Hilja Solala

From Variable Animal Populations to the Nordic Mountain Cattle Breeds

– A Model of the Birth of Native Animal Breeds and Local Cattle Types in Northern Sweden, Finland and Norway at the End of the Nineteenth Century and the Beginning of the Twentieth Century

Introduction

Today, historians have shown how including animals in historical research has changed our understanding of the past.[1] Even if animals have been breaking through the field of history via a multispecies angle in a more visible way in Finland in the twenty-first century,[2] we do not yet know even all the essential basic elements of the history of domestic animals. They have had, for example, a larger role in the studies of agricultural history in Sweden[3] than in Finland[4] but are nevertheless an integral part of it. At least in Finland, even basic research about the history of domestic animals is still needed.

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1 See e.g. Harriet Ritvo, *Noble Cows and Hybrid Zebras. Essays on Animals and History*. University of Virginia Press, Charlottesville and London 2010; Erica Fudge, "What Was It Like to Be a Cow? History and Animal Studies". *The Oxford Handbook of Animal Studies*. Edited by Linda Kalof. Oxford University Press, New York 2017, 258–278; Sandra Swart, ""The World the Horses Made": A South African Case Study of Writing Animals into Social History". *International Review of Social History*, 2010, 55, 241–263.

2 E.g. *Kanssakulkijat. Monilajisten kohtaamisten jäljillä*. Edited by Tuomas Räsänen and Nora Schuurman. Suomalaisen Kirjallisuuden Seuran Toimituksia 1464. SKS, Helsinki 2020.

3 See e.g. Göran Björnhag, "De svenska husdjursrasernas historia". *Agrarhistoria*. Edited by Bengt M P Larsson, Matts Morell and Janken Myrdal. Natur och kultur. LTs förlag, Stockholm 1998, 105–119; Mats Morell, *Jordbruket i industrisamhället 1870–1945. Det svenska jordbrukets historia 4*. Natur och Kultur. LTs förlag, Nordiska museets förlag and Stiftelsen Lagersberg, 2001, 226–261.

4 Animals had earlier been a larger part of agricultural and rich local history research in Finland but have often been passed over for many decades before the twenty-first century. See e.g. Seppo Simonen, *Raivaajia ja rakentajia. Suomen maatalouden historiaa*. Kirjayhtymä, Helsinki 1964, 61–155; Kustaa Vilkuna, *Suomen vetohäristä.* Varsinais-Suomen historiantutkimusyhdistys, Turku 1931.

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In this article[5], I study one of the central elements of the roots of present-day animals. The characteristics of animals have changed throughout history. This is partly because of natural selection, climate and environmental circumstances and people. Breeding, especially, is the topic that has widely affected the appearance of present-day animals. A leading pioneer of human–animal studies, historian Harriet Ritvo, focused on this theme already in the 1980s.[6] In recent years, the history of animal breeding has developed into its own field of history. In addition to Ritvo, historians Margaret E. Derry and Bert Theunissen, among others, have pointed out

[5] The article is an output from the 3MC – Nordic Mountain Cattle. Cultural Heritage & Genetics project, funded by Interreg Nord, Region Norrbotten and Lapin liitto and led by Section Leader Farm Animals Mervi Honkatukia, Nordic Genetic Resource Center (NordGen). See e.g. *Snöhvit, Punakorva, Fjellblom. Nordic Mountain Cattle – the Past, Present, and the Future*. Edited by Hilja Solala and Mervi Honkatukia. The 3MC – Nordic Mountain Cattle. Cultural Heritage & Genetics project, 2022. I want to thank Mervi Honkatukia and Auli Bläuer for many inspiring conversations and the three anonymous reviewers for their helpful comments.

[6] E.g. Harriet Ritvo, "Pride and Pedigree: The Evolution of the Victorian Dog Fancy". *Victorian Studies,* Winter 1986, 227–253; Harriet Ritvo, *The Animal Estate. The English and Other Creatures In The Victorian Age*. Harvard University Press, Cambridge, Massachusetts 1987, 43–121.

this rich and complex question.[7] Breeding also gives many interesting approaches to other fields of history. For example, studying the development of the principles of breeding gives fertile perspectives to the history of science.[8]

At the core of this article are the oldest types of animals: native animal breeds (landraces). They are local domestic animal populations adapted to the environment they have lived in for hundreds or even thousands of years, as well as to traditional agricultural production systems. They have formed over time and are seen as original in certain geographical regions.[9] These rare and often endangered breeds are

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7 E.g. Margaret E. Derry, *Bred for Perfection. Shorthorn Cattle, Collies, and Arabian Horse Since 1800*. The Johns Hopkins University Press, Baltimore and London 2003; Margaret E. Derry, *Horses in Society. A Story of Animal Breeding and Marketing, 1800–1920*. University of Toronto Press, Toronto, Buffalo and London 2006; Margaret E. Derry, *Masterminding Nature. The Breeding of Animals, 1750–2010*. University of Toronto Press, Toronto, Buffalo and London 2015; Margaret E. Derry, *Made to Order. The Designing of Animals*. University of Toronto Press, Toronto, Buffalo and London 2022; Bert Theunissen, "Darwin and His Pigeons. The Analogy Between Artificial and Natural Selection Revisited". *Journal of the History of Biology*, 2012, 45, 179–212; Bert Theunissen, "Breeding Without Mendelism: Theory and Practice of Dairy Cattle Breeding in the Netherlands 1900–1950". *Journal of the History of Biology*, 2008, 41, 637–676; Bert Theunissen, *Beauty or Statistics. Practice and Science in Dutch Livestock Breeding, 1900–2000*. University of Toronto Press, Toronto, Buffalo and London 2020; Roger J. Wood and Vítězslav Orel, *Genetic Prehistory in Selective Breeding. A prelude to Mendel*. Oxford University Press, Oxford 2001; Nicholas Russell, *Like engend'ring like. Heredity and animal breeding in early modern England*. Cambridge University Press, Cambridge, London, New York, New Rochelle, Melbourne and Sydney 1986; Barbara Orland, "Turbo-Cows. Producing a Competitive Animal in the Nineteenth and Early Twentieth Centuries". *Industrializing Organisms. Introducing Evolutionary History*. Edited by Susan R. Schrepfer and Philip Scranton. Hagley Perspectives on Business and Culture, Volume 5. Routledge, New York and London 2005, 167–189; Steven van der Laan, "Communicating an Innovation: Building Dutch Progeny Testing Stations for Pigs". *Agricultural Knowledge Networks in Rural Europe, 1700–2000*. Edited by Yves Segers and Leen Van Molle. Boydell Studies in Rural History. The Boydell Press, Woodbridge 2022, 218–234; Dries Clayes and Yves Segers, "'The Eye of the Master': Livestock Improvement and Knowledge Networks in Belgium, 1900–1940". *Agricultural Knowledge Networks in Rural Europe, 1700–2000*. Edited by Yves Segers and Leen Van Molle. Boydell Studies in Rural History. The Boydell Press, Woodbridge 2022, 132–154; Rebecca J. H. Woods, *The Herds Shot Round the World. Native Breeds and the British Empire, 1800–1900*. The University of North Carolina Press, Chapel Hill 2017.

8 See e.g. *Heredity Produced. At the Crossroads of Biology, Politics, and Culture, 1500–1870*. Edited by Staffan Müller-Wille and Hans-Jörg Rheinberger. Transformations: Studies in the History of Science and Technology. The MIT Press, Cambridge/Massachusetts and London 2007.

9 Ulla Ovaska, Auli Bläuer, Charlotte Kroløkke, Maria Kjetså, Juha Kantanen and Mervi Honkatukia, "The Conservation of Native Domestic Animal Breeds in Nordic Countries: From Genetic Resources to Cultural Heritage and Good Governance". *Animals*, 2021, 11(9):2730, DOI:10.3390/ani11092730.

conserved by national and international agreements.[10] First, I will outline the main phases of the birth of native animal breeds in the modern sense of the concept of the breed from the viewpoint of historical research. Second, I will analyse how the turning point of breeding manifested in local cattle types in northern Sweden, Finland and Norway at the end of the nineteenth century and beginning of the twentieth century. The construction of breeds has been studied in the history of animal breeding but not from the viewpoint of native animals in the Nordic countries as much as in other fields of science, especially by Camilla Eriksson and Andrea Petitt[11]. This article brings up northern native cattle breeds in a more detailed way in the field of history.[12] In Finland, this article also makes theme of breeding more prominent in historical research in general.[13] This article is not only part of rich international research about the history of animal breeding, but also part of the research of native animals in other fields of science. Knowledge about the birth of the Nordic Mountain Cattle breeds could also be used in multidisciplinary research.

