothnia. They can be seen as part of the resource governance, since they treated conflicts over land use and inheritance. But according to what rules? These are the rare notions on traditional Sami land use customs that I have found in historical sources:

- Every Sami knew very well the extension of his land (Lundius, 1983 [ca 1674], p. 30), at least in some communities (Graan, 1983 [1672], p. 33).
- If someone killed a reindeer on another persons land, the matter would be taken into court (Lundius, 1983 [ca 1674], p. 30).
- Forest Sami could allow reindeer herding mountain Sami to stay on their land during winter. The guests were then allowed to use winter pastures for their reindeer and to hunt wild reindeer (Lundius, 1983 [ca 1674], p. 11; Stobée, 1919 [1746], p. 72).
- Land and waters were usually inherited by all children in a family, both brothers and sisters (Graan, 1983 [1672], p. 33; Tornæus, 1983 [1672], p. 47; Rheen, 1983 [1671], p. 14).
- If a land for some reason was abandoned, relatives would move in and pay taxes. However, it could also be sold (Graan, 1983 [1672], p. 33).

Neither these notions on traditional land usage nor the two records on Sami courts suggest the existence of collective resource governance or of land being distributed without regard to former occupation, as Tanner reported from the Skolt Sami society. On the contrary, all sources from the western side of the Gulf of Bothnia claim that real property was the possession of a household or a family, who could even choose to sell it.

It is possible that resource governance really was different on the two sides of the Gulf of Bothnia. However, when Tanner's study on the Skolt Sami is read more closely, it does in fact contain several notions of land and waters being the inherited possession of a family (Tanner, 1929, pp. 354ff, 398f). Also, detailed minutes from 1938 on the division of fishing-waters among the Skolt families say that this division had been done already before Pechenga was incorporated into Finland (i.e. 1921) (Nickul, 1948, pp. 16f). In other words, families had long-lasting rights to land also in the Skolt Sami society.

I will not go further into resource governance in the Skolt Sami society or in Kemi Sami district, since this is outside the main scope of my thesis. As for my study areas, the low number of holders per taxland in all western forest Sami communities (except Siggevaara) in the 1695 cadastre (1,1–1,7; *Figure 10*) shows that these taxlands were essentially household territories. Also, the

notions on traditional land usage listed above show that each household could decide on issues concerning resource use inside their own land.

My conclusion is that autonomous Sami land governance in these areas was mainly exercised through household decisions, at least in the 17th century. It seems reasonable to believe that the Sami also had some kind of mechanism to resolve land-use conflicts between households in a peaceful way, and maybe this mechanism was a council of the type reported from Tydal and Åsele. However, conflict-solving is something quite different from the collective resource governance described by Väinö Tanner.

5.2.2 Sami governance within district courts

When Gustav Vasa charged his sheriffs to collect taxes from the Sami, he also instructed them to sustain law and order (Lundmark, 2006, p. 25; Korpijaakko-Labba, 1994, p. 86). No records were written from this early execution of law among the Sami, although books were kept of paid fines along with a notion on the nature of the crime and the name of the offender. In the first half of the 17th century, regular court proceedings were introduced. Records show that the district court assembled every year during the winter markets on the church places in the Sami districts, and settled whatever dispute was brought before it.

The law that was applied in Sweden during the 16th and 17th centuries could be ambiguous. The national law was the Country Law of King Christopher (*Kristofers landslag*) from 1442 (Lundmark, 2006, p. 26; Korpijaakko-Labba, 1994, p. 114). In 1608, this law was reprinted with the addition of the biblical Law of Moses (Taussi Sjöberg, 1996, p. 24). Furthermore, the judge rules of Olaus Petri from about 1540 stated that customary law should be regarded as law, as long as this did not entail any inconvenience (Lundmark, 2006, p. 27). Consequently, Gustav Vasa mentioned in his instructions to the sheriffs that they should enforce not only Swedish law but also ”good old customs” (Korpijaakko-Labba, 1994, p. 87). Customary law remained important during the 17th century and to some extent also after 1734, when the new Civil Code entered into force (Lundmark, 2006, p. 27).

Since the Middle Ages, one of the fundamentals of Swedish district courts has been the participation of lay judges. Originally, they were appointed by the local community and should ideally be twelve, hence their Swedish name *tolvmän* (“twelvemen”) (Taussi Sjöberg, 1996, pp. 17f). During the 16th and most of the 17th centuries, district courts were dominated by the local assembly of *tolvmän* while the Crown’s representative, the judge, played a minor role (Taussi Sjöberg, 1996, pp. 50ff; Olofsson, 1974, pp. 117ff). The courts of the Sami districts were no different in this respect (Granqvist, 2004, p. 78). The

dominance of the *tolvmän* was most prominent as long as the judge was a civil servant without law education, which in the Sami districts continued until 1720 (Olofsson, 1974, p. 124). The opinion of the *tolvmän* remained influential throughout the 18th century (Marklund, 2015, pp. 85ff).

Since the *tolvmän* should be appointed by the local community, the Sami would normally dominate as long as they were in majority in the area (Korpijaakko-Labba, 1994, p. 112; Hultblad, 1968, p. 72). The length of this period varied considerably between communities. In Maanselkä on the eastern side of the Gulf of Bothnia, Finns immigrated early and gained the majority among the *tolvmän* already in 1693 (Tegengren, 1952, p. 83). By contrast, the Sami dominated well into the 1790s in Arvidsjaur and Jokkmokk on the western side (Marklund, 2015, p. 104; Kvist, 1988, p. 145).

As long as the Sami dominated the courts, the application of customary law most probably reflected their opinions (Marklund, 2015, p. 86; Lundmark, 2006, pp. 25f; Hultblad, 1968, p. 72). This should particularly have been the case when lawsuits were settled without a trial and thus without involvement of national law. In the former parish of Enontekis in the early 18th century, several lawsuits were settled in this way every year (Korpijaakko-Labba, 1987). The same is true of the parish of Arvidsjaur (Marklund, 1999, pp. 49ff). Among the cases commonly settled without a trial were inheritance and land-use conflicts (Granqvist, 2004, pp. 32, 190; Marklund, 1999, pp. 49ff; Korpijaakko-Labba, 1987). Sami resource governance can thus be regarded as fairly autonomous even after the introduction of Swedish district courts, as long as the Sami were in majority among the *tolvmän*.

What was the content, then, of the Sami customary law on land-use matters, as it came to light in the district courts? In his extensive study of court records from Jokkmokk from 1640 to the late 19th century, Filip Hultblad (1968) discusses such decisions in great detail. The records show that each taxland was formally possessed by a single taxpayer, but in reality the land was used by a family including one or several married sons and sons-in-law (or in other words, sons and daughters), and sometimes siblings. The most common way to gain right to a taxland was through inheritance, usually from parents. If there was a conflict regarding land rights, long time use was a decisive argument. Land rights could also be acquired through marriage, purchase or donation, or in exchange for another land. If the owner died without an heir, the court could assign it to any person that strongly needed it. Furthermore, forest Sami landholders could decide under what conditions mountain Sami were allowed to stay (Hultblad, 1968, pp. 83ff). In short, land-use customs as they were reflected in Jokkmokk's district court records were strikingly similar to what was said in other sources about traditional Sami customs, as listed in the previous section.

As long as land-use conflicts only arose between the Sami, Swedish authorities had no particular reason to interfere. The situation changed as conflicts between Sami and non-Sami became more common. This was rarely the case before the 1670s, as there were then very few settlers in the Sami districts. In 1673, however, King Charles XI issued a proclamation to the effect that land that was not useful to the Sami could be claimed by Swedish and Finnish peasants as meadows and pastures (Charles XI, 1872 [1673], pp. 20f). As encouragement, settlers were guaranteed 15 years of tax freedom and the right to abstain from war service ever after.

Charles XI's offer was particularly tempting for Finnish settlers, who were in need of large forest areas for their traditional slash-and-burn cultivation. During the following years, numerous Finns moved to neighbouring Sami areas. Court records from Sompio, Maanselkä, Kitka, and Sodankylä in the 1670s and 1680s show that many newcomers made agreements with local Sami about suitable places for settlement. In some cases, settlers promised to care for elderly Sami in exchange for a permission to settle on their taxland (Korpijaakko-Labba, 1994, p. 433ff).

Although the initial settlements were often based on voluntary agreements with the local Sami, the situation soon got out of hand. The proclamation of 1673 had been founded on an idea of complementary land use where the settlers would mainly rely on agriculture and cattle raising, and the Sami on reindeer husbandry (Göthe, 1929, pp. 191ff). The Finnish settlers did not live by this idea, however, since they practised slash-and-burn cultivation, which destroyed the reindeer pastures and scared the game (Tegengren, 1952, p. 77). Apparently the settlers could not easily be evicted once they had established, since the Sami of Kitka and Maanselkä complained bitterly about their situation in the 1680s (Korpijaakko-Labba, 1994, p. 435; Tegengren, 1952, pp. 77ff). Their troubles reached the king, who issued a new proclamation in 1695, stressing that settlers were not allowed to rely primarily on slash-and-burn cultivation, but should establish permanent fields and meadows (Charles XI, 1872 [1695]). In this way, the Crown tried to protect the Sami's livelihood while yet allowing the settlement of peasants.

As to hunting and fishing, the proclamation of 1673 mentioned that settlers could pursue such activities. Nevertheless, the Crown's representatives repeatedly proclaimed that fishing and hunting rights were the prerogatives of the holders of the taxland. In 1722, the county governor Jacob Grundel made a statement saying that a settler was not entitled to use more land that he had cleared and that he could only fish or hunt on permission of the taxland holder (Göthe, 1929, p. 327). In 1749, a new royal regulation granted settlers fishing and hunting rights only within a radius of 5 km from the farmstead (Gustav III,

1872 [1749]). These rights were not exclusive, as clarified in a number of resolutions from the Crown's representative and the district courts (Bylund, 1956, pp. 267ff). Nevertheless, the immigration of Swedish and Finnish settlers inevitably meant a sharing of limited resources among an increasing number of inhabitants.

Sometimes, attempts were made by Sami to protect their land rights by demanding concession (*inrymning*) from the Crown's sheriff, or later from the district court or County Administrative Board. Through concession, a document on land rights was issued to which the holder could refer in case of conflict (Holmbäck, 1922, pp. 41ff). The oldest concession document is from 1689, and there are a few examples from the early 18th century (Holmbäck, 1922, p. 49). Concessions were not issued systematically but granted on demand from landholders who were for some reason interested.

To sum up, Sami governance of land and waters remained reasonably autonomous also after the introduction of district courts in the first half of the 17th century. Nevertheless, as the number of settlers grew, resource competition accelerated and the Sami lost their majority in the courts, which gradually lead to decreased autonomy. Still, however, a few more steps remained before autonomous governance had disappeared.

5.2.3 From Sami governance to state governance

Next to the growing number of settlers and the declining proportion of Sami *tolvmän*, Sami resource governance was enormously affected by the transfer of land-use decisions from the district courts to the representatives of the Crown, or the County Administrative Board (CAB). The reasons for this transfer have been thoroughly discussed by other scholars but are still unclear (Päiviö, 2011; Lundmark, 2006). It appears, however, that the single most decisive action was taken when the county governor Johan Gustaf af Donner in 1792 issued a letter declaring that decisions regarding Sami taxlands should henceforth be treated by the CAB (Prawitz, 1967b, pp. 23ff; Holmbäck, 1922, p. 78). Both the district judge and the *tolvmän* protested, but in vain (Prawitz, 1967b, pp. 25f). Around 1800, district courts had lost most of their governing ability in relation to taxlands, and although Sami *tolvmän* still existed they did not have much to say in land-use matters (Marklund, 2015, p. 85; Lundmark, 2006, p. 95).

At about the same time, the differences between peasants and non-peasant Sami in relation to land rights were accentuated. As mentioned in section 2.6, no absolute ownership of land existed among the common people in Sweden before 1789, neither for peasants nor other land-users. During the 18th century, the peasants gained increasing power in the Swedish parliament, and in 1789, they

were granted the same strong property rights as the nobles (Korpijaakko-Labba, 1994, pp. 234ff). From now on, peasants could decide for themselves how to cultivate their land, and failure to pay taxes could no longer entail the loss of land rights (Lundmark, 2006, pp. 96f; Korpijaakko-Labba, 1994, pp. 235f). As for the Sami, they had been represented in the parliament during certain periods, but not after the 1760's (Sjölin, 1981, pp. 77f). At the moment when the peasants were granted property rights, the Sami were not present and they were not included in the reform, unless they were peasants themselves.

Despite the strengthened position of the peasants, their influence in the Swedish Sami districts remained limited as long as their property rights concerned only actively cultivated land. Beyond these rather small parcels lay vast forests, wetlands and lakes which were used by the peasants for grazing cattle and harvesting natural hay, for cutting wood, for collecting berries and other wild foods, for hunting and for fishing (Campbell, 1982 [1948]; Rudberg, 1957, pp. 160f; Bylund, 1956, p. 291; Stobée, 1919 [1746]). Although these outlands (*utmarker*) were at least as important for subsistence as the cultivated land, the peasants did not own them (Rudberg, 1957, p. 125). The holders of the taxlands still controlled most resources, in particular fish and game.

Since game and fish were essential also for the peasants, some of them purchased a taxland and became a payer of Sami taxes (*lappskatt*) to be able to hunt and fish as freely as any Sami (Göthe, 1929, p. 326). In the area which is today Lycksele Municipality, for example, taxland after taxland was taken over by non-Sami settlers from 1719 to 1815 (Norstedt, 2011, pp. 49ff). Peasants that had not been able to purchase a taxland had to make arrangements with the landholder to fish and hunt further away from the farmstead (Göthe, 1929, pp. 327f).

More and more, Sami taxland holders felt the need to document their rights and demand concession of their lands. In accordance with the letter from the county governor in 1792, concessions were now granted by the County Administrative Board (CAB) which issued detailed regulations on the conditions (Lundmark, 2006, pp. 109ff; Holmbäck, 1922, pp. 49ff). Despite the old connection between taxlands on one hand, and hunting and fishing rights on the other, the CAB stressed that lands were conceded as reindeer pastures and only for as long as the holder had reindeer. Also, in the 1840s, it was said that concessions were granted provisionally and that a holder had to cede his land to settlers if the CAB thought that the land was better used in this way (Holmbäck, 1922, p. 55).

Peasants were thus increasingly being promoted while non-peasant Sami were disadvantaged. A crucial step towards a permanent imbalance was taken in 1873, when a regulation was issued on the delineation (*avvittringen*) of the Sami

districts. The delineation was the process through which all land was divided between the peasants and the Crown. In the Swedish Sami districts, each homestead was assigned on average 4 000 hectares of land per standard homestead unit (*mantal*) (Almquist, 1928, p. 486). To some extent, natural wet meadows far from the main property (*ströängar*) were included (Stenman, 2004; Rudberg, 1957, pp. 126f; Almquist, 1928, p. 492). This is the reason for today's strange situation where a number of wetlands belong to distant private real estates, although no haymaking has been going on there for many decades (*Figure 11*), whereas reindeer herders' settlement sites are generally located on Crown land, regardless of how long they have been in active use. As soon as a piece of land was private property, landowners had the right to hunt and also to fish in lakes and rivers of which they owned the shore (Lundmark, 2008, pp. 154ff). Since no property rights were assigned to taxland holders, no such hunting and fishing rules were applicable.

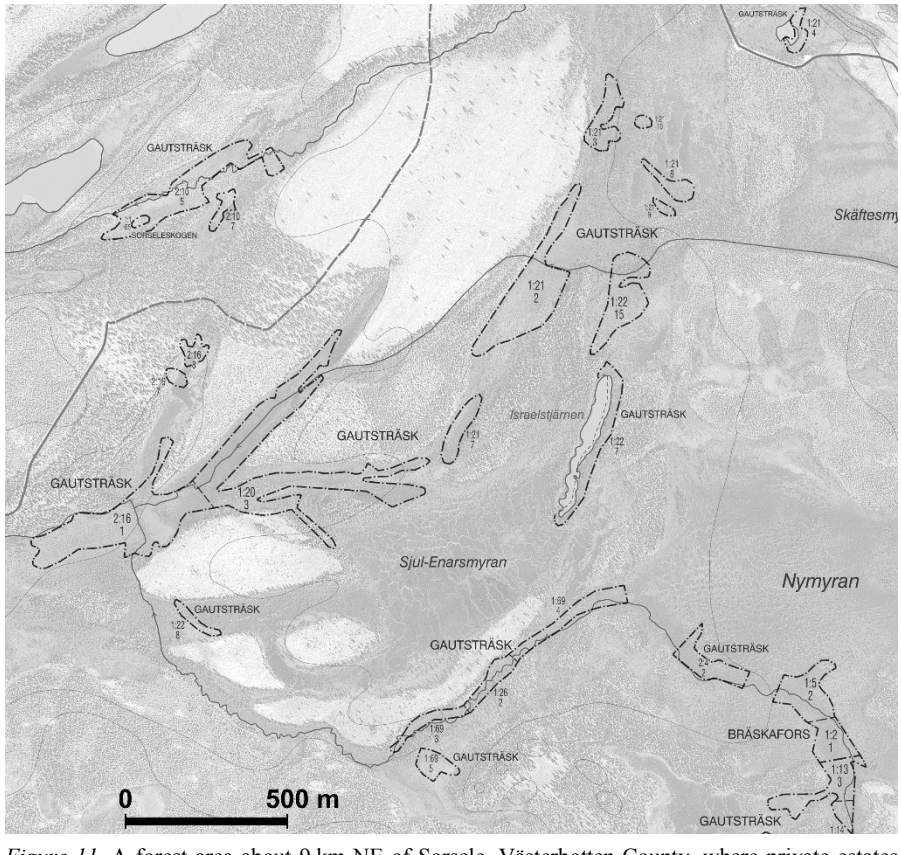

Figure 11. A forest area about 9 km NE of Sorsele, Västerbotten County, where private estates were created from a number of wet meadows during delineation. They have not been used for haymaking for many decades but are nevertheless private property. © Lantmäteriet.

The reasons why the holders of taxlands were not entitled to ownership are complex and cannot be clarified here. I will only use a few words on an important factor related to resource use, namely the concept of *nomadism*. The image of the Sami as being constantly on the move, roaming through the landscape, following the reindeer and living in tents, is as common in popular literature as in academic publications. It seems to have emerged in the early 17th century (Lundmark, 1982, pp. 62ff) and was widely spread by Johannes Schefferus (1956 [1673], pp. 219ff). Pastoral nomadism was a strange way of life for most people of Europe, who had long been sedentary and closely attached to cultivated land lots. The ancient Greeks had developed a theory of three stages of cultural development, where hunters and gatherers were in the first stage, pastoral nomads in the second, and settled farmers in the third (Herzog, 1982). During the 18th and 19th centuries, this old theory was dressed in a scientific garb and turned into common knowledge (Tuori, 2015; Lundmark, 2002, p. 12; Herzog, 1982). *Nomad* became an often repeated appellation of the Sami, for example in the investigations and debates that preceded the first legislative acts on Sami land use (Mörkenstam, 1999; Committee report, 1883).

The nomadic concept was accompanied by the idea that nomads could not own land (Mörkenstam, 1999, p. 72; Korpijaakko-Labba, 1994, pp. 21ff). This idea seems outdated today. Nevertheless, during the Girjas trials of 2016 and 2017, the State's representatives closely followed the tracks of the legislators of the late 19th century. They went even further when they claimed that *lapp* in historical sources signified just nomads, not Sami. As I have explained in section 2.2, this is not true, since *lapp* has signified the Sami as an ethnic group at least since the 16th century. Also, as I showed in section 5.1.3, two thirds of the Sami communities included in the 1695 cadastre (whose members were certainly called *lappar*) were characterised by territoriality, not nomadism. And as I will argue in section 5.3.3, the members of most territorial communities (i.e. the forest Sami) should rightly be classified as semisedentary. However, the use of *nomad* still seems to be an effective way of presenting the Sami as land users without land rights.

So, while peasants were assigned vast forest areas in the late 19th century, non-peasant Sami were not granted ownership to their taxlands or even to their traditional settlement sites. Still, there were some elements of autonomy left, since the Sami could decide on land-use matters as long as no other parties were concerned. In 1886, this situation changed through the coming into force of the first Reindeer Grazing Act (SFS 1886:38). The Act protected the pasture rights of reindeer-herding Sami, including the rights to hunt and fish, but it also strengthened the influence of the County Administrative Board (CAB). All land assigned to the Sami would now be divided into new kinds of Sami communities

(*lappbyar*) by the CAB. Although such communities have existed since the dawn of history, this is the first evidence of a division having been done from outside, and the communities that were introduced were geographically radically different from the former ones (Norstedt, 2011, pp. 34f). Furthermore, land rights would now be exercised collectively, through the new communities, while the old taxlands were to be abolished (Bengtsson, 2004, p. 36).

The autonomy of these new Sami communities was very restricted. For example, the CAB could decide to transfer reindeer herders from a crowded community to another, and only the CAB could lease hunting and fishing rights to others (SFS 1886:38). This first Reindeer Grazing Act was followed by a new one in 1898, which among other things contained provisions on community regulations (*byordningar*) through which land use would be ruled in even greater detail (SFS 1898:66). It is true that the Sami concerned were to be consulted, but it is equally true that important land-use decisions were from now on the responsibility of the CAB.

As a result of the extended interference of Swedish authorities in Sami land-use matters, specific Sami agents (*lappfogdar*) were appointed, and they were soon followed by the creation of a Sami Agency (*Lappväsendet*) (Lantto, 2012). The Agency's agents and supervisors should not only oversee the compliance with the Reindeer Grazing Act but also enhance reindeer management. To this end, they repeatedly interfered with management methods and even tried to decide what types of housing herders should choose and where their settlements should be located (Lantto, 2012, pp. 264f). Although the Sami Agency did not always succeed in its ambitions, autonomous Sami governance had effectively come to an end.

The conclusion of this overview on the governance of Sami lands is that decision-making was transferred from Sami households to Swedish governmental authorities through a lengthy process with several steps. The process started in the late 17th century with the arrival of settlers who competed with the Sami over resources and gradually diminished Sami influence in the district courts. It continued through the transfer of land-use decisions from the district courts to the County Administrative Board. The process was then accelerated by the strengthening of peasants' ownership rights and the delineation of private estates in the late 20th century. During the whole period, autonomous land governance was to some extent possible, concerning most land-use decisions in the beginning but only a small proportion in the end. The process was completed by the first Reindeer Grazing Act in 1886 and the subsequent creation of a Sami Agency.

Apart from the final steps, the timing of the process was quite different in different Sami districts. The transfer of land governance from Sami landholders

thus cannot be pinpointed to a certain date, but was a gradual process with many variations. The understanding of this process sets the frame of my research on how resources were formerly divided, used and managed in the Swedish boreal landscape.

5.3 Forest Sami resource use and management

After this panorama of decision-making on Sami lands from the 17th to the late 19th century, I will turn to the content of these decisions. I will explore some aspects of resource division, resource use and resource management in the boreal landscape during times of reasonably autonomous governance. I will mainly speak of the 1600s, but to some extent also of the 1700s and 1800s. The section is primarily based on my own research as published in papers I–III, but I have used the work of other scholars to create a more complete picture.

5.3.1 Resource division

Resource governance is often based on some kind of territorial division (Andrews, 1994; Donald & Mitchell, 1994; Ingold, 1980; Dyson-Hudson & Smith, 1978, p. 244f). As I have shown in section 5.1.1, most of the Swedish boreal forest was in 1695 divided into territories which I call taxlands. The only documents that map and describe Sami taxlands in detail before the arrival of settlers are Gedda's map and Holm's description (Gedda, 1671; Holm, 1671). I made use of these sources for a detailed investigation of how resources were divided among taxlands in two communities, Gran and Umbyn, and how resource division was related to wealth (paper I).

The forest Sami of the 17th century had a diversified subsistence pattern (sensu Krupnik, 1993, p. 7) including fishing, hunting, and small-scale reindeer husbandry (Schefferus, 1956 [1673], pp. 242ff). Plant matters were also vital for survival, but since the amounts harvested were small compared to those available (Rautio, 2014, p. 70), I assumed that plant resources had no impact on neither territorial division nor wealth. Instead, the two natural resources that I identified in paper I as being the most important to sustain the subsistence pattern of the forest Sami were 1) reindeer winter pastures and 2) fishing waters.

Reindeer winter pastures were crucial because the most important game species was wild reindeer (*Rangifer tarandus* L.), whose meat and fur were damaged by parasitic warble flies in summer, so hunting was mainly performed in winter (Norstedt, 2011, p. 84; Lundius, 1983 [ca 1674], p. 34; Rheen, 1983 [1671], p. 23; Hjorth, 1973 [1606], s. 196). In other words, wild reindeer represented a resource first and foremost in taxlands where they were present in

winter. Since reindeer are mainly dependent on ground lichens in that season (Skuncke, 1958), I designed a method to assess the amounts of lichen-rich forests in each taxland (section 4.2). The results showed that reindeer winter pastures were very unevenly distributed (*Figure 12*) in a way that correlated well with contemporary verbal assessments of wild reindeer frequencies (Holm, 1671).

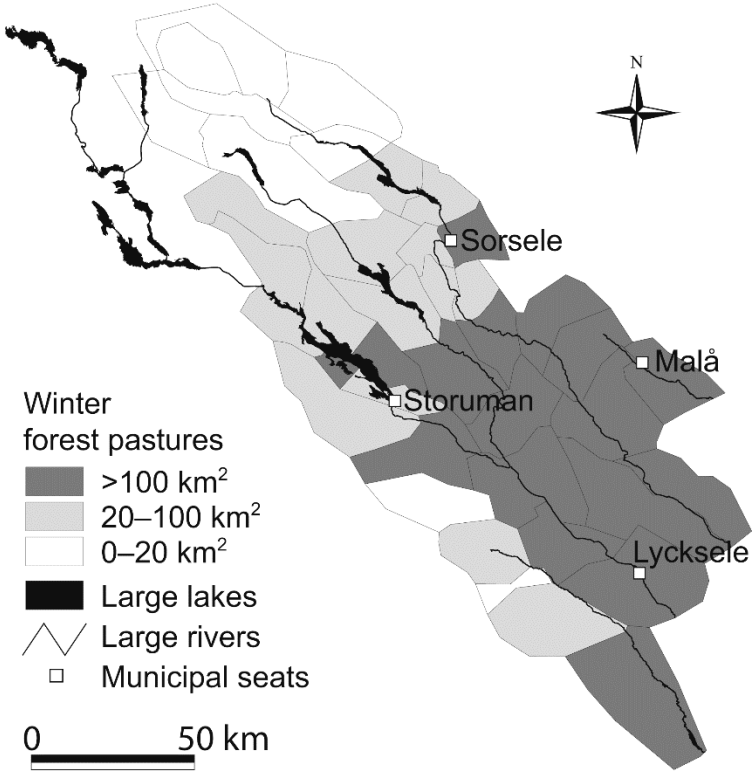

Figure 12. Areas of lichen pastures per taxland on Gedda's map of Ume Sami district from 1671, calculated from Malmström's forest map from the 1940s. It has been estimated that a minimum of 0.1 km^2 of lichen pastures is needed to feed a reindeer through the winter (Tottie, 1966, p. 107). The total number of reindeer that could be sustained in all 37 taxlands should then be around 44 000. The figure was published in paper I, and is reprinted with courtesy of the Arctic Institute of North America.

Access to reindeer winter pastures is also generally limiting for reindeer husbandry (Kitti *et al.*, 2006; Steen, 1966). For the forest Sami of my study, this was generally not the case, since most of their taxlands were richly provided with this resource. Therefore, many of the forest Sami could lease winter pastures to mountain Sami. Although the mountain Sami were more or less

dependent on reindeer herding, my results showed that almost none of their taxlands contained sufficient amounts of winter pastures. In this respect, my study area was very different from the one investigated by Josefsson et al. (2010a), where each taxland contained all resources that a reindeer herding household needed. In my study area, mountain Sami stayed on forest Sami taxlands in winter both to graze their herds and to hunt wild reindeer, and they paid a remuneration for this (Lundius, 1983 [ca 1674], p. 11; Stobée, 1919 [1746], p. 72). The same system was common in Jokkmokk (Hultblad, 1968, p. 84). In this way, reindeer winter pastures that the forest Sami could not fully exploit through hunting or herding nevertheless yielded a contribution to the households' economy.

The other crucial resource that I identified in forest Sami taxlands was fishing waters. In almost all lakes and rivers, there was northern pike (*Esox lucius* L.) and European perch (*Perca fluviatilis* L.), and frequently also common roach (*Rutilus rutilus* L.), European whitefish (*Coregonus lavaretus* L.), grayling (*Thymallus thymallus* L.), and brown trout (*Salmo trutta* L.) (Ekman, 1983 [1910], pp. 304ff; Holm, 1671). Fish were mainly caught with nets and seines, and in autumn, graylings and pikes were lured with torches and speared (Holm, 1671). Since there was no obvious way to measure the fish resource, I estimated the water area and river length in each taxland from modern spatial data, and retrieved information on number of fishing waters and fish species from Gedda's map and Holm's description. Regardless of the variable used, I found that most forest Sami taxlands were well provided with fishing resources, although there were large variations.