In the creation of breed in its modern sense, the herd book was – and still is – fundamental. Therefore, I concentrate on the establishment of herd books and their first animals when illustrating phenomena like the birth of native cattle breeds in northern Fennoscandia. The herd book was seen as the register of breeding animals

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10 The agreements concerning Finnish native animals, see Tuula Pehu, Elina Kiviharju, Mari Rusanen, Juha Kantanen and Petri Heinimaa, *Suomen maa-, metsä- ja kalatalouden kansallinen geenivaraohjelma*. Publications of the Ministry of Agriculture and Forestry 2018:11a. Ministry of Agriculture and Forestry, Helsinki, http://urn.fi/URN:ISBN:978-952-453-994-4.

11 Camilla Eriksson and Andrea Petitt, "Designing Cattle: The Social Practice of Constructing Breeds". *Anthrozoös*, 2020, 33:2, DOI:10.1080/08927936.2020.1719758, 175–190; Andrea Petitt and Camilla Eriksson, "Breeding Beyond Bodies: Making and "Doing" Cattle". *Society & Animals*, 2022, 30, DOI:10.1163/15685306-00001733, 108–126; Sakari Tamminen, *Biogenetic Paradoxes of the Nation. Finncattle, Apples, and Other Genetic-Resource Puzzles*. Duke University Press, Durham 2019, 38–83. See also Camilla Eriksson, "Fjällkor för bevarande och produktion. Om olika drivkrafter bakom lantrasavel". *Nötkreatur i Sverige. Kulturhistoriska och samtida perspektiv*. Edited by Katharina Leibring and Ingvar Svanberg. Institutet för språk och folkminnen, Uppsala 2020, 123–146.

12 However, a popular book or a thesis has been written on these breeds. E.g. Robert Nilsson, *Fjällkon – historik, avel och framtid*. Luleå 2007; *Sidet trønderfe og nordlansfe. Matprodusent, tradisjonsbærer og genetisk ressurs*. Edited by Atle Meås. Avlslaget for sidet trønderfe og nordlandsfe, 2014; Jaana Juvani, *Pohjoissuomenkarjan kantakirja-analyysi*. Thesis from Degree Programme in Agricultural and Rural Industries, Oulu University of Applied Sciences 2014, https://www.theseus.fi/bitstream/handle/10024/81435/Juvani_Jaana.pdf?sequence=1&isAllowed=y (read 13.10.2022). See also Håkan Hallander, *Svenska lantraser. Deras betydelse förr och nu*. 1989, 186–240.

13 Some Finnish studies about breeding, see e.g. Hilja Solala, *Suomalaisen hevosrodun synty. Maatiaishevonen ja kotieläinjalostuksen kansainvälinen murros 1893–1907*. Tampere University Dissertations 442/2021, https://urn.fi/URN:ISBN:978-952-03-2031-7; Anneli Mäkelä-Alitalo, *Pennusta pitäen – Suomalaisen kennelhistorian ensimmäiset sukupolvet*. SHS, Helsinki 1998; Seppo Simonen, *Suomen ayrshireyhdistyksen historia*. Suomen ayrshireyhdistys, Helsinki 1950.

of one breed. It was, in essence, a breeding system concretised as a book or booklet about animals observed to keep the conditions of herd book animals of the breed. Herd books were maintained by societies or even the state and led by breeding experts. To judge the animals, exhibitions were organised. The herd book could contain, for example, information on animals' characteristics, year of birth, pedigree, prizes or cows' milk production (Picture 1).[14] At the same time, registration in the herd book was seen as evidence of being part of the breed as an ideal animal. In addition, the breed was defined as a uniform group of one animal species with similar characteristics. Previously, a motley group of animals could be named, for example, on the grounds of their distribution area or purpose of use, but without any specific breeding standards. As many historians, especially Bert Theunissen, Harriet Ritvo and Margaret E. Derry, have shown, this turn was topical in the ideology of animal breeding since the late eighteenth century and particularly in the latter part of the nineteenth century.[15] Before the herd books, it would be clearer to use terms such as a type or a population, meaning previous non-uniform animal stocks – which were variable according to animals' appearance, other characteristics or descent – as a difference from the present-day uniform animal breeds with the detailed breed definitions.[16] Since the establishment of herd books, the term breed has been used in its modern sense. Even if the definitions and implementations of herd books have changed throughout their history, both the concepts, that is, the breed and the herd book – or the stud book – are still the bases of animal breeding. For example, the general breeding organisations maintain each of the present-day Nordic Mountain Cattle breed's herd book.

This article is divided into theoretical and empirical parts. First, I outline a model for the formation of the native breed. This was inspired by previous studies on the history of animal breeding, especially by Margaret E. Derry, Harriet Ritvo and Bert Theunissen.[17] Previous studies about the international turning point of breeding helped in understanding the contexts of the large phenomenon in Europe at the end of the nineteenth century. The concept of the herd book was new, and from the stages of its introduction can also be found similarities to the theories about decision-making and diffusion of innovations, for example, by communication theorist and sociologist Everett M. Rogers.[18] The sources of the second, empirical part consist of cattle

[14] About the realisation of herd books of different breeds, e.g. Orland 2014, 177–184; Solala 2021.

[15] See e.g. Ritvo 2010, 166–174; Ritvo 1986; Ritvo 1987, 64–65, 93–96, 107–108; Theunissen 2012, passim; Theunissen 2008, 637–676; Orland 2005, 177–181; Derry 2003; Derry 2006; Solala 2021, 34–38, 19–31.

[16] The concept of breed, see also Margaret Derry, Donna Haraway, Donna Landry, Harriet Ritvo and Sandra Swart, "Roundtable on Breed", *Humanimalia*, Fall 2018, 10:1, 5–26.

[17] E.g. Derry 2003; Derry 2006; Theunissen 2008; Theunissen 2012; Ritvo 1987, 45–121; Ritvo 2010, 157–176.

[18] Everett M. Rogers, *Diffusion of Innovations*. The fifth edition. Free Press, New York 2003.

P.-S. K. *A 1.* **Punakorva.** Omistaa A. Junes, Alatornio.

Lehmiä.

(A 1) ***Punakorva*** (1 polvi)

Syntynyt: 1902 Turtolan Lamsijärvellä.
Omistaja: A. Junes, Alatorniolla.
Väri: Valkea, korvan nokat ruskeat, pilkku kaulassa.
Mitat: sk 114, rk 49, rl 38,5, ll¹ 38, ll² 38, ll³ 26, ey 168, ty 174, rp 136, kp 196.
Lypsänyt: 2,564 kg à 3,9 % rasvaa.
Palkittu: Turtolassa 1902 2 palk., Alatorniolla 1903 1 palk., Simossa 1908 ryhmässä 1 palk., lypsylehmänä 3 palk.

Picture 1. Punakorva was the first herd book cow of Northern Finncattle. Source: Pohjois-Suomen karjanjalostusyhdistys v:na 1905–1909. Pohjois-Suomen maatiaiskarjan kantakirja I. Oulun kirjapaino oy, Oulu 1910, 92, appendix.

breeding documentation from northern Sweden, Finland and Norway. To analyse the characteristics of native cattle at the introduction of the new breeding method and its effects on their characteristics, the main primary sources are, of course, the herd books of the Nordic Mountain Cattle breeds (Table 1).[19]

Table 1. The herd books of the Nordic Mountain Cattle in this study.[20]

Region	Years	Cows	Bulls
Sweden (Swedish Mountain Cattle)			
Västernorrland	1899	157	24
Västerbotten	1898 - 1900	83	21
Norrbotten	1898	45	11
Jämtland	1898	120	48
Kopparberg	1899	93	32
Gävleborg	1900	36	5
Finland (Northern Finncattle)	1906 - 1909	120	90
Norway (Coloursided Troender and Nordland Cattle)	1893 - 1900	4	89