The general picture emerging from the research presented in paper I was thus one of unequal distribution of crucial resources among the forest Sami. Was this inequality in reality a complementarity, so that landholders with scarce fishing resources controlled more lichen pastures, and the other way around? As I had not addressed this issue in my paper, I made an additional analysis for the thesis, plotting the two resources against each other (*Figure 13*). Contrary to my expectations, the result showed a significant positive relationship between fishing resources and lichen pastures in forest Sami taxlands. In other words, taxlands with ample fish resources also had ample lichen resources, crucial for both reindeer hunting and reindeer herding, while lands with scarce fish resources had scarce lichen resources.

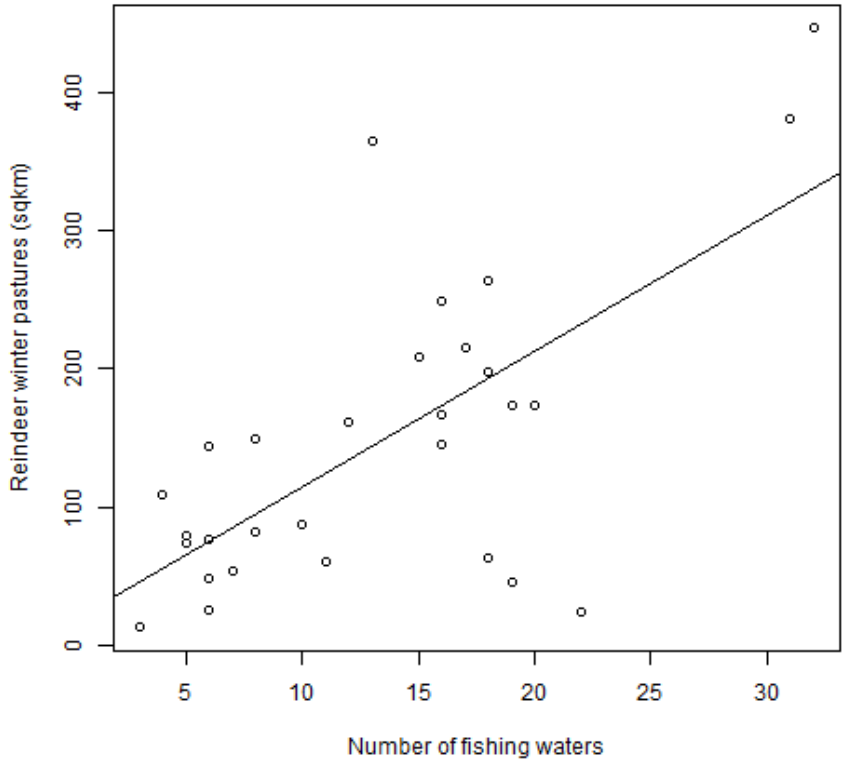

Figure 13. The relationship between number of fishing waters and area of lichen pastures for the 29 forest Sami taxlands in Ume Sami district in 1671 ($p<0.001$).

I could thus show that there was a real inequality among landholders in terms of resource control. In my paper, I had hypothesised that the unequal control of resources led to inequality of wealth, and that this would show in taxation. The tax system of this period was organised in the way that each Sami taxpayer was registered for a certain tax unit, *mantal*, literally meaning "the number of one man". Most taxpayers had ¼ or ½ *mantal*, and a person with ¼ *mantal* paid half as much as a person with ½ *mantal* (Sköld, 1992, p. 10ff; Lundmark, 1982, pp. 139ff). It has been debated whether taxes were related to the quality of the household territory (Korpijaakko-Labba, 1994, pp. 357ff) or if they were purely individual (Lundmark, 2006, pp. 40ff). It is probably impossible to settle the question, since the Crown's representatives could not even in 1695 figure out how the system worked (Douglas & Bure, 1695). Therefore, I assumed in paper I that taxes reflected the wealth of each taxpayer as perceived by the tax

collector, and that this wealth was in some way related to the quality or resource content of the land.

Nevertheless, taxes showed very low statistical correlation to reindeer winter pastures. This was probably due to the fact that most of the forest Sami taxlands were so richly provided with this resource that differences were of little importance. The correlation to taxland size was higher, but still very low. The variables that were most highly correlated to tax levels were all related to water and fish: number of fish species, number of named water bodies, and length of river stretches. I thus concluded that if taxation was in any way related to wealth, control of good fishing facilities seemed to have been an important determinant.

To sum up, the study I published in paper I showed that resources were unevenly distributed among the forest Sami taxlands of my study area. The resource that correlated most with taxation and probably also with wealth was fish. The results of paper I thus point in the same direction as the analysis presented in section 5.1.3, which resulted in the conclusion that taxlands were originally created to divide fishing resources. In the future, it would be interesting to investigate how much fish of different species a household had to catch to secure its subsistence, and what combinations of lakes and river stretches were needed to provide this amount of fish, and then compare the results to the territorial division on Gedda's map.

5.3.2 Resource defence and sharing

To what extent were resources defended, once they had been divided between taxlands, and to what extent could they be shared? Resource defence means to establish boundaries and to claim the authority of the resources within. As for taxland boundaries, their existence is mentioned in contemporary sources (Lundius, 1983 [ca 1674], p. 30; Graan, 1983 [1672], p. 33), and they are also marked on the map by Jonas Persson Gedda (1671). Some scholars have claimed that Gedda represented taxland boundaries carefully and exactly (Korpijaakko-Labba, 1994, p. 381), and that they were even marked in the field with clearing-lines and cairns (Stenman, 2001, pp. 108f). However, in a close study of Gedda's map, I could show that taxland boundaries were approximate, sketchy, and not based on measurements (Norstedt, 2009). It is true that detailed descriptions of taxland boundaries can be found in court records (Brännlund, 2014; Josefsson *et al.*, 2010a) (see also paper III), and that such boundaries were sometimes marked in nature (Korhonen, 2002b, p. 87, 2002a; Hultblad, 1968). However, these boundary documents and markers are mostly from the 19th century, and were made in connection with land concessions issued by Swedish authorities. So far,

I have not seen any evidence that Sami autonomous governance practices included the delimitation of taxlands with continuous and well-marked borders.

Nevertheless, Gedda's map does indeed contain information on landmarks that separated one taxland from another, and these marks could be very stable over time. For example, when the boundary between two taxlands was disputed in the district court in 1741 (Egerbladh, 1967a, p. 43), the landmark in question was described in the same manner as on Gedda's map 70 years earlier (Norstedt, 2011, p. 24). In the absence of continuous and well-defined borders, such landmarks delimited taxlands on important spots, and landholders usually had a clear image of to whom every specific lake or any other important resource belonged.

When it comes to resource defence through claims of authority, landholders were often ready to state such claims in court. There are numerous well-documented cases, especially concerning fishing waters but also over game and other resources (Marklund, 2015; Korpijaakko-Labba, 1994; Sköld, 1992; Hultblad, 1968).

An alternative to defence and conflict was sharing. One common way, which I described in paper I and in section 5.3.1, was that mountain Sami could be allowed to stay on forest Sami taxlands in winter to hunt wild reindeer and graze their herd. The remuneration (mostly meat and cheese) was important for the forest Sami, who were said to live in winter mainly from their earnings (Stobée, 1919 [1746], p. 72). Thanks to this relationship, the forest Sami could also sell berries and birds' down to the mountain Sami, who would eat the berries and bring the down to Norway to sell (Lundius, 1983 [ca 1674], pp. 17ff). In this way, both groups got access to resources from areas which they did not control themselves.

Among the mountain Sami, resource defence became more important during the late 18th century, and they then tried to get hold of several taxlands to secure resources for different seasons (Hultblad, 1968, pp. 90f). I suggest that one important reason for this development was the increasing importance of reindeer husbandry among the forest Sami, as documented by Marklund (2015, p. 65). This development did not only mean increasing competition over reindeer pastures in the boreal forest but also a lower interest among the forest Sami to purchase reindeer cheese and meat, which they could now produce themselves. However, the expansion of reindeer husbandry also led to the creation of a new kind of sharing among mountain Sami. By the end of the 19th century, it was common for the holder of a suitable spring and autumn land in the subalpine birch region to spend the summer on the alpine taxland of another person, who would then be allowed to spend the spring and autumn on the land of the first one (Norstedt, 2011, p. 54).

Finally, in some cases, resources were defended through the installation of physical barriers. In paper III, I investigated the rationales behind the barrier fences that can be found in the boreal forest, in particular one extensive system built around 1835 east of Lake Tjieggelvas in Pite Sami district. In this area, the human population had more than doubled from 1750 to 1800 (Josefsson *et al.*, 2010a), the number of reindeer had increased rapidly (Berg *et al.*, 2011a), and numerous cases of land conflict were documented in court records. In my study, I found one court case from 1815 where the holders of the forested area where the fence would later be built sued a group of mountain Sami. The landholders demanded that the mountain Sami be forbidden to pass, since their large reindeer herds would destroy the lichen pastures, and instead follow the mountain range. The mountain Sami alleged that they risked freezing to death on the mountain and therefore had to go down into the forest. The court was convinced by this argument and ruled that the mountain Sami were allowed to pass through the forest. This was thus a kind of forced sharing, imposed upon the forest Sami by a district court. In paper III, I argued that the fence was built as a response to this ruling, and that it served to prevent the reindeer of the mountain Sami to disperse all over the area and deplete the lichen pastures. Although much of the autonomous Sami governance was by then lost, there was still sufficiently left to allow the landholders to decide to build a fence to protect their interests.

The examples that I have presented in this section show that resources were not only divided among taxlands but also defended against intrusion from other landholders. However, resources could also be shared with non-landholders, although this practice was always conditioned by the landholder. If the household did not have any spare resources, if they were not sufficiently interested in what the others had to offer, or if they simply did not feel like sharing, the others would not be allowed to stay. The household that was in control of the taxland also exercised the governance of its resources and could use them in the way that best suited the needs of the household members.

5.3.3 Resource use

There are quite a few ethnographic works containing information on the resource use of the forest Sami in the area which today is a part of Sweden (Brännström *et al.*, 2017; Sommarström & Westman Kuhmunen, 1997; Düben, 1977 [1873], pp. 39ff; Læstadius, 1977 [1831], pp. 220ff; Manker, 1968; Ruong, 1945; Hultblad, 1944; Ruong, 1944; Manker, 1939; Ullenius, 1937; Manker, 1934; Wiklund, 1921, 1901). These works mainly treat the 19th century and sometimes the early 20th century, when the core of forest Sami life was reindeer milking. Summers were spent on a number of settlement sites where there were

sometimes wooden huts, sometimes simple shelters. Herding was intense, does were milked daily, and cheese was produced and stored. To keep the animals from overgrazing and to prevent disease, people and reindeer moved to a new site almost every week. Although fishing and hunting contributed to subsistence, especially in spring and autumn, the movements of the people were more than anything determined by the needs of the reindeer.

Forest Sami resource use can also to some extent be described from information on Gedda's map of Ume Sami district (Gedda, 1671), since most of the taxlands on the map were held by forest Sami. However, when I studied the map closely I realised that important details were not consistent with the resource use and subsistence pattern of the forest Sami as described in literature. According to the cited publications, the intense summer work of herding, milking, and cheese production left very little time for fishing, and as a consequence, summer camps were rarely located close to lakes and rivers. By contrast, all 38 settlement symbols on Gedda's map were located close to waterbodies. Since settlement patterns are often thought to be related to resource use (Bergman, 1995; Forsberg, 1985; Willey, 1953), I hypothesised that the pattern on the map was a clue to a deeper understanding of the forest Sami's subsistence patterns.

Already in paper I, I had noticed that there were certain parallels in terms of resource use between the Sami of the Ume district in 1671 and the forest Sami further east, more specifically the Skolts of Pechenga and the Sami of Inari. I therefore designed paper II to investigate whether the settlement pattern on the map was related to a subsistence pattern typical of the eastern Sami. Information on these groups can be found in a number of ethnographic and geographic works concerning both the 19th and the early 20th century (Paulaharju, 2009 [1921]; Jefremoff, 2001; Itkonen, 1948b; Nickul, 1948; Tanner, 1929; Fellman, 1915, 1912; Wahlenberg, 1804). Typically, both the Skolts and the Inari Sami spent summers fishing, moving from lake to lake according to the spawning times of important fish species (*Figure 14*). By each lake there were permanent constructions, usually small log cabins or huts on sites that were visited annually, and simple shelters by less regularly visited lakes. Most people owned reindeer, but the animals were generally not tended during summer. Unlike the Swedish forest Sami of the 19th century, the summer movements of the Inari and the Skolt Sami were thus determined not by the needs of the reindeer but by the spawning times of fish, and summer settlements were located close to lakes and rivers, just like the ones on Gedda's map of Ume Sami district in 1671.

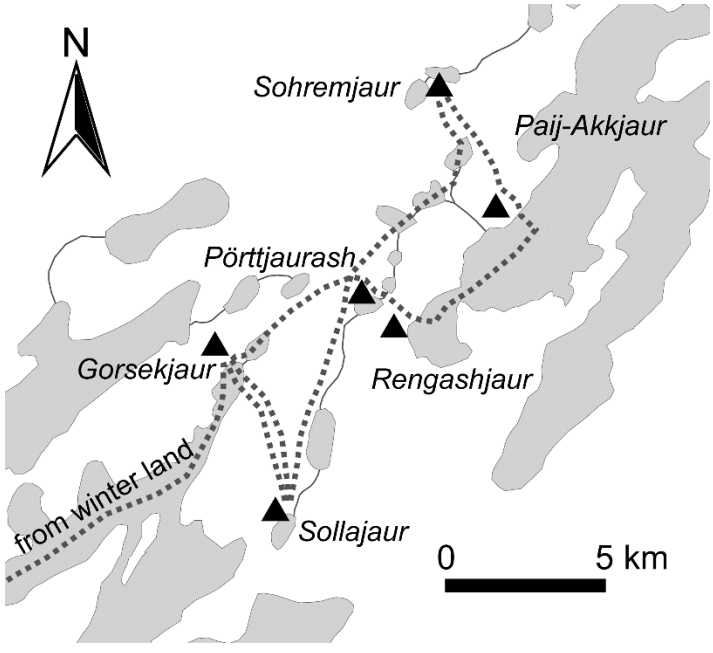

Figure 14. Settlement pattern and yearly movements of a household following a fish-centered subsistence pattern, in this case belonging to the Skolt Sami of the Pechenga in 1938 (Nickul, 1948, pp. 31f, and map in appendix). The figure was published in paper II, and is reprinted with courtesy of the University of Wisconsin Press.

In paper II, I classified the subsistence pattern of the Swedish forest Sami in the 19th century as reindeer-centered, and the one of the Inari and Skolt Sami as fish-centered. Both of these patterns include the same three main subsistence modes – fishing, hunting, and reindeer herding – but they differ in proportional contribution (cf. Marklund, 2015, p. 44; Wheelersburg, 1991). According to Gedda's map, the settlement pattern of Ume Sami district in 1671 was not consistent with the reindeer-centered pattern, but very much so with the fish-centered one. The results of paper II thus confirmed my findings in paper I, where fishing resources turned out to be the most important for the wealth of the forest Sami in Ume Sami district in 1671.

It should be noted that both the fish-centered and the reindeer-centered subsistence patterns were based on regular migrations between well-known settlement sites with permanent installations (*Figure 15*). This is something quite different from the long-lasting image of the Sami as nomads roaming freely through the landscape and living in tents. However, already when this concept was created in the 17th century, it was mainly applied to the mountain Sami, not the forest Sami (Schefferus, 1956 [1673], pp. 220ff). Later, K.B. Wiklund (1922) classified the forest Sami as *seminomadic*, and this label has since been

frequently used (Hedman, 2003, p. 18; Aronsson, 1991, p. 7; Khazanov, 1984, p. 42; Arell, 1977, p. 36; Hultblad, 1968, p. 123; Manker, 1968, p. 17; Tegengren, 1952, p. 203; Ruong, 1937, p. 17; Tanner, 1929, pp. 28ff). However, I argued in paper II that the forest Sami should not be called seminomadic, since this is commonly defined as a community "whose members wander in bands for at least half of the year but occupy a fixed settlement at some season" (Murdock, 1967). Instead, they are more rightly called *semisedentary*, i.e. a community "whose members shift from one to another fixed settlement at different seasons" (Murdock, 1967).

Figure 15. A forest Sami settlement close to the outlet of Lake Jeäddnjájávrrie in River Piteälven, Pite Sami district. The picture is a detail from a photo taken in 1871. The place belonged to "Stam Ol Larsson", Olof Larsson (1808–1882), and his wife Maria Matsdotter. When he died, Stam Ol Larsson was the owner of 33 reindeer and 13 calves, and also of seines, nets, fish spears, and three boats. Although fish apparently played an important part, the family seems to have had a mainly reindeer-centered subsistence pattern and moved with their reindeer between milking pens on their taxland *Pite elf* during the summer (Brännström *et al.*, 2017; Aro, 1997, pp. 40f). One of the milking pens was Nilasvallen about 7 km SE, a place where studies on the impact of Sami land use have been performed (Karlsson, 2006; Östlund *et al.*, 2003). The settlement on the photo was perhaps mainly used for fishing outside the milking season, i.e. spring and autumn. This would explain why there are no people on the photo, which was probably taken in August (Dahlman, 1991, p. 11). Photo: Lotten von Düben, © Nordiska museet.

I thus concluded in paper II that the Sami of Ume Sami district in 1671 were semisedentary and mainly focused on fish. These conclusions are very much in line with contemporary descriptions, where forest Sami are said to live more or less exclusively on fish (Lundius, 1983 [ca 1674], pp. 10f; Graan, 1983 [1672], p. 35; Rheen, 1983 [1671], p. 20; Högström, 1980 [1747], p. 85; Stobée, 1919 [1746]). Some sources even mention that the forest Sami moved from lake to lake according to spawning times (Graan, 1983 [1672], p. 35; Rheen, 1983 [1671], p. 14f), just like the eastern Sami. Since the available historical sources all point in the same direction, I feel confident that the settlement pattern that emerges on Gedda's map from 1671 is indeed the reflection of a fish-centered subsistence pattern.

5.3.4 Resource management

The extent to which the Sami actively managed natural resources and not only used them is poorly known. In my research, I have studied one particular case of resource management, namely the use of barrier fences to manage reindeer pastures (paper III). In the alpine mountains, there are stone walls that may have been installed in the 1700s and 1800s to control the movements of reindeer herds (Andersen, 2014). In the boreal forest, however, similar installations built before 1900 have been next to unknown. In my study, I revealed that barrier fences had been widely used in both Lule and Pite Sami districts from the mid-18th century onward. They were ingeniously built of local materials, mostly whole pines combined with boulders, and were sometimes several kilometres long (*Figure 16*). This kind of fence, which I have called *whole-tree fence* (*helträdsstängsel*), had previously barely been described. They were commonly built from shore to shore of lakes that were thus incorporated into the fence. In this way, they were designed to improve the landscape's own structuring qualities, just as many similar features used in traditional human-animal relationships in Northern Eurasia (Anderson *et al.*, 2017).

I found that whole-tree barrier fences were installed for different purposes. As I explained in section 5.3.2, they could be built to protect lichen pastures from overgrazing by foreign reindeer. They could also serve to keep own reindeer confined to a preferred grazing area (Læstadius, 1977 [1831], p. 442). Furthermore, fences could be built to keep reindeer out of areas with insufficient resources (Brännström *et al.*, 2017, p. 55; Tomasson, 1918, pp. 88f). These were important aims for Sami reindeer herders, but when Swedish authorities started to interfere actively with Sami resource management in the late 19th century, the autonomous installation of barrier fences was perceived as a problem. Therefore, the Reindeer Grazing Act that entered into force in 1928 (SFS 1928:309)

prohibited the building of such fences without permission from the State's sheriff. Reindeer fences did not go out of use, but they were no longer part of an autonomous resource governance.

The barrier fences that were installed in the 1800s could potentially have influenced the vegetation and structure of the boreal forest. Along the border fence between Norway and Finland, the vegetation is currently strongly affected by different reindeer management regimes (Kumpula, 2006). Around one of the fences I studied, some differences in the frequency of large pines and birches, as well as the volume of both living and dead trees, have been noted between the two sides of the fence (Josefsson *et al.*, 2010b). It is possible that similar effects could exist along other old barrier fences, and that Sami resource management affected the boreal forest.

Figure 16. Fence remains between Lakes Ieggelatj and Tjäktjajávrre in Pite Sami district. The fence was found thanks to a protocol from 1814 included in a court record.

Another kind of management, which has received much attention in North America, is the use of fire by native Americans to produce game habitats (Cronon, 1983, pp. 49ff). This has inspired research on possible fire use also in the boreal forest of Sweden. So far, the research on the matter is limited to an area north of Jokkmokk where there are a couple of stands of Norway spruce (*Picea abies* L.) with abundant reindeer lichens (*Cladonia* Hill ex P. Browne). This is a rare combination, since lichen-rich forests are usually dominated by Scots pine (*Pinus sylvestris* L.). Fire seems to have played an important role in the genesis of these stands, since pollen samples from adjacent mires show elevated levels of charcoal particles during certain periods. Since there are also archaeological remains of human presence in the area, the authors have concluded that fire was actively used to reduce the cover of dwarf shrubs and mosses, and to promote the abundance of reindeer lichens. In the earliest phase, the aim would have been to attract wild reindeer for hunting, and later to provide pastures for domesticated reindeer (DeLuca *et al.*, 2013; Hörnberg *et al.*, 1999).

However, the results of these fire studies are not unequivocal. The overlap in time between charcoal particles and archaeological remains is only partial, so the causal link is not obvious. Also, the results show that fire impact ceased a couple of centuries ago and has been almost absent since. If fire was used to produce reindeer pastures, it seems odd that it would have been abandoned at the very moment when the number of reindeer was becoming important, i.e. the mid-18th century (Hultblad, 1968, pp. 141ff). Furthermore, there is to my knowledge no documentation in historical sources on the use of fire to promote lichen pastures. On the contrary, it is reported that reindeer herders perceived fire as a destructive agent, and that settlers sometimes set fire to the forest to keep reindeer herding Sami away (Granström & Niklasson, 2008; Campbell, 1982 [1948], pp. 234ff; Pettersson, 1982 [1941], p. 235; Læstadius, 1977 [1833], pp. 436ff). Further research is needed before it can be claimed that the Sami really used fire as a tool to manage lichen pastures in the boreal forest.

Whether wildlife resources were managed in other ways is not known. As to fish, it has been shown that DNA of whitefish (*Coregonus lavaretus* L.) suddenly appeared in the sediments of Lake Hotagen in Jämtland about 2 200 years ago (Olajos *et al.*, 2017). Since the lake is located above the highest post-glacial coastline and is cut off from natural dispersal by a waterfall, it is plausible that whitefish were transported there by humans. It is equally plausible that the Sami made similar introductions of valued fish species to other lakes.

When it comes to plant resources, known active management before the introduction of domesticated crops mainly concern garden angelica (*Angelica archangelica* L.) and common sorrel (*Rumex acetosa* L.). Both of these species were mixed with warm reindeer milk to produce a solid curd that could be stored

for later consumption (Fjellström, 1986, pp. 282f). Especially the angelica was, alongside Scots pine, a Sami cultural key-stone species and qualitatively vital for survival (Rautio, 2014, p. 55). Through interviews, it has been documented that traditional users knew and still know how to prolong the lifespan of this basically biennial plant through careful harvest and prevention of flowering (Rautio *et al.*, 2016b). Furthermore, although long-distance spread of angelica seeds mainly occurs through running water, the species can sometimes be found close to settlements in other locations, suggesting human intervention (Rautio *et al.*, 2016b).

As to the sorrel, it is easily dispersed and commonly occurs on disturbed ground. It often grows in reindeer corrals (Rheen, 1983 [1671], p. 22) and its pollen is used as an indicator of former reindeer husbandry (Karlsson, 2006; Aronsson, 1991). In fact, sorrel was actively sown in the corrals to be readily available (Brännström *et al.*, 2017, p. 159; Læstadius, 1977 [1831], p. 380; Paulaharju, 1977, pp. 80f; Hultblad, 1944, p. 108). Sorrel was also managed in the sense that the reindeer were kept away from mature plants so that the roots would not be destroyed by trampling (Drake, 1979 [1918], p. 39).

The different ways of active resource management that I have described in this section may have influenced the boreal landscape through a differentiated grazing pressure as well as the dispersal and promotion of certain species. Without doubt, there are other aspects of autonomous resource management of which we are not aware. For example, we know very little of how the boreal environment was affected in the past by selective hunting, the use of different kinds of weapons, and other kinds of wildlife management (cf. Anderson, 2004). Our knowledge is equally scarce on landscape agency, i.e. how the landscape has provided favourable opportunities for resource use, and how people may have interacted with the landscape to make good places even better (Anderson *et al.*, 2014). The fact that the barrier fences I described in paper III were previously almost unknown is a clear indication that major aspects of Sami autonomous resource management are still to be discovered.

5.3.5 Changing views on forest Sami resource use

A recurrent theme in my research is the preeminence of fish as the main subsistence mode of the forest Sami during the 17th century. This might seem to be a trivial conclusion, since it only confirms what is said in contemporary sources. However, as long as it has not fully permeated into research, it is an important conclusion. The scholars presenting forest Sami as primarily reindeer herders, or assuming that fishing Sami were former reindeer herders who had lost their herds, are too numerous to cite. As one single example, I will mention

Ernst Manker who in his extensive and indispensable study on the forest Sami presents a list of steps of economic development. There, he considers hunting, fishing, reindeer husbandry, and farming in different proportions, and although fishing is included in five of the six steps, it is never in the first position (Manker, 1968, p. 240). This is all the more remarkable since Manker's work contains citations from all but one of the sources where the forest Sami are said to live more or less exclusively on fish. I believe that Pálsson (1988) was right when he observed that there is a tendency among anthropologists to "see fishing activities either as a last resort, as a compensation for the deficiency of the terrestrial environment, or as mere fun".

Another reason why my conclusion is important is that it challenges the archaeological theory of a dramatically changed settlement pattern all over northern Fennoscandia during the first millennium AD. This theory is based on the observation that archaeological sites from earlier times are generally located near large lakes and rivers, whereas later sites are mainly located in the forest (Halinen *et al.*, 2013; Hedman, 2003, p. 18; Bergman, 1995, p. 203). The shift is thought to mirror a transition from fish to reindeer as basic resource, and at the same time a transition from a hunting society to a reindeer-herding one (Bergman *et al.*, 2013; Hedman, 2003; Storli, 1994; Aronsson, 1991). However, some aspects of the theory can be questioned. Many of the hearths that are thought to be connected to reindeer husbandry are in fact located quite close to rivers and larger lakes, where they could equally well have been connected to fishing. Even if the hearths were made by reindeer herders, these herders could have been visiting mountain Sami, since we know that they frequently spent winters on forest Sami lands (section 5.3.1). It is therefore not obvious that the observed settlement pattern reflects a shift from fish to reindeer as the basic resource among the forest Sami, already in the first millennium AD.

By contrast, my findings are coherent with the conclusions of the historian Bertil Marklund (2015, p. 65). In his thesis, he describes the development of the forest Sami community of Arvidsjaur in the following way: During 1650–1720, fishing and hunting were dominating, and the number of reindeer was low. During 1720–1750, single forest Sami decided to spend more time on reindeer husbandry. After 1750, more and more forest Sami followed their example. The number of reindeer grew, and migrations to winter pastures further east, outside the taxland, became more common. According to Marklund, the shift from a fish-centered to a reindeer-centered subsistence pattern thus occurred during the 18th century among the forest Sami of the Arvidsjaur community.

My findings are equally consistent with the results presented by the geographer Filip Hultblad (1968, pp. 141ff), who found very few notions on forest reindeer husbandry in court records from Jokkmokk before the mid-18th

century, whereas fishing was repeatedly mentioned, and in a few cases even wild reindeer hunting. His conclusion was that reindeer husbandry was too insignificant to be a matter of dispute, whereas fishing was the most important mode of subsistence. Only from the mid-18th century did Hultblad find a growing body of evidence for forest reindeer husbandry in Jokkmokk. In the western part, forest Sami began to migrate to alpine summer pastures with the mountain Sami. In the eastern part, the forest Sami stayed all year round in the boreal forest, but nevertheless developed herds that equalled the ones of the mountain Sami in size. Although the situation seems to have been more complex in Jokkmokk than in Arvidsjaur, Hultblad's research indicates that the shift from a fish-centered to a reindeer-centered subsistence pattern occurred at more or less the same time, i.e. during the 18th century.

In historical sources, only the forest Sami of northernmost Sweden appear to be different. Already in 1692, the Sami of both Siggevaara and Suonttavaara in the Torne district were described as living mainly of reindeer husbandry (Kammarkollegiet, 1910 [1692], p. 245), although the number of reindeer in Siggevaara was lower than in the neighbouring mountain Sami community, Tingevaara (Hackzell, 1910 [1738]). Also, the Sami of Siggevaara and Suonttavaara seem to have undertaken summer migrations to the Norwegian coast already around 1600 (Tanner, 1929, pp. 43f).

When it comes to the rest of the forest Sami communities west of the Gulf of Bothnia, the results that I present in papers I and II, together with 17th century sources and the research of Bertil Marklund and Filip Hultblad, lead to the conclusion that they went from a fish-centered to a reindeer-centered subsistence pattern during the 18th century. The descriptions of the forest Sami that we find in ethnographic works from the late 19th and the early 20th century are thus related to a way of life that had not been common for a very long time. As I briefly summarised in section 2.4, innumerable aspects affect the perceived value of resources (Odner, 1992, pp. 21ff). Since these aspects have changed over time, so has the value of each resource and by consequence resource use.