Sources: *Stambok öfver ayrshire- och fjäll-boskap inom Gefleborgs län. III 1902.* Published by hushållningssällskapet (premieringsnämd). Bröderna Rosenlöf, Kungsgård 1902, 17–22, 26; *Stambok öfver fjäll-boskap inom Kopparbergs län. III 1903.* Published by hushållnings-sällskapet (premieringsnämd). Falu Nya Boktryckeri–Aktiebolag, Falun 1903, 3–16, 34–38; *Stambok öfver Fjällboskapen inom Norrbottens län.* Published by Premieringsnämnden. 1898, 6–9, 11–18; *Stambok öfver fjäll-boskapen inom Vesternorrlands län. III.* Published by hushållnings-sällskapet (premieringsnämd). Hernösands-postens tryckeri-aktiebolag, Hernösand 1900, 61–86, 91–95; H2:1 Huvudstambok 1891–1910 Hondjur, The Archive of the Economic Society of the County of Jämtland, Riksarkivet, Östersund; H2:3 Huvudstambok 1893–1906 Handjur, The Archive of the Economic Society of the County of Jämtland, Riksarkivet, Östersund; F 16 Husdjursnämnden 145 Stambok, VB, The Archive of the Economic Society of the County of Västerbotten, The Archive of Popular Movements, Västerbotten; *Pohjois-Suomen karjanjalostusyhdistys v:na 1905–1909. Pohjois-Suomen maatiaiskarjan*

19 The research was made during the COVID-19 pandemic. I want to thank Maria Kjetså (NordGen) for copying the Norwegian herd books and the Norrbotten Museum, Riksarkivet (Östersund), the Archive of Popular Movements (Västerbotten), and Uppsala University Library the Swedish ones. The information on the Finnish herd books was already gathered by Jaana Juvani related to her thesis (Juvani 2014). I want to thank Juvani for her work, as well as Tampere University Library for interlibrary services.

20 In Sweden, especially in Jämtland, the year of taking the animal to the herd book was not straightforward in some cases. For example, if the animal was prized in exhibitions in several years, the earliest year was not always the one recorded in the herd book. In addition, the number of cows included heifers in Sweden. The possible herd book of Värmland in Sweden could not be found according to an e-mail conversation with Åsa Vålvik from Föreningsarkivet i Värmland.

kantakirja I. Oulun kirjapaino oy, Oulu 1910, 77–152 (collected by Jaana Juvani); W. W. Christie, *Stambok over sidet trønderfe. 1. bind okser født 1890–1925*. Edited by Ivar Nesheim. Nidaros Boktrykkeri A S, Trondheim 1934, 13–30; W. W. Christie, *Stambok over sidet trønderfe. 2. bind kyr nr. 718–1307. Født 1895–1925*. Edited by Ivar Nesheim. Nidaros Boktrykkeri A.s, Trondheim 1936, 11–12.

I have chosen the earliest example years of herd books of the Nordic Mountain Cattle as possible according to the diffusion of the new breeding system in each country (Table 1). Herd books can be found in Sweden as early as the 1890s. They were more detailed closer to the end of the century, when the new method was little more known than in its very first years. Therefore, I chose the example years in every region in Sweden at the end of the 1890s.[21] Quantitatively, Sweden is the most representative because of the many comprehensive herd books from different counties. If the herd book was published, I used the printed version.[22] I analysed the data from Finland from the first published herd book from 1906–1909. From Norway, I explored the animals taken to the herd book in 1893–1900. They were the first ones in the herd book, so they can be seen as the starting point of the breed. However, the system was slightly different in Norway. The information on animals has been gathered afterwards for the first herd book publications (1934 and 1936), mainly from the cattle prized long ago in state exhibitions. The number of animals analysed in Norway is smaller than in Sweden and Finland. Instead of extending the period, I focused on the first herd book animals to study the turning point of breeding in a validated way also in Norway.

In addition, other contemporary publications, including annual reports of associations, agricultural periodicals and other books related to cattle breeding, are used to study the establishment of the herd books and the aims of breeding behind them, that is, the definition of these breeds. Research methods are partly qualitative and partly quantitative for analysing different kinds of primary sources. However, both are fundamentally based on contextualising and interpreting historical analysis, including, for example, source criticism and close reading of the sources about breeding. Because of the three countries, the comparison has an important role in this study.

21 They depend on the accessibility and informativeness of herd books.

22 However, there was the printed version of the earlier herd book in Jämtland but the handwritten one was more informative in 1898. *Stambok för Fjällboskap inom Jämtlands län.* Published by Hushållningssällskapet (premieringsnämd). Östersundspostens tryckeri, Östersund 1895.

History of the doctrine of native animal breeding

The history of cattle is thousands of years long. Nevertheless, the history of cattle breeds in their modern sense is short. Previously, animals had mainly been bred freely on pastures. In addition, different populations had also been crossed with each other. Many previous studies, especially by Margaret E. Derry, as well as Bert Theunissen and Harriet Ritvo, have shown the turning point of breeding. So-called purebred breeding began to develop in the late 1700s. Both the first stud book in Europe – for Thoroughbred in 1791 – and British farmer Robert Bakewell's (1725–1795) breeding principles were at the core of the formation of the new breeding methodology. Its main point was not crossing different breeds with each other. In Europe, during the 1800s, the breeding of purebred animals began reducing indiscriminate crosses. In addition, the so-called constancy theory (August von Weckherlin 1794–1868) based on breeding of one cattle type had already been popular among cattle breeding in the first part of the nineteenth century, but it had mainly been replaced by the so-called individual potency theory (Herman Settegast 1819–1908), which was again based on crossbreeding. Domestic animal breeding was not new, but purebred breeding revolutionised its methods. The concepts of modern animal breeding, the breed – and the definition of breed – and the herd book rose to the core in the new method as a part of the modernisation of breeding. Herd books were increasingly founded for cattle and other domestic animals in Europe in the latter part of the nineteenth century. For what are now recognised as present-day animal breeds, many were formed into breeds in this period. In general, the concept of breed, in its modern sense, became the basis for the classification of domestic animals.[23]

Around the same time, Danish veterinarian and professor Victor Prosch (1820–1885) became an advocate for native animals. He pointed out the importance of preserving the qualities that made them well adapted to their environment. Because of Prosch's ideology on native breeds, Denmark became the role model for the breeding of native animals – especially in the Nordic countries. All this new breeding knowledge arrived in Sweden, Finland and Norway. As a result, the crossing of native

[23] In a more detailed way, e.g. Theunissen 2008; Theunissen 2012; Derry 2006; Derry 2003; Derry 2015; Ritvo 1986; Ritvo 2010, 156–176; Simonen 1950, 23–24, 41; Solala 2021, vii, 19–31, 33–41. About the relationship between Charles Darwin's doctrines and breeding, e.g. Theunissen 2012, 179–207; Derry 2015, 13–14, 32–35.

animals with other breeds began to cease in Nordic countries.[24] However, by then, some local types of animals had already disappeared.[25]

The birth of native animal breeds

In previous studies, it has been shown that there were the large-scale changes in animal breeding as a result of purebred breeding and herd books during nineteenth-century Europe and North America.[26] However, there has been less focus on the native animal breeds of the Nordic countries in recent historical research about breeding.[27] Even though there are some exceptions,[28] the far-reaching effects of Victor Prosch's work have often been overlooked. It was mainly the consequence of his work that the local animal types were saved from total extinction in the Nordic countries at the end of the nineteenth century. Even if the new principles of breeding were applied to native animals, among others, the meaning of this turning point has not yet been highlighted as a whole from the viewpoint of these breeds.[29] This article explores a new angle to the history of animal breeding – the birth of Nordic native animal breeds in the modern sense of the concept.

During the long history of domestic animals, natural selection and unconscious breeding, as well as intentional crossbreeding with other types of animals, led many local populations to variable groups of animals. However, some original types of animals had even gone extinct because of crossings and the spread of more improved

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24 Hilja Toivio (Solala), "Risteytyksistä maatiaisrotuihin. Professori Victor Prosch ja kotieläinjalostuksen murros 1800-luvun jälkipuolella". *Lähde – Historiallinen aikakauskirja*, special issue "Eläimet", 2014, 96–112; Solala 2021, 29–31; Solala and Honkatukia 2022, 59. See also e.g. Hallander 1989, passim; Bjarne Gjelstad, "Nordens husdyr: En presentasjon". *Husdyr i Norden. Vår arv – vårt ansvar. Jord og gjerning 1992/93. Årbok för Norsk landbruksmuseum*. Edited by Bjarne Gjelstad, Nils Kolstad and Kalle Maijala. Landbruksförlaget, Oslo 1993, 33–34, passim. However, Iceland had been isolated in animal breeding.