Of course, the image that I present of a transition from a fish-centered to a reindeer-centered subsistence pattern during the 18th century is much simplified. Individual forest-Sami households pursued a reindeer-centered way of life much earlier. One example is Ture Turesson, who is mentioned on Gedda's map of Ume Sami district as the holder of the Staggowari taxland, located on the north side of the river Vindelälven from the Lappland border to Vormsele. According to a record from a court case where he was himself the plaintiff, Ture Turesson was the owner of about 100 reindeer (Egerbladh, 1963b, p. 17). Also, he payed more than twice the average tax rate (Wrede *et al.*, 1698). In his time, Ture

Turesson was remarkably rich, but a hundred years later, a herd of 100 head was by no means exceptional.

It should be noted, though, that the two subsistence patterns that I describe in paper II were not the only possible ones among the forest Sami. In some communities in Kemi Sami district in the early 18th century, neither reindeer husbandry nor fishing was said to be important, whereas the hunting of beaver and wild reindeer was more rewarding (Hackzell, 1910 [1738]). The subsistence pattern of these communities could be classified as game-centered. This is a pattern that I have not studied, but I imagine that it would develop differently depending on whether hunting was undertaken individually or communally. Also, the gathering of plant matter is a subsistence mode that should always be considered, since preferences for certain harvesting sites can influence movement and settlement patterns (Rautio *et al.*, 2014). Another important factor is trade (Marklund, 2008; Wheelersburg, 1991; Kvist, 1986). Furthermore, small-scale agriculture became common among the forest Sami in the early 20th century and was combined with both reindeer husbandry, fishing and hunting (Manker, 1968) (*Figure 17*). There are even palynological data indicating small-scale shifting cultivation on forest Sami taxlands already in AD 800 (Hörnberg *et al.*, 2015).

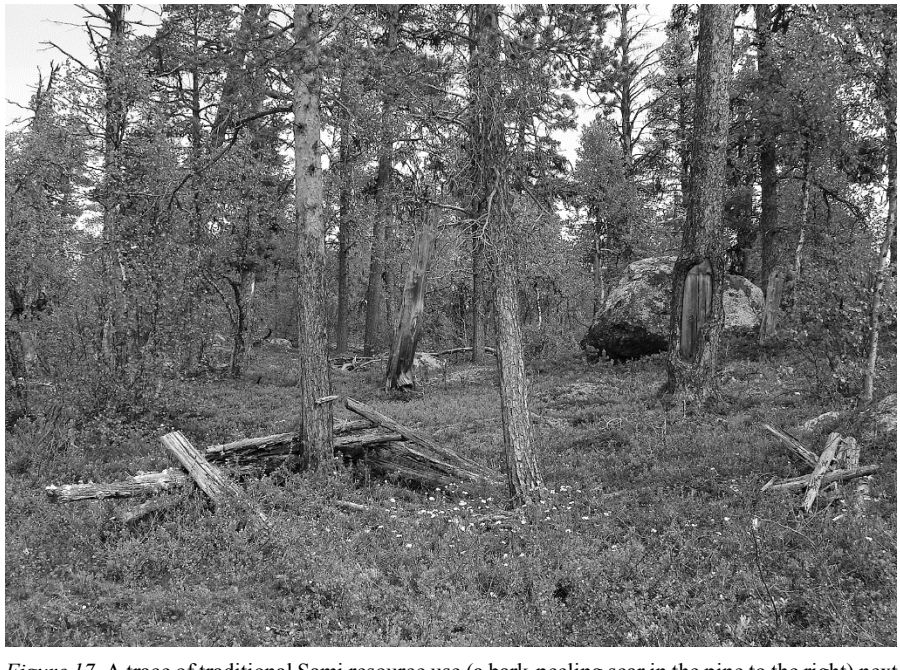

Figure 17. A trace of traditional Sami resource use (a bark-peeling scar in the pine to the right) next to the remains of a barn built to store natural hay harvested on the nearby mire. The remains are found close to an abandoned Sami settlement by Lake Muŋkajávrre in Pite Sami district.

To sum up, my research indicates that fishing was the main subsistence mode among the forest Sami of Ume Sami district in 1671, although they also hunted and practised reindeer husbandry. Since my results are consistent with both contemporary sources and the findings of other scholars, I believe that they are valid for a much larger area than the one I studied. The situation then changed and had become radically different by the 19th century. As documented in many ethnographic works, reindeer husbandry focused on milk production was then the main subsistence mode of the forest Sami in Sweden. This kind of subsistence does not represent forest Sami past, however, but only one of many common patterns. "The past" is a very long time and includes many ways to secure subsistence, and numerous moments of change. Even in identical environments where the same natural resources are available, different subsistence patterns are possible.

5.4 The lost flexibility

My overview of Sami taxlands and resource governance shows that the system entailed a certain rigidity in matters of resource use, since the taxland's resources were usually defended by the landholder. However, I have also demonstrated that taxlands had a huge potential for flexibility. Resources could be shared and exchanged, so that the holder of one taxland could get access to the resources of another. Even more importantly, the landholder could change from one subsistence pattern to another.

The flexibility in resource use and subsistence patterns was made possible by the autonomous governance of Sami lands. The natural resources included in each taxland were controlled by the household that paid the taxes, and this household could choose to use resources in another way. The household's members could consider strategic decisions such as: "Should we really move down to the coast this winter?", "Maybe we should do more fishing?", "Should we begin to tend settlers' reindeer, against a remuneration?", or "Maybe it is time to divide the taxland?", among many others summarised by Bertil Marklund (2015, p. 50).

This flexibility was lost as the autonomous governance was gradually dismantled during the 18th and 19th centuries through the process I described in section 5.2.3. It must be admitted, however, that the Sami were not completely deprived of all rights. In the late 19th century, the Swedish Crown made an attempt to guarantee the rights of reindeer herding Sami through special provisions. Most importantly, a cultivation limit (*odlingsgränsen*) was drawn through the Sami districts to keep settlers out of the westernmost parts (Lundmark, 2006, p. 137; Prawitz, 1967a; Almquist, 1928, pp. 480, 487). This

area was said to be assigned to the Sami (*för Lapparne afsatta land*) (SFS 1886:38). Although a number of settlements already existed west of the limit and more were to be established, reindeer-herding Sami were guaranteed the right to graze their reindeer all year round in the area, and also to fish, hunt, and take wood for personal use. East of the cultivation limit, reindeer herders were guaranteed similar usufructuary rights, but only in winter (SFS 1886:38).

These provisions were essentially made to protect the rights of reindeer-herding mountain Sami, not forest Sami (Holmbäck, 1922, p. 63). Most forest Sami had by the end of the 19th century become settled, and many of them combined reindeer husbandry with small-scale farming. In the preparatory works of the first Reindeer Grazing Act, this combination was considered to lead to both bad reindeer husbandry and bad farming, and it was presumed that the forest Sami would soon become full-time farmers (Mörkenstam, 1999, pp. 93f; Committee report, 1883, pp. 60f). Although household taxlands could have been useful for the forest Sami, a collective land use was considered to be more rational for mountain-Sami reindeer husbandry, and so taxlands were abolished (Holmbäck, 1922, pp. 66ff).[5]

In short, Sami taxland holders had been flexible and free to explore alternative ways to use resources, but their descendants became locked into a situation where only the right to pursue reindeer husbandry was to some extent secured. Furthermore, traditional hunting and fishing rights were assigned only to reindeer herders, and not managed by them but by the County Administrative Board. Not being the owners of the land they used, the Sami could not choose to settle down where they wanted, lease fishing lakes, hunting grounds, pastures or hay meadows to other people, or exploit natural resources in new ways. The flexibility inherent in the taxland system was lost.

5. The forest Sami did not give up their reindeer, however, and in the report from the 1919 Sami committee, where for the first time also Sami took part, a special law was proposed on forest Sami reindeer husbandry (1919 års lappkommitté, 1923). This was never realised. Instead, provisions were included in the Reindeer Grazing Act of 1928 to guarantee the rights of the forest Sami to graze their reindeer on State land and also on private land that has traditionally been used for reindeer husbandry (SFS 1928:309). However, the forest Sami's fishing and hunting rights are still not protected to the same extent as those of the mountain Sami (Bengtsson, 2004, p. 101).

6 Mapping former Sami land use

Our ability to understand the underlying structures and patterns of former Sami land use is severely restrained by the deficiency of our data. Ethnographic accounts are incomplete, the biological archives of culturally modified trees have mostly been destroyed, and archaeological surveys only cover selected parts of the landscape. The last-mentioned deficiency can hopefully be remediated through further investigations. However, traditional ground surveys are tedious and time-consuming in the boreal forest, especially where the ground is obscured by abundant vegetation. It is therefore almost impossible to perform surveys all over the landscape.

Since cultural remains in the Swedish boreal forest are at constant risk of damage and destruction through forestry practices (Unander & Claesson, 2016) (*Figure 18*), there is an urgent need to develop efficient detection methods. One promising method is *airborne laser scanning* (ALS), which is described in more detail in sections 3.5 and 4.3. The use of ALS data carries an enormous potential to enhance our knowledge of forests as cultural landscapes, and to perform the landscape surveys that are necessary for unbiased analyses of land-use structures and patterns (cf. Opitz, 2016, pp. 46f; Raab *et al.*, 2015; Pilø, 2013, pp. 23f).

In the following section, I will go through the various kinds of remains of former presence and land use that are considered as typically Sami, and assess the possibilities to detect each one of them using ALS data. I will then summarise the usability of such data for surveys, and propose an optimizing workflow based on the study presented in paper IV.

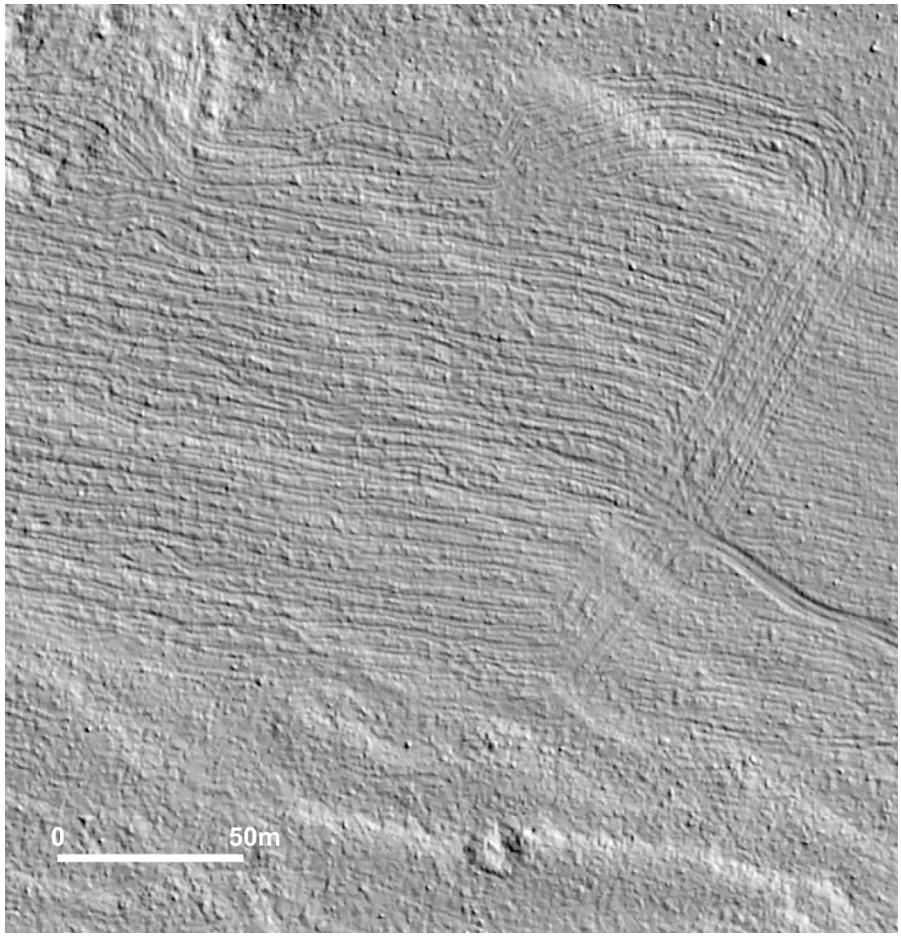

Figure 18. Harrowing is the commonest way of soil preparation in Swedish forestry, which in turn is the commonest cause of damage to cultural remains (Unander & Claesson, 2016, p. 22). Once harrowing has been performed, the possibilities to find more cultural remains is seriously reduced. The image is a part of the DTM that I created from the high-resolution data set of the Krycklan area. In the lower part, a tar kiln is seen

6.1 Remains of Sami land use

The archaeological remains connected to Sami land use and discussed in this section have been selected on the basis of one publication on surveys of Sami remains in general (Ljungdahl, 2011), and another on different kinds of remains in the boreal forest (Berg & Gustafsson, 2013). Focus will be on types that can be encountered in the boreal forest with some glances to the subalpine and alpine mountains as well. Since ALS cannot be used to look under rocks or dig into the ground, only remains that are somewhat visible from above will be considered.

I will briefly describe each type of remain and discuss its proven or potential detectability in ALS data. Since very little research has previously been done in this field, my assessments are mostly based on my own explorations.

The ALS data sets considered are those described in section 3.5.1 and in paper IV. In most cases, I have used the low-resolution (hereafter: LR) data set of the Swedish National Land Survey, which will cover all of Sweden, but some assessment are based on the high-resolution (hereafter: HR) data set from the Krycklan research catchment. As for the LR data set, it is publicly available as a DTM on the Internet (Lantmäteriet, 2018b; RAÄ, 2018). However, this DTM is a 1 m grid (Lantmäteriet, 2016a), which is relatively coarse for detecting cultural remains, and it is an image which cannot be manipulated. I have therefore used ground points from the point cloud in LAS format to generate DTMs with a 0.7 m grid (for method see section 4.3.2). I did this for selected areas with known remains registered in the publicly available database of the Swedish National Heritage Board (RAÄ, 2018). Manipulating light and height conditions of the DTMs, I assessed whether these remains were detectable or not. It should be stressed that it is easier to see remains where you expect them to occur than to detect them without previous knowledge. Also, even a detectable remain might not be possible to classify without a field control.

Graves

Traditional Sami graves were of many different kinds (Schanche, 2000; Manker, 1961). The ones that are most interesting for ALS surveys are graves where the corpse has been covered with stone, creating a rectangular chamber or a cairn. In Sweden, stone graves are mostly known from the mountain area (Schanche, 2000, pp. 159ff), but they can sometimes occur in the boreal forest (Berg & Gustafsson, 2013, p. 89). I have only tried to detect one grave in ALS data, without success. However, I have recently heard that stone graves have been detected using ALS data in Mortensnes on the coast of Finnmark in Norway.