25 Hallander 1989, passim; Solala 2021, 29–30; Theunissen 2012, 201, 205.

26 See footnotes 6–7.

27 About the construction of Swedish Mountain Cattle in other fields of science, e.g. Eriksson and Petitt 2020; Eriksson 2020. The breeding of native breeds within agricultural history, for example, in Sweden and Norway, e.g. Morell 2001, 241, 251–253; Jan Rendel, *Från byatjur till genteknik. En agrar- och vetenskapshistorisk studie av utvecklingen av svensk husdjursgenetik och husdjursavel under 1900-talet*. Skogs- och lantbrukshistoriska meddelanden nr 30. Enheten för de Areella Näringarnas Historia, 2003, passim; Paul Borgedal, *Norges jordbruk i nyere tid. Bind II Husdyrholdet*. Bøndenes forlag, Oslo 1967, passim. Some informative popular publications, e.g. Hallander 1989, 186–240; Nilsson 2007; Meås 2014; Lauri Myllylä, *Suomenkarja maan alkuperäinen karjarotu*. Suomenkarjan jalostussäätiö, Vantaa 1991, passim.

28 For example, I have explained the birth of Finnhorse as a part of the international turning point of breeding in 1893–1907. Solala 2021.

29 The effect of Prosch's ideas on Finnish native animals. Toivio (Solala) 2014, 96–122.

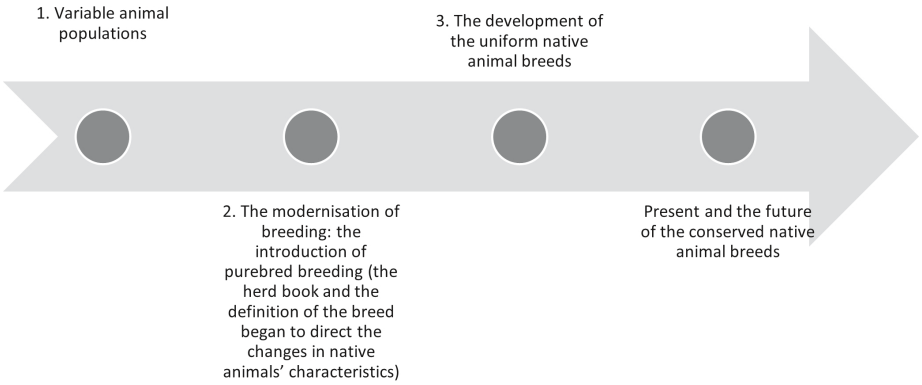

Figure 1. A model of the birth of native animal breeds from the viewpoint of animals' characteristics.

breeds often imported abroad (stage 1, Figure 1).[30] The modernisation of breeding via the establishment of breeds was a turning point in the history of native animals (stage 2, Figure 1). To put it briefly, for the native animals chosen to breed, this meant establishing herd books and breeds in their modern form. From then on, the definition of the established native animal breed was defined, which meant that other kinds of animals and their influence on the breed were excluded, where possible. Now, one of the main aims of their breeding was to replace earlier often-used crossbreeding with purebred breeding.[31] These changes were crucial to saving local animal types, even if parts of their somewhat random and variable populations were excluded from recently established breeds based on their strict breed definitions. Because of the unifying of populations,[32] some local types in Europe even disappeared, such as a native pig type from eastern Finland[33]. In any case, the turn was the starting point for the construction of uniform native animal breeds. Developing a uniform animal breed (stage 3, Figure 1) has also had many critical points, here based on the breeding decisions and surrounding society.[34] In this way, the future of native breeds also depends on the decisions made today. These three parts (Figure 1) are one way

30 E.g. Hallander 1989, passim; Auli Bläuer, *Voita, villaa ja vetoeläimiä. Karjan ja karjanhoidon varhainen historia Suomessa*. Karhunhammas 17. Archaeology, University of Turku, Turku 2015, passim; Theunissen 2012, 200–205.

31 See in short, e.g. Solala 2021, 19–30, 33–39.

32 E.g. Theunissen 2012, 200–205.

33 Bläuer 2015, 165–167.

34 These can be catastrophes like a war – such as the Lapland War (the Second World War) for Northern Finncattle – or changes in agriculture or structure of society. If the size of the stock of one native breed decreased enough, challenges can occur at stage 3. In that case, one option for conserving the breed could be to study breeding decisions in its joint history with some other native breed. Solala and Honkatukia 2022, 60, 55, 63.

to outline the stages of the formation of present native breeds in the international context of the history of animal breeding. However, every native animal breed has its own history, with local and temporal details.[35] If this three-stage development did not occur or had failed, the native type of animal may have become extinct. In addition, stage 4 could be added to the model: does the native animal breed still exist, and, if so, how is the conserved breed doing today and in the future?

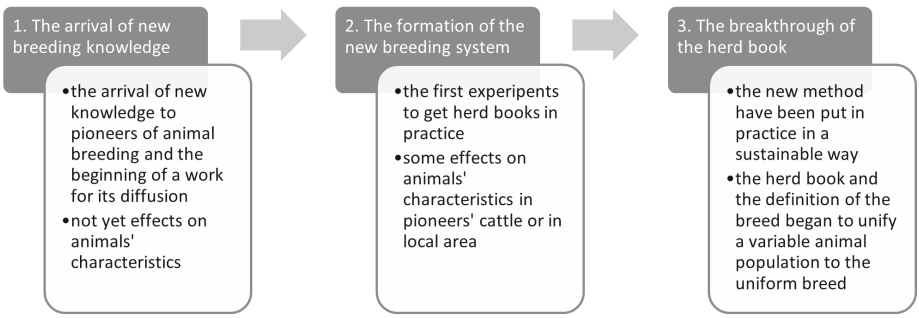

Figure 2. The modernisation of native animal breeding from the viewpoint of establishing the herd book.

Figure 2 shows the three stages of the modernisation of native animal breeding, which are included in stage 2 in Figure 1. Fundamentally, it meant establishing a herd book system related to the breed in its modern form. The process is divided into the arrival of international breeding knowledge, the formation of a new breeding system and the breakthrough of the herd book. I have already used this kind of division about the turning point of animal breeding with the birth of Finnhorse.[36] I noted that there is also much in common between the three stages (Figure 2) of the turning point of breeding and five stages of Everett M. Rogers' theory of the diffusion of innovations.[37] Together, the three stages of the modernisation of native animal breeding via the establishment of a herd book marked a watershed moment between variable animal populations and native animal breeds in their modern sense. This turning point has been central to native animals existing as their own breeds today.

The breakthrough of northern native cattle herd books

Next, I focus on what is often the most critical phase in a model of the birth of native animal breeds (stage 2, Figure 1; Figure 2). When compared with Finland and Norway,

35 E.g. Hallander 1989.
36 Solala 2021.
37 Rogers 2003.

Sweden took a leading role in developing northern native cattle as its own breed at the end of the nineteenth century. In Sweden, the breeding of northern native cattle was discussed already in the 1850s, instead of concentrating to imported breeds.[38] In July 1893, there was a meeting concerning the aim of local cattle breeding in Östersund. The chair of the meeting was the secretary of the Economic Society of the County of Jämtland, J. F. Broman. He was also one of Sweden's leading advocates for breeding mountain cattle.[39] Herd books of mountain cattle breed (*fjällras*) were implemented with government-supported cattle exhibitions. The first herd book was published as early as 1894. In the 1890s, herd books were established in the counties of Jämtland, Västernorrland, Västerbotten, Norrbotten, Kopparberg and Gävleborg. In addition, some animals may have been added to a herd book in the county of Värmland. Local economic societies maintained the herd books of the county (*länsstamböcker*). Later, only part – as little as 21.2%[40] – of the nearly 20,000 animals of the regional herd books was recorded in the one herd book of the state. This collective herd book, the *Riksstambok över svensk fjällboskap*, replaced the earlier herd books in 1916 (stage 2, Figure 1; also stage 3, Figure 2). However, there is a continuum between these herd books. Today, this native animal breed is known as Swedish Mountain Cattle.[41]

Also, in northern Finland, the focus on cattle breeding at the end of the nineteenth century was part of the more extensive interest in animal – especially cattle and horse – breeding in Finland. For example, the question of a suitable cattle breed began to be discussed in agricultural meetings in northern Finland in 1878 and 1884.[42] The

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38 Paul Hellström, *Norrlands jordbruk*. Almqvist & Wiksells boktryckeri-A.-B., Uppsala 1917, 552–553.