Sacrificial sites

Just like the graves, Sami sacrificial sites were of many different kinds (Manker, 1957). Some of them include stone formations (Fossum, 2006, pp. 125ff; Huggert, 2000) (*Figure 19*) that could be detectable with ALS data. I have tried to identify a couple of known sacrificial sites in the LR data set, but without success. A more highly resolved ALS data set is probably needed.

Figure 19. Stone ring on Mount Altarliden in Lycksele Sami district, registered as Lycksele 233 by the Swedish National Heritage Board (RAÄ, 2018), is believed to be a Sami sacrificial site (Huggert, 2000). The ring is not detectable in LR ALS data, but similar sites are potentially detectable in HR data sets.

Stalo foundations and other settlement sites

Close to the birch tree limit in the Scandes, there is a particular type of remain consisting of an oval to rectangular embankment, a few meters across, surrounding a depression with a hearth in the centre. These so called stalo foundations (*stalotomter*) are the remains of ancient habitations (Liedgren & Bergman, 2013; Manker, 1960; Tomasson, 1930, 1929). I have tried to detect several known stalo foundations using the LR data set, sometimes with success and sometimes not. Two easily recognisable examples are shown in *Figure 20*. In northern Norway, other kinds of Sami hut foundations have been mapped with ALS data (Risbøl, 2009). Just like the Swedish ones, they were located in a relatively open landscape.

In some parts of the boreal forest, there are so called *skogstomtningar*, which are remains similar to the stalo foundations but in a forested environment (Mulk, 1994, pp. 128f). They are probably detectable in ALS data. Otherwise, forest Sami settlements have usually been characterised by wooden constructions without embankments (Liedgren *et al.*, 2009; Aronsson, 1991; Manker, 1968). Once they are abandoned, such constructions perish relatively quickly, are

overgrown and become difficult to spot even in the field. I have not been able to detect any known forest Sami settlements with ALS data.

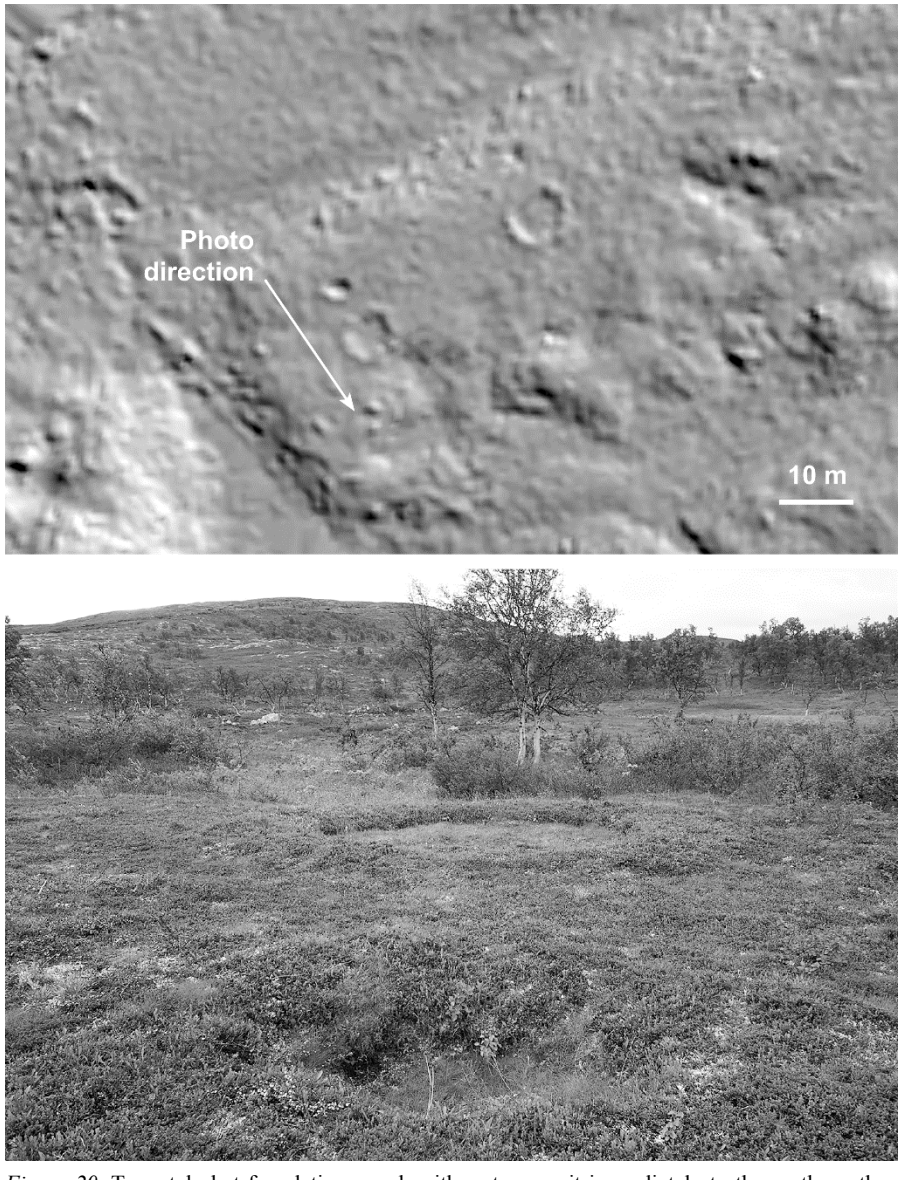

Figure 20. Two stalo hut foundations, each with a storage pit immediately to the north, as they appear in a DTM generated by me from LR ALS data. The photo below shows the left foundation and pit, and is taken in the direction indicated. Charcoal from the hearth of the other foundation has been dated to 890–1050 AD. The place is located in Pite Sami district, not far from to the border with Norway, and the remains are registered as "Arjeplog 1015" by the Swedish National Heritage Board (RAÄ, 2018).

Hearths

At the centre of every traditional Sami dwelling, whether a tent or a permanent wooden construction, was an oval or rectangular hearth lined with stones. Such hearths can be found over most of northern Sweden, and are considered to be very typical remains of Sami land use (Viklund, 2004; Hedman, 2003; Bergman, 1988). I have tried to find a number of known hearths in the LR data set, but without success. During the study described in paper IV, I happened to find a hearth in the field. Although it was well visible above the ground, it could not be detected even with the HR data set, since the point cloud contained very few points in this particular spot. However, it is probable that hearths with stones that protrude some distance above the ground are detectable in HR ALS data.

Storage caches

The Sami commonly stored milk, meat and other food stuff in caches close to settlements. Some caches were placed under boulders while some were excavated in dry and sandy hills. In a study in northern Norway, known meat caches were not detectable, since they formed small and shallow depressions in stone accumulations (Risbøl, 2009). However, caches that have been excavated in the ground should be detectable, just like the ones in the USA (Howey *et al.*, 2016; Krasinski *et al.*, 2016). In the LR data set, I was able to detect two storage caches that were located in an open landscape (*Figure 20*). I have not managed to detect such caches in the boreal forest, but this should be possible with a HR data set (cf. *Figure 21*).

Settlement pits, cooking pits, and roasting pits

Pits dug for different purposes are common in the boreal forest. Two types that are interesting in this context are the cooking pit (*kokgrop*), which is defined as a pit with a dense lining of thermally altered stones, commonly with soot and charcoal, and the settlement pit (*boplatsgrop*), which is a similar pit without a stone lining (RAÄ, 2014). Some of these pits may have been used by Sami for roasting pine inner bark (Lundius, 1983 [ca 1674], pp. 31f; Rheen, 1983 [1671], p. 22). In this procedure, the pine inner bark was wrapped in birch bark, placed in a deep pit and covered with sand. A log fire was lit on top and burned through several days and nights. The pit was then excavated, and the roasted pine bark was taken out and hung to dry.

Since pine bark was a staple food for the Sami well into the 19th century (Zackrisson *et al.*, 2000), roasting pits must have been very common, but they are completely absent from the Swedish archaeological record. This does not mean that they have never been detected, but rather that they have probably been

recorded among the settlement pits. I have tried to detect a number of known cooking pits and settlement pits in the LR data set, but so far without success. However, they should be detectable in a HR data set, just like shallow pits of other kinds (*Figure 21*).

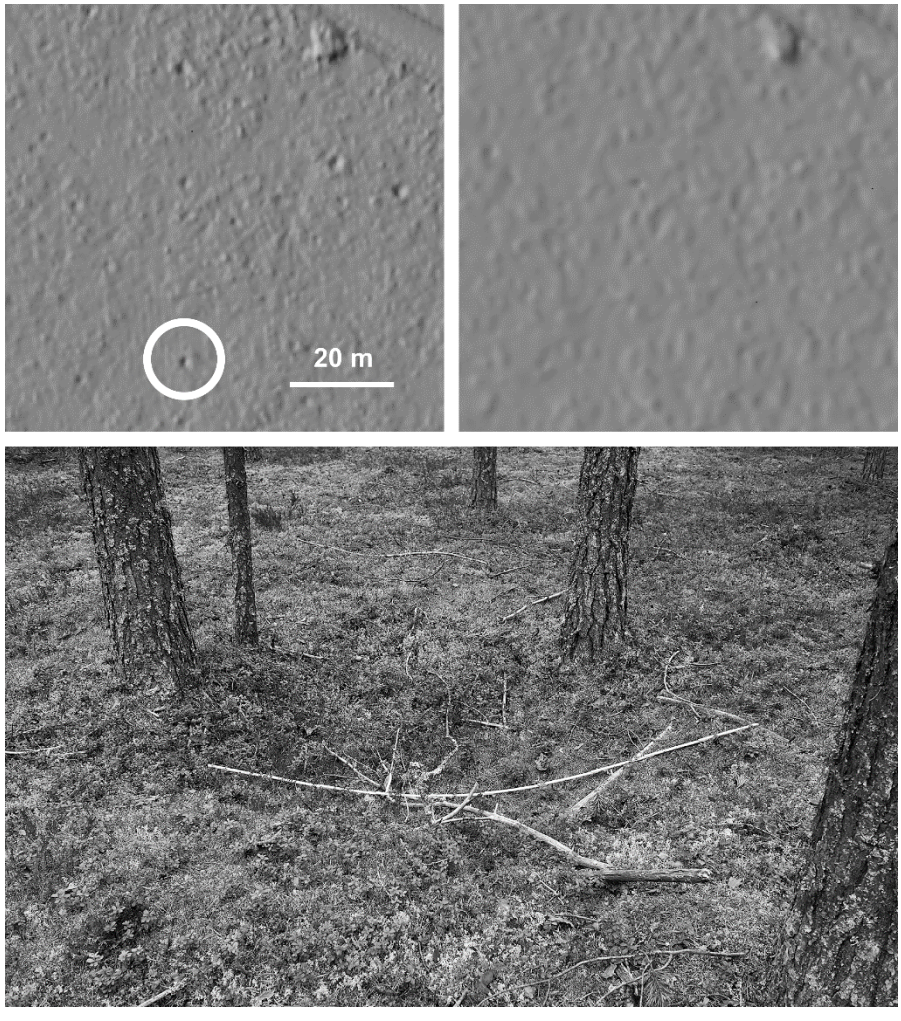

Figure 21. Stump pits were clearly visible in the HR DTM used in paper IV (upper left), but almost invisible in the DTM generated from the LR data set (upper right). The pit on the photo is the one encircled in the DTM. Since even such a shallow pit in closed forest is visible in the HR DTM, storage pits and roasting pits connected to Sami land use should also be detectable.

Hunting pits

Hunting pits are very common in northern Sweden, both inside and outside the area concerned by this thesis, and have been used for millennia (Hansson & Rathje, 1999; Spång, 1997; Selinge, 1974; Manker, 1960). Hunting pits cannot in themselves be taken as indicators of the presence of any specific ethnical group (Bergstøl, 2008). However, if hunting pits are dated to a time when only Sami are known to have been present in the area, it is reasonable to view the pits as remains of Sami land use. Most hunting pits are detectable with ALS, although they can be confused with other kinds of pits (Risbøl, 2013; Risbøl *et al.*, 2011; Jansson *et al.*, 2009; Risbøl, 2009). Most of them are visible even in the LR data set, especially when they occur in rows. However, they cannot be classified without field verification.

Walls

Above the tree line, low stone walls have sometimes been erected to form enclosures or to guide the reindeer's movements (Andersen, 2014). Such structures should be detectable in ALS data. Nevertheless, when DTMs are generated from the point-cloud classified by the National Land Survey, stone walls tend to be absent because the relevant points have been classified as non-ground and excluded (Willén & Mohtashami, 2017; Klang & Klang, 2010). This problem may be solved with a more generous ground-point classification, such as the one applied in paper IV (cf. Risbol & Gustavsen, 2016; Jansson *et al.*, 2009, p. 35). Also, linear objects are most easily detected when the model is illuminated from a direction perpendicular to the main direction of the line, so a software where light-and-shade conditions can be changed repeatedly is very useful.

Fences

In the boreal forest, stone walls are usually connected with cultivation, since this is where stones have been removed from the ground. In the traditional forest Sami way of life, fences were built of wood. Some of them surrounded small pens where reindeer were gathered for milking and handling, while others were long, linear constructions aimed at constraining or guiding reindeer herds (see paper III). Linear wooden fences could also be used for catching wild reindeer (Lundemark, 1939; Paulaharju, 1937). Today, wooden fences of traditional types are mostly in decay, but the remains can sometimes be followed several kilometres in the field. Using the LR data set, I have tried to detect the fences documented in paper III, but so far without success. A HR data set is probably

needed, and the data will then have to be carefully processed to emphasise the points that are reflected from the fence.

Corrals

During the time of intense reindeer herding focused on milk production, the forest Sami often had a corral next to each summer settlement where the reindeer were protected from mosquitoes by smoke fires, and the does were milked. After reindeer milking ceased, corrals have commonly been built for separation of herds and calf marking. In the settlement of Tjadnes, the two adjoining separation corrals are clearly visible in the LR DTM (*Figure 22*). Since the corrals have been restored and are also visible in an aerial photo, this is not surprising. However, in the DTM, similar contours are vaguely visible to the north of the settlement, where no cultural remains are registered in the public database of the Swedish National Heritage Board (RAÄ, 2018). It is highly probable that old corrals are detectable with ALS data, and that settlement sites from the milking period can thus be mapped.