39 "Till fjällrasens förbättrande". *Jämtlandsposten* 2.8.1893; J. F. Broman, "Hvilka erfarenheter hafva vunnits vid de pågående förädlingsarbetena med vår inhemska fjällras, och i hvilken rigtning bör detta förädlingsarbete fortfarande bedrifvas?". *Landtbruks-akademiens handlingar och tidskrift* H.3./1897, 192; J. F. Broman, "Några ord uti en för Norrland betydelsefull fråga". *Jämtlands läns Hushållningssällskaps Handlingar för År 1893*. Jämtlandspostens boktryckeri, Östersund 1894, 210–211; Hallander 1989, 197–198; Nilsson 2007, 23–24, 27. See also J. F. B–n, "Fjällrasen". *Jämtlands Fjällboskap. Typer från länets Nötboskapspremieringar jemte Dess Hushållningssällskaps Stambok*. Östersundspostens tryckeri, Östersund 1895, 5–7.

40 However, some animals had been recorded in two regional herd books. Kungl. Lantbruksstyrelsen, *Riksstambok över svensk fjällboskap (vit kullig svensk lantras). I. Delen 1892–1915*. Förlagsaktiebolagets i Malmö boktryckeri, Malmö 1922, V–VII, 1–147.

41 *Riksstambok över svensk fjällboskap (vit kullig svensk lantras). I. Delen 1892–1915*, III–XI; Solala and Honkatukia 2022, 56, 59. See also Nilsson 2007, 27. More about the breeding of *fjällras*, see also e.g. Hållander 1989, 186–203.

42 The question of cattle breeding in northern Finland at the end of the nineteenth century, e.g. Östen Elfving, "Några iakttagelser om nötboskapen i norra Finland". *Biet* 4/1896, 106–117; Eewert S–la, "Nautakarjan parantamisesta Perä-Pohjolassa". *Maatalouslehti* 1/1900, 4–7; U. Wegelius, *Oulun läänin talousseuran 75-vuotinen historia*. Oulun kirjapaino-osakeyhtiön kirjapaino, Oulu 1904, 276–277; Seija Miettinen, *150 vuotta Oulun l. talousseuran historiaa. 7 vuotta maatalouskeskuksen aikaa*. Oy Liiton kirjapaino, Oulu 1978, 114. More about animal breeding in Finland, Solala 2021; Toivio (Solala) 2014, 96–112.

local cattle population had its defenders, such as the consultant of cattle keeping, Akseli Kiianlinna, and a teacher of the Koivikko agricultural school, Mauno Barker, among others.[43] Even if the Swedish model of breeding local mountain cattle was well known,[44] the question was not simple to solve. There were two known types of cattle in northern Finland: Lappish (*lappilainen* or *Perä-Pohjolan kanta*) and Northern Finnish (*Pohjois-Suomen kanta*).[45] The question of breeding these local cattle types as a breed actualised, especially at the turn of the century. The Northern Finnish Cattle Breeding Association was established in 1905 by the Agricultural Society of Perä-Pohjola and the Economic Society of the County of Oulu (stage 2, Figure 1; also stage 3, Figure 2).[46] This association established the first large-scale herd book[47] for northern native cattle in Finland and made its first breed definition. However, the name of the breed and its characteristics – first of all, the colour of the cattle – became the main topic of discussion because of the two different local cattle types in northern Finland. As a result, the Northern Finnish Cattle Breeding Association initially set up a herd book for white- and red-coloured animals.[48] Later,

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43 *Pohjois-Suomen karjanjalostusyhdistys v:na 1905–1909. Pohjois-Suomen maatiaiskarjan kantakirja I*, 15. See also e.g. Östen Elfving, "Några iakttagelser om nötboskapen i norra Finland". *Biet* 4/1896, 106–117; Eewert S–la, "Nautakarjan parantamisesta Perä-Pohjolassa". *Maatalouslehti* 1/1900, 4–7; A. N., "Perä-Pohjolan tunturirotu". *Maamies* 3/1905, 56–59.

44 See e.g. E. F. S., "Kirje Jämtlannista". *Maamies* 17/1901, 276–277; E. F. Simola, *Matkakertomus viime kesäisestä ulkomaanmatkasta, jonka tein valtion ja Perä-Pohjolan maamiesseuran myöntämillä matkarahoilla karjanhoidon, meijeritalouden ja sikahoidon tutkimista varten Ruotsissa, Norjassa ja Tanskassa*. Maanviljelyshallituksen tiedonantoja N:o XL 1902. Keisarillisen senaatin kirjapaino, Helsinki 1902, 1–8; *Pohjois-Suomen karjanjalostusyhdistys v:na 1905–1909. Pohjois-Suomen maatiaiskarjan kantakirja I*, 14.

45 *Pohjois-Suomen karjanjalostusyhdistys v:na 1905–1909. Pohjois-Suomen maatiaiskarjan kantakirja I*, 3, 16; A. Peltovuoma, "Karjanhoito ja maitotalous". *Perä-Pohjolan Maamiesseuran Toiminta-aloilta. Kirjoituksia maanviljelys-, karjanhoito-, metsänhoito- ja puutarhanhoito-oloista Perä-Pohjolassa*. Oulun Kirjapaino-Osakeyhtiön Kirjapaino, Oulu 1907a, 13–20; A. Peltovuoma, *Perä-Pohjolan karja. Sen jalostus, ruokinta ja hoito*. Kustannusosakeyhtiö Otava, Helsinki 1916, 7–12.

46 See e.g. Östen Elfving, "Några iakttagelser om nötboskapen i norra Finland". *Biet* 4/1896, 106–117; Eewert S–la, "Nautakarjan parantamisesta Perä-Pohjolassa". *Maatalouslehti* 1/1900, 4–7; A. N., "Perä-Pohjolan tunturirotu". *Maamies* 3/1905, 56–59; "Siitosyhdistys Perä-Pohjolaan". *Maamies* 7/1905, 138–140; *Pohjois-Suomen karjanjalostusyhdistys v:na 1905–1909. Pohjois-Suomen maatiaiskarjan kantakirja I*, 15–20.

47 According to some sources, it could have already been a herd book organized by the Economic Society of the County of Oulu. Marjatta Perälä, *Kotieläinneuvonnan vaiheita Oulun läänin Talousseurassa 1829–1969, Oulun maatalouskeskuksessa 1970–1991, Oulun Maaseutukeskuksessa 1992–2004*. ProAgria Oulu 2008, 17–18.

48 "Siitosyhdistys Perä-Pohjolaan". *Maamies* 7/1905, 138–140; *Pohjois-Suomen karjanjalostusyhdistys v:na 1905–1909. Pohjois-Suomen maatiaiskarjan kantakirja I*, 3, 15–20; Peltovuoma 1907a, 13–20.

white stock became the focus.[49] This native animal breed became known as Northern Finncattle.[50]

Purebred breeding became topical in Norway around the 1890s as well. The question of breeding concerning northern native cattle also arose in Norway, emerging especially in the region of Röros.[51] Compared with Sweden or Finland, the case for northern native cattle was the most complex because of multiple local stocks in Norway, according to the founding of the herd book. The colour of cattle or whole question about the breed was not simple to solve.[52] Finally, five local cattle types – Röros, Snåsa, Trysil, Nordland and Finnmark Cattle[53] – were merged into one breed. The herd book's breakthrough took a long time, and the first herd book of Coloursided Troender and Nordland Cattle was published as late as 1934 (stage 2, Figure 1; also stage 3, Figure 2). However, every region was not yet in the herd book. The first herd book was done by assistant of husbandry W. W. Christie and published by the consultant of the state Ivar Nesheim. Information on animals was partly based, for example, on earlier cattle exhibitions organised by the state since the 1890s, and

49 Juvani 2014, 28–29.

50 See also Solala and Honkatukia 2022, 57, 59.

51 Helge Bækkedal, *NRF og norsk feavl*. Landbruksforlaget, Oslo 1980, 87; Erik Stenvik, "Opprinnelsen til tamfeet og framveksten av raser". *Sidet trønderfe og nordlandsfe. Matprodusent, tradisjonsbærer og genetisk ressurs*. Edited by Atle Meås. Avlslaget for sidet trønderfe og nordlandsfe 2014, 16–19; Ola Syrstad, "Sidet trønderfe og nordlandsfe - ein rase blir til". *Sidet trønderfe og nordlandsfe. Matprodusent, tradisjonsbærer og genetisk ressurs*. Edited by Atle Meås. Avlslaget for sidet trønderfe og nordlandsfe 2014, 23–38. The beginning of cattle breeding in Röros, see also e.g. Hans Tilrem, "Feavlen i Rørosdistriktet gnemmon 50 år". *Landbrukstidende* 1953, 248–251. New cattle breeding knowledge in Norway, e.g. Harald Skjervold, "Fra landraser til seminavl". *Jord og gjerning 1988. Årbok för Norsk landbruksmuseum*. Edited by Elisabeth Koren and Kåre Sveen. Landbruksförlaget, Oslo 1987, 48–50; Borgedal 1967, 223–243; Bernt Holtsmark, *Husdyrlære*. Grøndahl & søns forlag, Kristiania 1908, 92–97, 99–101; Bernt Holtsmark, *Husdyrlære*. Grøndahl & søns forlag, Kristiania 1897, 80–88, 90–93.