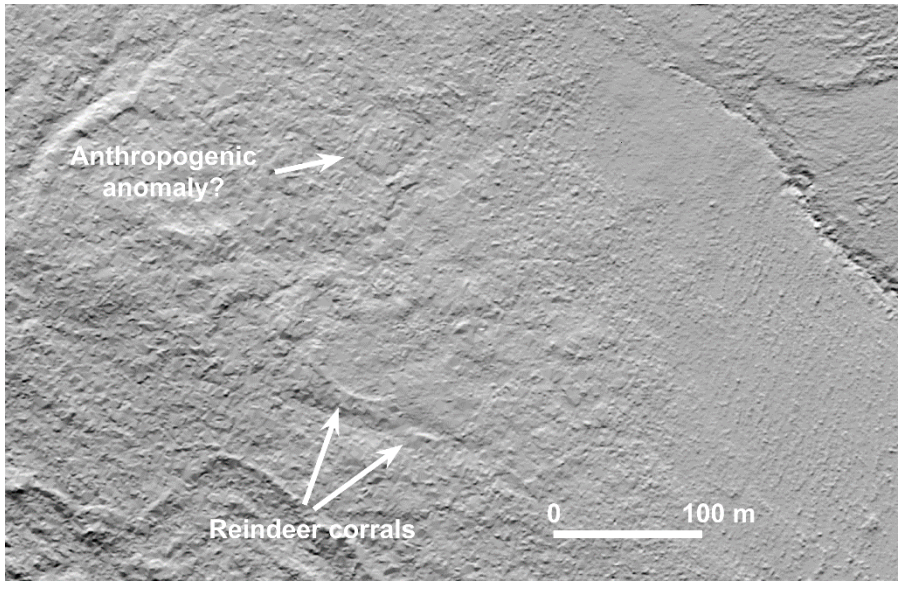

Figure 22. DTM created of Tjadnes settlement, which is shown on the aerial photo in *Figure 1*. The two adjoining corrals are clearly visible. These remains are registered as "Arvidsjaur 2488" by the Swedish National Heritage Board (RAÄ, 2018). Further north, however, there is another anomaly which could possibly be the remains of another man-made structure.

Paths

As long as there has been people in an area, there has surely been paths connecting important places. In the alpine mountain of Pite Sami district, there is a very old and intriguing trail marked with erected stones (Bergman *et al.*, 2007) that could possibly be detectable with ALS data. However, at the moment of finishing this thesis, the area in question had not yet been scanned. In the boreal forest, an old trail can show up in a DTM as a narrow, more or less linear depression in the landscape or as a holloway (Koivisto & Laulumaa, 2012; Risbøl *et al.*, 2011; Jansson *et al.*, 2009). Just like the walls, the detection of old paths is greatly facilitated by the use of a software where light-and-shade conditions can be changed repeatedly. Whether detected trails reflect Sami land use must then be evaluated with the help of historical sources.

To sum up this overview of remains of Sami land use, I conclude that hunting pits is the only kind that has proved to be readily detectable in LR data sets. Stalo foundations, walls, paths, corrals, storage caches, and settlement pits should generally be detectable in HR data sets, since they can sometimes be detectable in LR data. Graves, sacrificial sites, hearths, and fences cannot be expected to be detected in LR data sets but could potentially be detectable in HR data. Dwelling remains other than stalo foundations are probably difficult to detect in all kinds of ALS data sets.

6.2 The potential of ALS data

To map former Sami land use in the boreal forest with ALS data, the types of remains that appear to be most promising are different kinds of pits, in particular storage caches and roasting pits. Even shallow stump pits can be detected with ALS data (*Figure 21*), so there is a good chance that the same holds true for pits related to Sami land use. They would need to be checked in the field, however, and the surroundings could then be searched for other remains such as hearths and culturally modified trees.

If ALS data of the Swedish National Land Survey could be used for mapping pits and other cultural remains in the boreal forest, it would be a fantastic resource for landscape surveys since it covers the whole country. However, shallow pits are not easily detectable in the national data set, due to its low resolution (*Figure 21*). A new national scanning campaign is currently being planned, primarily for forestry purposes, but so far there are no indications of a higher ground-point density (Skogsstyrelsen, 2017). Given the high risk of destruction of cultural remains through forestry activities (Unander & Claesson, 2016), this new campaign would have been a perfect opportunity to scan with

higher resolution to enable the mapping and protection of the forest's cultural heritage.

Both when planning future scanning campaigns and when utilising existing data, there are a number of factors that should be considered to optimise ALS data for surveys of cultural remains, especially of Sami origin. In the next section, these factors will be discussed as parts of an effective workflow.

6.3 A workflow for optimised ALS surveys

Based on previous research and on experiences from the study presented in paper IV, I have outlined a workflow where care is taken at every step to optimise ALS data for the detection and mapping of cultural remains in forested landscapes (cf. Opitz, 2016). This is of particular importance for surveys concerning remains of Sami land use, since these structures are often low and indistinct. The following overview contains all steps, from scanning to field verification (see section 4.3 for a description of methods). Depending on the data set used, different parts of the workflow will be applicable.

1 **Scanning time** should be during the short time-lapse after the snow has melted and before the ground vegetation starts to grow (Pilø, 2013; Risbøl *et al.*, 2011; Jansson *et al.*, 2009).
2 **Scanning resolution** should be the highest possible. In Norway, a point density of 5 points/m^2 is considered sufficient for archaeological surveys (Pilø, 2013, p. 16; Risbøl *et al.*, 2011, p. 35). This is a measurement of the density of first returns, which, according to experience, corresponds to 2–3 ground points/m^2 in forests (Pilø, 2013, p. 16). The Norwegian recommendation is a trade-off between data quality and economy, and is based on studies including charcoal burning platforms, hunting pits, grave mounds, holloways and some other rather distinct types of remains. Since the remains of Sami land use are usually more difficult to detect, it is probable that surveys of such remains would benefit from an even higher ground-point density, such as the 13 points/m^2 achieved in paper IV.
3 **Classification of ground points** should include a sufficient number of points to reveal the types of remains expected in the environment in question. In dense vegetation, a relatively generous inclusion of ground points may facilitate detection (paper IV). Ideally, parameters should be tried out specifically for each study area.
4 **DTM generation** should not be primarily aimed at producing smooth surfaces (paper IV). Also, grid cells may well be made smaller than the actual

resolution to produce a sharper image, but should not exceed a doubling of data (Crutchley & Crow, 2009).

5 **Historical and recent maps**, as well as **literature on local history**, should be checked before the interpretation of DTMs. They may contain information on settlement sites, reindeer pens, paths etc., as well as place names indicating former land use. If maps are digitised and rectified to the standard coordinate system, the location of each feature can be easily compared to the DTM (paper IV).

6 **Interpretation of DTMs** should be made in a software that allows the changing of light-and-shade conditions, scale, height scale etc. repeatedly. This is particularly important for the detection of linear objects such as paths, walls, and fences, but also for shallow pits. If a 100x100 m grid is applied on the DTM, this is a good frame for a thorough examination cell by cell, although it is a time-consuming procedure (paper IV).

7 **Field verification** is necessary for many anthropogenic anomalies, especially for the often subtle structures connected to Sami land use. A portable device where digital DTMs can be shown and located, and where data can be collected directly is of great help for field work (paper IV).

8 After field verification, **maps and literature** should once again be consulted to resolve unclarities and deepen the understanding of registered remains.

9 Field verification and DTM interpretation should be **alternated**, so that the experience of how a certain anomaly appears in the DTM and what it looks like in the field is repeatedly carried back to influence and improve interpretation (paper IV).

In brief, I see a great potential to use ALS data for surveys of remains of Sami land use, if the outlined workflow is followed and the listed factors are considered. To turn this potential into practice, further studies should be done on the use of HR data in areas with a higher density of Sami remains to fine-tune the parameters. Also, studies should be done on the best ways to reclassify the national LR data and assess whether it can be used for more extensive surveys. If ALS data is used in the right way, it will greatly contribute to our knowledge of the boreal forest as an ancient cultural landscape.

7 Conclusions

The aim of my doctoral studies has been to contribute to the understanding of the context of former Sami resource use in the boreal landscape. To attain this aim, I have used sources of many kinds and often combined them in an interdisciplinary approach. My main conclusions are summarised below.

7.1 Fishing was the main subsistence mode

Fishing was the main subsistence mode among most of the forest Sami of Sweden in the 17th and parts of the 18th century. As a result, settlement patterns were first and foremost influenced by the preferred times to catch important fish species in different water bodies. Reindeer husbandry was also practised, however, and during the 18th century, it became the main subsistence mode among most forest Sami.

7.2 Taxlands were created to divide lakes and rivers

The 1695 cadastre shows that the boreal landscape of Sweden (including Finland) was almost entirely divided into taxlands. There was usually only one Sami household per land on the western side of the Gulf of Bothnia whereas several households commonly shared each land in the east. Most likely, the main purpose of taxlands was to secure a sufficient number of lakes and river stretches for households that mainly lived on fish. In large parts of the area that today is Finland, however, taxland division was probably more related to the division of game resources.

7.3 The forest Sami were semisedentary

Since forest Sami households repeatedly returned to the same sites, they built wooden dwellings and other permanent installations. This is true regardless of whether fish or reindeer was the main subsistence mode. Therefore, forest Sami settlement patterns are best characterised as semisedentary.

7.4 Taxlands enabled flexible resource use

Autonomous resource governance through taxlands enabled a flexible utilisation of resources, since each holder was free to make decisions on both use and management. Different kinds of resources could be exploited in different proportions, or shared with people from outside in exchange of desired products. When Swedish authorities gradually took over the governance of Sami matters and abolished the taxlands, the landholders' descendants became locked into a situation where only the right to pursue reindeer husbandry (including certain hunting and fishing rights) was secured.

7.5 Barrier fences were commonly used

Barrier fences were widely used in reindeer husbandry from the mid-18th century onward to control the movements of both own and foreign reindeer in the boreal forest. Fences were mostly built of whole pines combined with boulders, and were sometimes several kilometres long. Remains of such *whole-tree fences* can still be found.

7.6 Former land use can be mapped with ALS data

Many kinds of cultural remains in the boreal forest can be detected with ALS data. When it comes to remains of Sami land use, some are detectable in low-resolution data sets, but high-resolution data is needed for effective surveys. Furthermore, the data should be carefully processed with particular attention to point-cloud classification. Since ALS data can be used to survey whole landscapes with minimum bias, it has a large potential for detection of remains that need protection from destructive forestry practices and that can contribute to our knowledge of the boreal forest as an ancient cultural landscape.

7.7 An interdisciplinary approach is necessary

When studying such a complex matter as Sami resource use in the boreal landscape, an interdisciplinary approach is an effective way of expanding the number of independent sources. Data should be extracted from all imaginable sources with the best methods possible, regardless of the academic discipline to which they traditionally belong. Interpretations of all this information can then be combined into a picture which is as complex and complete as possible.

Figure 23. One of the very few trees with a bark-peeling scar known from Åsele Sami district. The interpretation of the Swedish boreal forest as an ancient cultural landscape is severely impeded by the removal of old trees, which may be culturally modified, and soil scarification, which destroys hearths, settlement pits etc. Since most of the boreal forest outside nature reserves is used for industrial forestry, there is an urgent need to detect and protect remains of former land use. Otherwise, important parts of the cultural heritage of the Swedish boreal forest will be lost.

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Popular science summary

Having a land of one's own means to be in control of an area and its resources. For a long time, this was the reality of the forest Sami, the indigenous people of the forests of northern Fennoscandia. As long as they possessed their own lands, they were flexible and could adapt their resource use to changing conditions. An understanding of the dynamics of land use is essential for the comprehension of the forest history of northern Sweden.

The Sami before 1900 have often been described as nomadic reindeer herders roaming through the landscape and living in tents. Although this image was partly true, my research indicates that the Sami of the Swedish forests were more fishermen than reindeer herders until the 18th century. They moved between a number of settlement sites depending on the spawning times of fish and lived in simple but permanent buildings of wood. The forest Sami also owned reindeer, hunted wild reindeer and gathered plants, but fish was the most important resource. Each household had its own territory, a *taxland*, that had probably been created to secure enough lakes and river stretches to feed a family.

In the winter, the forest Sami received mountain Sami who were more dependent on reindeer herding and had many reindeer. The mountain Sami were allowed to graze their herds on the lichen pastures of the forest Sami's land and also to hunt wild reindeer. In exchange, they gave reindeer cheese and meat. Also, the forest Sami could sell birds' down, berries and other goods to the mountain Sami. The berries were eaten and the down was taken to Norway and sold. Both mountain Sami and forest Sami thus got access to resources from each others areas.

In the 18th century, the forest Sami began to focus more on reindeer husbandry and less on fish. As a consequence, competition over grazing lands increased. The forest Sami probably became less interested in sharing their lichen pastures with the mountain Sami, since they now needed more pastures for their own reindeer and also produced more milk and meat. Some even built fences through the forest to protect and manage reindeer pastures. The fences

were built of whole pine trees and boulders without any nails, strings or other metal parts. They zigzagged through the forest for kilometres, often between lakes which thus formed parts of the fence. Today, these old whole-tree fences are in severe decay, but they can still be tracked through the forest. They had not been described before I published my research, and they have rarely been registered in archaeological surveys, but they seem to have been common in some districts.

Since each forest Sami household was in control of its taxland, the family members could decide for themselves how to use the land's resources. They could spend their summers fishing or they could rear more reindeer and focus on milking and cheese production. They could allow mountain Sami to stay for the winter, or tell them to move on. They could decide to allocate some of their time to down gathering, berry picking, root rope production or extraction of any other resources from the land. The control of the land enabled a flexible and dynamic resource use.

All of the Fennoscandian forest was divided into taxlands. Only in Sweden, there were about 250 such lands. Regardless of whether the forest Sami focused on fishing or reindeer herding, there were a number of permanent settlements on each taxland, and often also fences and other installations. In addition, the visiting mountain Sami had camp sites. Most of these activities must have left traces, but they are often hard to detect and in large parts of northern Sweden, there are very few known cultural remains. This gives a false image of the Sami presence in earlier days. Also, unregistered remains are at constant risk of destruction through forestry practices.

It is important to detect existing remains of former Sami land use. A new way of doing this is to use airborne laser scanning (ALS) or lidar. This is a technique through which the ground can be studied from above, even where it is covered by a tree canopy. In one of my studies, I showed that cultural remains such as charcoal burning platforms and tar kilns are easily detectable with ALS data. The technique has a great potential also for the detection and mapping of remains of Sami land use.

The research that I present in my thesis gives a broader context of former forest Sami resource division, use and management, and emphasises the importance of flexibility and change. Knowledge of these circumstances is crucial for our understanding of the area's forest history. We must also protect remaining cultural vestiges so that we can create a better image of history.

Populärvetenskaplig sammanfattning

Att ha ett eget land betyder att ha kontroll över ett område och dess resurser. Detta var länge verklighet för skogssamerna, urbefolkningen i norra Fenno-skandiens skogar. Så länge de var innehavare av sina egna marker var de flexibla och kunde anpassa sitt resursutnyttjande till förändrade förhållanden. En förståelse för dynamiken i markanvändningen är nödvändig vid studier av norra Sveriges skogshistoria.

Samerna före 1900 har ofta beskrivits som nomadiska renskötare som strövar genom landskapet och bor i tält. Denna bild var delvis sann, men min forskning visar att de som bodde i de svenska skogarna var mer fiskare än renskötare ända in på 1700-talet. De flyttade mellan ett antal visten beroende på fiskarternas lektider och bodde i enkla men permanenta träkåtor. Skogssamerna ägde visserligen renar, jagade vildren och samlade växter, men fisk var den viktigaste resursen. Varje hushåll hade sitt eget territorium, ett *skatteland*, som troligen inrättats för att säkra tillräckligt med sjöar och vattendrag för att försörja en familj.