52 Harald Skjervold, "Storfeavlen gjennom hundre år". *Norske melkeprodusenters landsforbund 1881–1981*. Oslo 1981, 400; Bækkedal 1980, 84–87, 107–108, 117–118, passim; Bjarne Gjelstad, "Norske husdyrraser – opprinnelse og utvikling". *Jord og gjerning 1987. Årbok för Norsk landbruksmuseum*. Edited by Elisabeth Koren and Kåre Sveen. Landbruksförlaget, Oslo 1987, 41; Hans Tilrem, "Storfeavlen i Norge 1850-1950". *Norsk Landbruk* 1954, 116–118. See also Solala and Honkatukia 2022, 59.

53 Later, Nordland and Finnmark Cattle become extinct, e.g. Atle Meås, "Hva skjedde med nordlandsfeet?". *Sidet trønderfe og nordlandsfe. Matprodusent, tradisjonsbærer og genetisk ressurs*. Edited by Atle Meås. Avlslaget for sidet trønderfe og nordlandsfe 2014, 127–133; Harald Rasmussen, "Den store dyretransporten". *Sidet trønderfe og nordlandsfe. Matprodusent, tradisjonsbærer og genetisk ressurs*. Edited by Atle Meås. Avlslaget for sidet trønderfe og nordlandsfe 2014, 136–140.

there were even animals born as early as the 1890s. In the first herd book, the bulls chosen were owned by local breeding associations and some private persons.[54]

All in all, the discussion around breeding the three northern native cattle as specific breeds began to take shape in Sweden, Finland and Norway at the end of the nineteenth century (stages 1 and 2, Figure 2). Because the birth of the breeds related directly to the establishment of the herd books, the breakthrough of the herd books of these cattle was crucial (stage 3, Figure 2). The strength of introducing a new breeding system was demonstrated by the existence of several informative herd books. The numbers of early herd book animals (Table 1 in the introduction) reveal the stage of the diffusion of new breeding knowledge and its principles. On the strength of the statistics as well, the method was introduced the sharpest at first in Sweden. Finally, despite complex formation processes, the herd books were founded for northern native cattle in all three countries. Establishing the breeds (stage 2, Figure 1) caused a turning point in their history. It is still the basis for the existence of the conserved Nordic Mountain Cattle.

Unifying the characteristics

Present-day animals of the Nordic Mountain Cattle are usually polled and white or white with different kinds of darker marks. They mainly look the same in Finland, Sweden and Norway.[55] However, it cannot be assumed that the appearance of these cattle has always been the same, even if it has been illustrated that there was an old white and polled cattle population in northern Fennoscandia.[56] Despite a possible shared origin, it has been shown that there has been lots of variability in northern

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54 Syrstad 2014, 23–38; Solala and Honkatukia 2022, 56, 59; Robert Nilsson, "STN-rasens avlshistorie". *Sidet trønderfe og nordlandsfe. Matprodusent, tradisjonsbærer og genetisk ressurs*. Edited by Atle Meås. Avlslaget for sidet trønderfe og nordlandsfe 2014, 144–145; Christie 1934, 7–8. The first herd book was for bulls and the second for cows. See also Christie 1936.

55 Solala and Honkatukia 2022, 56–57.

56 See e.g. *Pohjois-Suomen karjanjalostusyhdistys v:na 1905–1909. Pohjois-Suomen maatiaiskarjan kantakirja I*, 3–7, 11; A. Kiianlinna, "Pohjoisten seutujen valkoinen karjarotu (J. Ekelundin mukaan)". *Maamies* 9/1907, 218–219, 223–224; Peltovuoma 1916, 7–9; Holtsmark 1908, 261–262, 264; Hallander 1989, 115, 119. See also E. O. Arenander, *Undersökningar rörande den obehornade nötboskapens (fjällboskapens) härstamning*. Föredrag vid Andra Nordiska Landtbrukskongressen. Förlags-Aktiebolagets Boktryckeri, Malmö 1897; E. O. Arenander, *Den obehordade nötboskapstypens oföränderlighet under mer än 4000 år*. Meddelande från Ultuna landtbruksinstitut N:r 25. Almqvist & Wiksells boktryckeri-a.-b., Uppsala 1919.

native cattle populations. The animals of one stock were quite diverse.[57] For example, there were cattle in five colours and polled and horned in the municipality of Kittilä, Finland, in the 1890s.[58]

According to a model of the birth of native animal breeds, their herd books were the turning point of animals' characteristics when the unification of variable local populations into specific breeds began (stage 2, Figure 1). The first herd books reveal what the ideal animals were like during this change in breeding. As Harriet Ritvo, Bert Theunissen and Margaret E. Derry have shown, the definition of the breed – from variable population – was one of the first tasks to be done when establishing the herd book. In general, the external characteristics of an animal played an important role in this. For example, a colour could be seen as a mark of the influence of other types of animals.[59] When the definitions of which animals were to be included and which to be excluded in the breed began to take shape, colour was one of the central approaches to defining the northern native cattle breeds.[60] In Sweden, the colour of the *fjällras* breed was determined as white, with smaller black or red marks.[61] According to Figure 3, white was the primary colour of herd book cattle in the counties of Västerbotten and Västernorrland at the end of the 1890s. There was only diversity in the marks on the white base colour. All white was the most common colour of herd book animals in Västerbotten in 1898–1900. In Västernorrland, the most common colour in 1899 was white with reddish ears. The majority of these

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57 See e.g. J. Ekelund, *Avelscentra för nötboskap. Redogörelse för avelscentertävlingarna 1913–1915 och 1918–1920 jämte allmän översikt av avelscenterverksamheten*. Del II. Fjällras. Meddelanden från Kungl. Landtbruksstyrelsen N:r 257. Förlagsaktiebolagets i Malmö boktryckeri, Malmö 1927, 14; F. B–n, "Fjällrasen". *Jämtlands Fjällboskap. Typer från länets Nötboskapspremieringar jemte Dess Hushållningssällskaps Stambok*. Östersundspostens tryckeri, Östersund 1895, 5; E. O. Arenander, *Fjällrasen. Dess afvel, utfodring och vård*. På upprag af Kungl. Landtbruksstyrelsen. Brobergs boktryckeri, Stockholm 1912, 7–8; Hallander 1989, 192–193, 195, 197–198, 200; Nilsson 2007, 14–15, 17–20; *Pohjois-Suomen karjanjalostusyhdistys v:na 1905–1909. Pohjois-Suomen maatiaiskarjan kantakirja I*, 3, 10–11, 15–16; Peltovuoma 1916, 8–10; Peltovuoma 1907a, 13–15, 17, 19; Östen Elfving, "Några iakttagelser om nötboskapen i norra Finland". *Biet* 4/1896, 109–113; Stenvik 2014, 17–19; Syrstad 2014, 22; Holtsmark 1908, 261–269.

58 Östen Elfving, "Några iakttagelser om nötboskapen i norra Finland". *Biet* 4/1896, 111.

59 E.g. Theunissen 2012, 201–203; Ritvo 1987, 104–115; Orland 2004, 179–180; Theunissen 2008, 656; Derry 2003, 158, passim.

60 E.g. Gjelstad 1993, 33–34.

61 See e.g. J. F. B–n, "Fjällrasen". *Jämtlands Fjällboskap. Typer från länets Nötboskapspremieringar jemte Dess Hushållningssällskaps Stambok*. Östersundspostens tryckeri, Östersund 1895, 7; J. F. Broman, "Några ord uti en för Norrland betydelsefull fråga". *Jämtlands läns Hushållningssällskaps Handlingar för År 1893*. Jämtlandspostens boktryckeri, Östersund 1894, 213–214. The county of Jämtland was central in the creation of this breed, but the aims of breeding were similar in every region. *Riksstambok över svensk fjällboskap (vit kullig svensk lantras). I. Delen 1892–1915*, III. See also e.g. Arenander 1912, 7–8; Hallander 1989, 197–198.

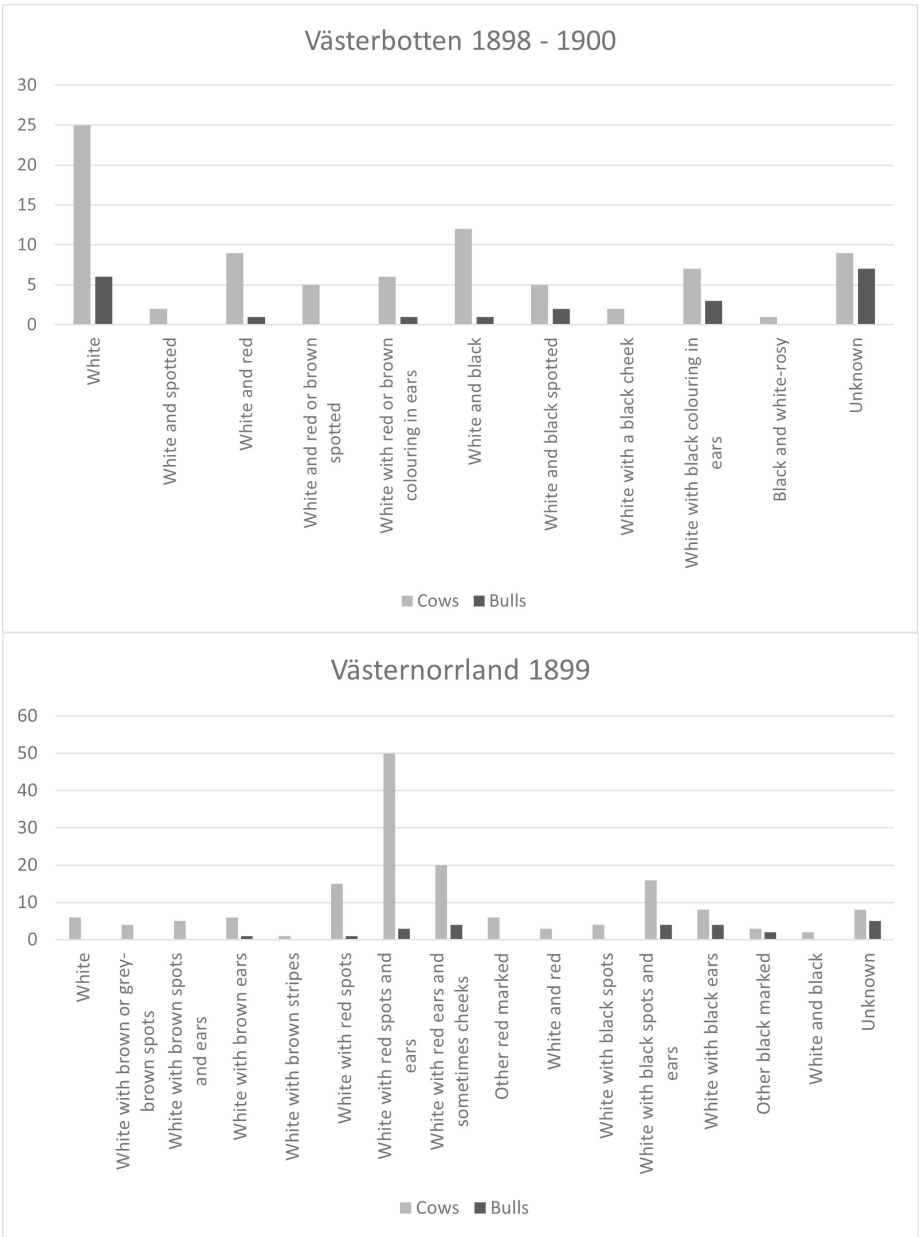

Figure 3. Colours of Swedish Mountain Cattle in the herd books of Västerbotten and Västernorrland at the end of the 1890s. Sources: F 16 Husdjursnämnden 145 Stambok, VB, The Archive of the Economic Society of the County of Västerbotten, The Archive of Popular Movements, Västerbotten; Stambok öfver fjäll-boskapen inom Vesternorrlands län. III 1900, 61–86, 91–95.

animals had also other red marks, especially red spots.[62] In both regions, there was much diversity, with red, brown and black marks among animals with a white base colour. Overall, the colour of herd book animals seemed to be relatively uniform. However, the definition of the colour of the *fjällras* breed was under discussion.[63]

In the case of northern native cattle in Finland, the question of colour was not unequivocal. Because there were two known local cattle types in northern Finland, at first, there was a herd book for white and red animals.[64] Figure 4 shows that half of the herd book animals belonged to white stock and half to red stock in 1906–1909. Animals within the white stock were typically white or white with red colouring in

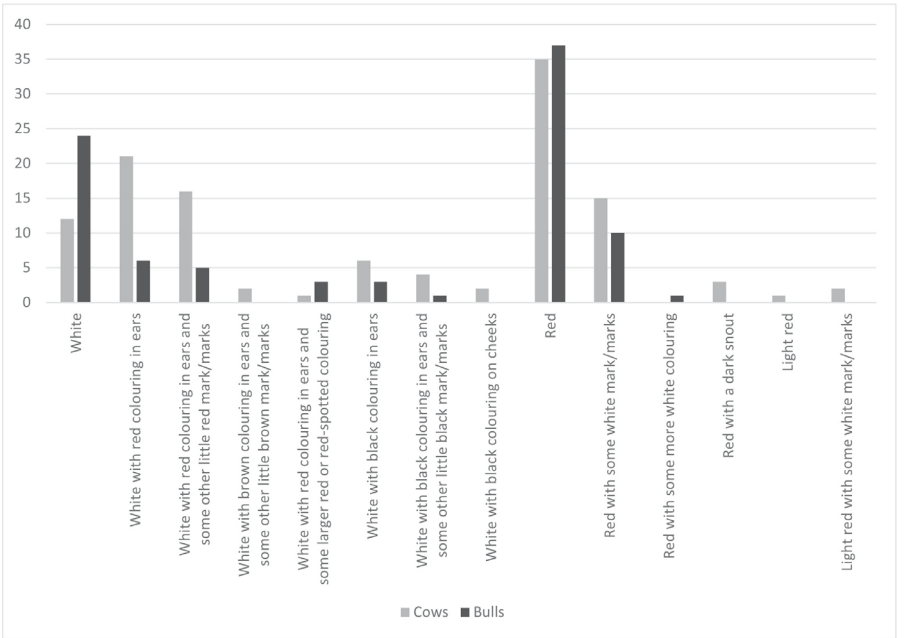

Figure 4. Colours of Northern Finncattle in its herd book in 1906–1909. Source: Pohjois-Suomen karjanjalostusyhdistys v:na 1905–1909. Pohjois-Suomen maatiaiskarjan kantakirja I, 77–152 (collected by Juvani).

62 In Figure 3, herd book animals with other red or black marks on the white base colour were often some kind of variation of other mentioned colour combinations, but these groups contained also one red sided and one black sided cow in Västernorrland.

63 According to some people, it should not had been accepted coloured marks with the white base colour among *fjällras*. The question of white colour, e.g. J. F. Broman, "Några ord uti en för Norrland betydelsefull fråga". *Jämtlands läns Hushållningssällskaps Handlingar för År 1893*. Jämtlandspostens boktryckeri, Östersund 1894, 213–214. See also e.g. Arenander 1912, 7–8; Hallander 1989, 197–198; Nilsson 2007, 19–20.