Vintertid tog skogssamerna emot fjällsamer som var mer beroende av renskötsel och ägde många renar. Fjällsamerna fick låta sina hjordar beta renlav på skogssamernas land och de fick även jaga vildren. I utbyte lämnade de renost och renkött. Skogssamerna kunde också sälja fågeldun, bär och andra varor till fjällsamerna. Bären åts upp medan dunet togs till Norge för att säljas. Både fjäll- och skogssamerna fick på detta sätt tillgång till resurser från varandras marker.

Under 1700-talet började skogssamerna inrikta sig mer på renskötsel och mindre på fiske. Följden blev att konkurrensen om betesmarkerna ökade. Skogssamerna blev troligen mindre intresserade av att dela sina lavbeten med fjällsamerna, eftersom de nu behövde mer bete åt sina egna renar och dessutom kunde producera tillräckligt med mjölk och kött själva. En del byggde också stängsel genom skogen för att skydda och förvalta renbetesmarkerna. Stängslen byggdes av hela tallar och block utan spik, tråd eller andra metalldelar. De gick i sicksack kilometervis genom skogen, ofta mellan sjöar som blev delar av

stängslet. Idag är dessa gamla helträdsstängsel kraftigt förfallna, men fortfarande kan man följa resterna genom skogen. De hade inte beskrivits innan jag publicerade min forskning och de har sällan registrerats i arkeologiska inventeringar, men de verkar ha varit vanliga i delar av Norrland.

I och med att varje skogssamiskt hushåll hade kontroll över sitt skatteland kunde familjemedlemmarna själva bestämma hur landets resurser skulle användas. De kunde ägna somrarna åt fiske eller föda upp fler renar och satsa på mjölkning och osttillverkning. De kunde låta fjällsamer stanna över vintern eller låta dem flytta vidare. De kunde besluta sig för att lägga tid på att samla dun, plocka bär, tillverka rep av granrötter eller utvinna någon annan av landets resurser. Kontrollen över landet möjliggjorde ett flexibelt och dynamiskt resursutnyttjande.

Över hela Fennoskandien var skogarna indelade i skatteland. Bara i Sverige fanns omkring 250 land. Vare sig skogssamerna inriktade sig på fiske eller på renskötsel hade de ett antal fasta visten på varje skatteland, och ofta även stängsel och andra anläggningar. Dessutom anlade fjällsamerna tillfälliga lägerplatser. Merparten av dessa verksamheter måste ha lämnat spår efter sig, men de är ofta svåra att upptäcka. Faktum är att det finns mycket få kända kulturlämningar i stora delar av norra Sverige. Det ger en felaktig bild av samernas närvaro i äldre tid. Dessutom löper oregistrerade lämningar stor risk att förstöras av skogsbruket.

Det är viktigt att hitta de lämningar som fortfarande finns kvar av äldre samisk markanvändning. Ett nytt sätt att göra det är genom luftburen laserskanning (ALS), även kallat lidar. Med denna teknik kan marken studeras från ovan, även när den är täckt av trädens krontak. I en av mina studier visade jag att kulturlämningar som kolbottnar och tjärdalar lätt kan upptäckas med ALS-data. Tekniken har stor potential för kartläggning av lämningar efter samisk markanvändning.

Den forskning som jag lägger fram i min avhandling skapar ett bredare sammanhang kring skogssamernas resursanvändning och resursförvaltning i äldre tid. Nyckelord är flexibilitet och förändring. Vi måste ha en känsla för hur resursutnyttjandet gick till om vi ska kunna förstå ett områdes skogshistoria. Vi måste också skydda de kulturlämningar som fortfarande finns kvar så att vi kan få en bättre bild av historien.

Tack! Thank you!

Först och främst: tack **Lars** för att du tog emot mig som doktorand och blev min handledare under lite speciella omständigheter. Du är en mästare i den svåra konsten att dela ut tillräckligt mycket beröm för att man ska kunna ta ett ”men”. Tack också till **Anna-Lena**, min biträdande handledare, för alla inspirerande idéer, kommentarer och tips. Båda har ni visat prov på stort mod när ni givit mig den frihet jag behövde för att kunna gräva mig ned i doktorandstudierna. Bättre handledare hade jag knappast kunnat få och jag hoppas att vårt samarbete ska kunna fortsätta på något sätt.

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Jag har inte haft något arbetsrum på Skogis och har bara sällan tittat in på institutionen. Det har därför betytt mycket för mig att den administrativa personalen – **Elisabeth**, **Ann-Kathrin**, **Gun-Marie**, **Ulf** och nu på slutet **Kyungjin** (”**Q**”) – har fått mig att känna mig så välkommen när jag väl dykt upp. Ni har inte bara hanterat alla byråkratiska frågor snabbt och effektivt utan även varit ett mycket trevligt sällskap i fikarummet.

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A large number of people, both **PhD students and other colleagues**, have been working at the department during these years. Since I suffer rather badly

from face blindness, I may not always have recognised you and I may not know your name. However, I have had so many nice evenings thanks to you – people from all over the world – during pubs, christmas parties and other festivities. I won't mention any names for fear of missing someone out, but I'm most greatful to all of you who have ever approached and talked to this rare and maybe strange guest. You made me feel like I belonged!

Stort tack också till er som satsat pengar på min forskning. Göran Gustafssons Stiftelse för natur och miljö i Lappland bekostade de studier som redovisas i artiklarna I, II och III. Stiftelsen Mauritz Carlgrens Fond bekostade studien i artikel IV samt skrivandet av själva avhandlingen. Tack igen!

Grunden för doktorerandet vilar dock på människor utanför den akademiska världen. Jag avstår från att nämna mina vänner vid namn, återigen av rädsla för att utelämna någon. Där finns i alla fall ett brett spektrum av gamla klass-, kurs- och arbetskamrater, nuvarande grannar och människor som jag stött på i olika sammanhang. Ni finns där för middagar, surströmmingskalas, dominokvällar, mejlväxlingar, telefonsamtal eller bara ett vänligt ord när vi möts på byn eller på Facebook. Ni vet själva vilka ni är, och ni ska veta att jag är mycket tacksam för att ni går och har gått vid min sida genom livet.

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Appendix 1. Analysing the 1695 cadastre

In this appendix, I explain how the data of the 1695 cadastre (Wrede *et al.*, 1698) was processed for the analysis in section 5.1 and discuss some methodological aspects of the data.

My first step was to transcribe the whole text listing taxpayers and taxlands for all the Sami communities (*lappbyar*) that paid taxes to the Swedish Crown during this period. Since the deciphering of the handwriting is not always obvious, I compared my reading to earlier transcriptions (Holmbäck, 1922, pp. 16ff; Fellman, 1915, pp. 285ff).

I then went on to associate taxland names with geographical locations. There are several problems involved in this procedure. First of all, names are not always spelled in a consistent way, so it is not always clear whether names indicate the same taxland or not. This problem can only be solved through a reasonable amount of guessing, the outcome of which obviously affects the number of taxlands per community, the average area per land, and the average number of households per land. The next challenge was to find the geographical position of the 350 taxland names. As for Umbyn, Gran, Åsele, Vapsten and Ran, I had earlier done this through an extensive research in primary sources, and a follow-up of landholders and their successors in fiscal records from 1695 to the end of the 19th century (Norstedt, 2011, and unpublished data). The result is very reliable, but the work was also extremely time consuming, so the rest of the communities were treated in a more superficial way to complete the analysis presented in this thesis.

A number of works have helped in the interpretation of place names and the delimitation of communities (Marklund, 2015; Kuoksu, 2011; Enbuske, 2008, 2003; Korpijaakko-Labba, 1994; Teerijoki, 1993; Sköld, 1992; Arell, 1977; Hultblad, 1968; Bylund, 1956; Ruong, 1937; Hultblad, 1936; Hackzell, 1910 [1738]; Wahlenberg, 1804). Positions of taxland names were found thanks to several web-based map services (*Google Maps*, 2018; Kartverket, 2018; Lantmäteriet, 2018b; Lantmäteriverket, 2018). Once place names had been located, they were marked as points in ArcMap. However, several markings are unsure and about 20 place names could not be located at all. For the analysis presented in the thesis, the number of taxlands per community was more important than the exact position of each land, and therefore points were added in "empty" spaces to make up for the points that had not been localised.

Also, points were added to compensate for taxlands that had by 1695 been taken over by the church. When church places were established in the Sami

districts from 1606 onward, one taxland was requisitioned in each of the parishes to serve the needs of the vicar (Norstedt, 2016). Since no one paid taxes for those lands, they were not included in the fiscal records, so to produce a correct average taxland area in this analysis I had to add the church lands. Points representing church lands were added in most locations where churches existed in 1695, or more specifically Lycksele (Umbyn), Åsele, Sorsele (Gran), Arvidsjaur, Arjeplog, Jokkmokk, Jukkasjärvi (Siggevaara), Markkina (Suonttavaara), Sodankylä, and Inari. There was also a church in Kemijärvi that had been established in 1647 to serve the Sami population, but it was located outside the scope of the 1695 cadastre. Also, a church was built in Kuusamo (Maanselkä) after 1675, but since there is a taxland called "Kussamabij" (Kuusamo village) in the cadastre this is probably the land around the church place. No land has therefore been added in Kuusamo. In Silbojokk, there was a church and maybe also a church land, but since Silbojokk was located in Semisjaur where there were no taxlands, this has not been accounted for. As for the chapels in Avaviken, Nábrreluokta, and Ålloluokta, there are no indications of a vicar being steadily employed, so it is unlikely that church lands existed.

One possible source of errors in my analysis is that I have assumed that all land was divided among taxlands. This assumption is not entirely correct, since there were also commons. During the Girjas trial, commons were repeatedly mentioned, and one could get the impression that taxlands were small and surrounded by much larger commons. This is not what I have seen in the sources, however. On the only existing map of the distribution of taxlands, the one of Ume Sami district, there is just one small common (Gedda, 1671). In Jokkmokk and Arjeplog, some taxlands that were located along important migration routes were commons (Læstadius, 1977 [1833], p. 13; Hultblad, 1968, p. 84). They do not appear to have been more significant than the common of Ume Sami district. However, the situation might have been different in Finland. As mentioned in section 5.1.1, most of the taxland names in Inari were clustered around Lake Inari, whereas those in neighbouring Kittilä and Sodankylä were mostly located in the south, which suggests that there were commons on the watershed in between. However, since the main focus of my thesis lies on the western side of the Gulf of Bothnia, I have chosen not to take commons into account. There are also practical reasons for this, since I have no indications on the position and extent of possible commons, apart from the area marked on Gedda's map. It should therefore be remembered that if there were considerable areas of common land in some communities, average taxland areas have been overestimated in those cases.

The number of households per land was defined as the number of persons noted in the cadastre for each single land. An average was then calculated for

each community to produce *Figure 10*, p. 62. In some of the communities that were divided into taxlands, no land was indicated for a number of people. In most cases, this number was insignificant, but in both Kaitum and Sirkas, about one third of the members had no indication of land. In both of these communities, two persons were explicitly said not to have a land, but there is no way of knowing if any of the others did have a land and in that case which one. Kaitum and Sirkas are unique in presenting this mixture of members with and without taxlands. At the same time, they are two of only three mountain Sami communities with taxlands. I have therefore assumed that it is not by mistake that taxlands have not been indicated for these people, but more likely because they were involved in a more collective kind of land use. Both systems may well have existed in the same community.

It should be noted that the number of households is not the same as the number of taxpayers. Each community had one or two persons who served as intermediaries (*byländsmän*) between the community and the Crown's sheriffs, and they were exempt from taxes. In most of the northern and eastern communities, there were also at least one person who was responsible for transportation (*skjutsrättare*) and who did not pay taxes. In addition, people who could not pay taxes because they were poor, dead or absent are sometimes included. If the 1695 cadastre were to be used for an analysis where the number of taxpayers is important, all these persons would have to be subtracted.

In future analyses, the ethnicity or origin of taxpayers may be a variable of interest. In 1695, most of the persons included in the Sami tax register were unsettled Sami, but there were also quite a few settlers. During the Girjas trial in the Court of Appeal, I heard the State's representative claim that all taxpayers that were registered for 4 dalers in the 1695 cadastre were settlers. This claim seems to have been based on a historical document on the new tax system, where it was declared that the Sami would pay 2 or at most 2½ dalers, while "those who cultivate fields" would pay 4 dalers (Kammarkollegiet, 1910 [1695]). When the 1695 cadastre is studied, however, it is clear that this principle was not applied. A tax level of at least 4 dalers was in fact much more common in the mountain Sami communities, where settlers arrived very late or never, than in the forest Sami communities, where there are known settlements in 1695. In other words, 4 dalers or more was a tax level paid also by rich reindeer-herding Sami, not only by settlers, so this cannot be used to assess the number of settlers.

From the sources mentioned in the beginning of the Appendix, I have reached the conclusion that the following numbers of settlers were included in the Sami communities in the 1695 cadastre: Siggevaara (10), Kittilä (6), Kitka (5), Suonttavaara (5), Sjokksjokk (5), Sompio (3), Umbyn (3), Åsele (2), Maanselkä (2), Sodankylä (1), Peltojärvi (1) and Gran (1). Almost all of these settlers came

from outside and they were mostly Finns, also in Umbyn and Åsele in the south-west. Some settlers were Swedes or Sami, though. The ethnic classification of settlers usually requires access to literature on genealogy and local history, but it can sometimes be ambiguous or impossible.

In the analysis presented in section 5.1, I have included settlers regardless of origin, as long as they were holders of taxlands. This was, however, not always evident. In some cases I was well aware of the situation. For example, in Åselebyn there were two settlers in the cadastre who were both registered for Gapsele (Gafsele). Most probably, they were also the holders of a taxland located around this village, since such a land was mentioned in later sources (Westerdahl, 2008, p. 38). By contrast, the three settlers of Umbyn were all registered for Örträsk but they were not landholders, as evidenced by other sources (Egerbladh, 1965, pp. 32ff). Instead, the taxland around Örträsk was held by a Sami who would later cede it to another settler, the founder of Knaften (Egerbladh, 1963a; Göthe, 1929, pp. 326ff). In other words, the conclusion of whether a settler held a taxland or not not requires detailed knowledge of the conditions of each community, a knowledge that I have not been able to acquire in each and every case. Instead, I have used the bits and pieces of information that I have gathered from literature, and sometimes I have guessed.

In short, the total number of persons registered in each Sami community in the 1695 cadastre is not the same as the number of taxpayers, the number of Sami, or the number of non-settlers. Considerations of these aspects as well as numerous others, depending on the analysis performed, are necessary when data is used from this source. In most cases, the right values are subject to discussion.