64 *Pohjois-Suomen karjanjalostusyhdistys v:na 1905–1909. Pohjois-Suomen maatiaiskarjan kantakirja I*, 15–16.

their ears. However, it raised conversations about the colour of the breed in northern Finland.[65] After 1914, only white stock was chosen for Northern Finncattle.[66]

The colour of northern native cattle was defined a little differently in Norway than in Sweden or Finland. Instead of only animals with a white base colour, there was a controversy over the colour between black and red sided. Despite the varied shades of cattle, black sided with a white base colour – instead of red sided – was chosen as the primary colour in breeding northern native cattle in Norway in 1898.[67] The complex breed question because of multiple stocks in northern Norway was revealed by the first herd book animals of Coloursided Troender and Nordland Cattle. As Figure 5 shows, there was much diversity in their colours.[68] Even if the central part of the animals was black sided or with more or less some other kind of black colouring, there were

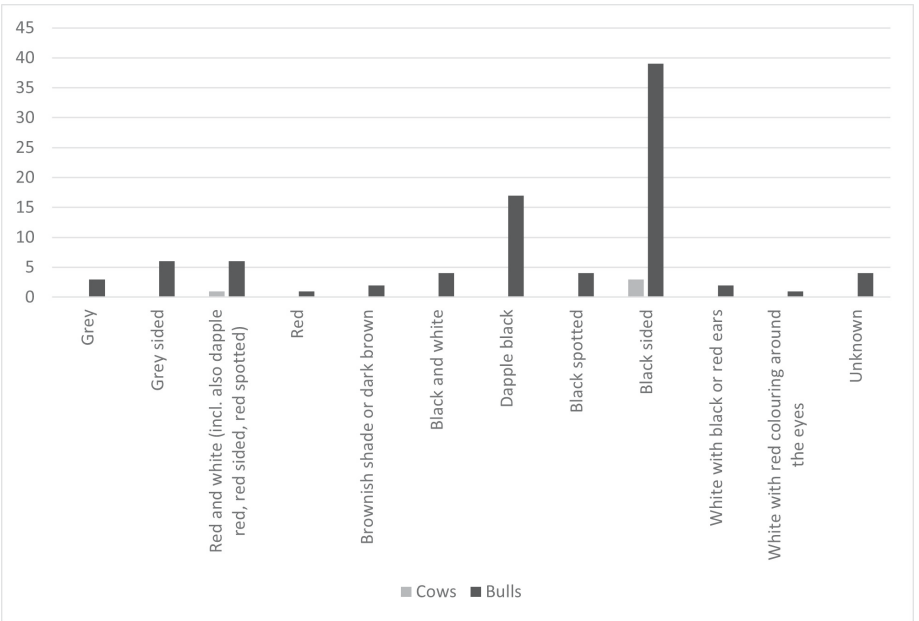

Figure 5. Colours of Coloursided Troender and Nordland Cattle in its herd book in 1893–1900.[69] Sources: Christie 1934, 13–30; Christie 1936, 11–12.

65 See e.g. *Pohjois-Suomen karjanjalostusyhdistys v:na 1905–1909. Pohjois-Suomen maatiaiskarjan kantakirja I*, 21–22, 57–58.

66 Juvani 2014, 28.

67 Gjelstad 1993, 53; Bækkedal 1980, 86–87, 117–118; Gjelstad 1987, 41; Holtsmark 1908, 261–269; Syrstad 2014, 22–38; Stenvik 2014, 19. See also Hans Tilrem, "Storfeavlen i Norge 1850-1950". *Norsk Landbruk* 1954, 116–118.

68 Even if animals from every region were not yet part of the herd book.

69 Herd book animals' colours are translated as near to the sources as possible. In Norway, as well, different marks were on a white base colour. In every country, some colour variations had to be combined into the same group.

different colours such as grey, brown and red or these colours combined to white as well. In addition, there were some white animals with only slight colouring. Compared with Sweden, there were more other colours, predominantly black than white, with the first herd book animals of northern native cattle in Norway. However, black snout and ears in otherwise white animals are also considered a variation from colour-sided animals.[70]

The question of colour was not unambiguous when establishing breeds because of the earlier diversity in northern native cattle populations. The variation was a consequence of missing efforts made to develop their physical qualities towards having particular features until then or possible crosses with other cattle types. Because of the requirement of colour, many animals were excluded from the herd books. Whole cattle populations were not as uniform as the herd books showed, and there was still even more colour diversity. This is partly confirmed by the variety in the herd books of the northern native cattle breeds, especially in Finland and Norway.

The other basis for defining the native cattle breed was being polled or having horns.[71] The polled animal was usually the aim of breeding when creating the Nordic Mountain Cattle breeds.[72] However, there were differences between having horns and being polled. In northern Finland, 13.3% of herd book bulls had scurs or some kind of small horns in 1906–1909. In addition, only two bulls were recorded as polled. Within cows, horns were not mentioned, but it was not noted if a herd book cow was polled either.[73] This information was not always written in the herd books in Sweden or Norway as well. In the county of Västerbotten in Sweden, the term polled began to be mentioned in 1900, when 39.2% of herd book cows were noted as being polled. That year, two of the eight bulls were recorded as being polled, and two had small horns.[74] In Norway, horns seemed to be quite typical of the first herd book bulls. In

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70 Syrstad 2014, 19. For example, it was still seen the non-uniformity of northern native cattle of Norway in the cattle exhibition in Bergen in 1898 as well. "Kotieläimet Bergenin näyttelyssä". *Suomen maanviljelyslehti* 9–12/1898, 209–210.

71 E.g. Gjelstad 1993, 33–34.

72 See e.g. J. F. B–n, "Fjällrasen". *Jämtlands Fjällboskap. Typer från länets Nötboskapspremieringar jemte Dess Hushållningssällskaps Stambok*. Östersundspostens tryckeri, Östersund 1895, 7; J. F. Broman, "Några ord uti en för Norrland betydelsefull fråga". *Jämtlands läns Hushållningssällskaps Handlingar för År 1893*. Jämtlandspostens boktryckeri, Östersund 1894, 214; Arenander 1912, 7; Hallander 1989, 197–198; *Pohjois-Suomen karjanjalostusyhdistys v:na 1905–1909. Pohjois-Suomen maatiaiskarjan kantakirja I*, 16; Syrstad 2014, 22–38.

73 *Pohjois-Suomen karjanjalostusyhdistys v:na 1905–1909. Pohjois-Suomen maatiaiskarjan kantakirja I*, 77–152 (collected by Juvani).

74 F 16 Husdjursnämnden 145 Stambok, VB, The Archive of the Economic Society of the County of Västerbotten, The Archive of Popular Movements, Västerbotten.

1893–1900, 48.3% of bulls had horns, and in addition to these, some had small horns. Only 11.2% of the bulls were recorded as being polled.[75]

One characteristic often changed because of breeding is the size of the animals. The measurements of northern native cattle in the early herd books were related to the general interest in the measurements of cattle in the nineteenth century.[76] In northern Finland, the height of herd book cows was 112.2 cm and bulls 116.5 cm, on average, in 1906–1909. In the county of Norrbotten in Sweden, the height of the couples of the earliest herd book bulls was 118.1 cm and cows 115.1 cm on average.[77] Nowadays, the size of Nordic Mountain Cattle cows is bigger than at the time when creating the breeds, typically 120–130 cm.[78]

One of the aims of the breeding of the northern native cattle breeds was to increase their milk production.[79] In this way, it was also linked to the general advance of livestock control, such as milk records.[80] On average, in the county of Norrbotten in 1898, cows' milk production, which was registered in the herd book in 1894, was 2,012 litres.[81] In northern Finland, the milk production of herd book cows per year was 2,064.5 kg on average in 1906–1909.[82] In Norway, the share of milk was mentioned only from one of the 1890s prized herd book cows: 2,318 litres in 1907.[83] Even if the figures were smaller than nowadays, the milk production of the ideal animals could be assumed to be bigger than every northern native cattle cow at the time when the dairy industry was just beginning to grow.

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75 It was not mentioned whether the rest of the herd book animals had horns or not. Christie 1934, 13–30; Christie 1936, 11–12. More about horns among northern native cattle in Norway, e.g. Stenvik 2014, 17–19; Syrstad 2014, 22–29; Holtsmark 1908, 261–269. See also Hans Tilrem, "Storfeavlen i Norge 1850-1950". *Norsk Landbruk* 1954, 116–117.

76 Ulrike Heitholt, "Ideal Bodies – Measuring Cattle at the End of the 19th Century". The Ideal Animal -conference, Witzenhausen 2.6.2016; Kate Whiston, "The Ideal Animal: How Images of Animals and Animals Were Created". *H-Soz-Kult*. http://www.hsozkult.de/conferencereport/id/tagungsberichte-6646 (read 2.11.2022).

77 *Pohjois-Suomen karjanjalostusyhdistys v:na 1905–1909. Pohjois-Suomen maatiaiskarjan kantakirja I*, 77–152 (collected by Juvani); *Stambok öfver Fjällboskapen inom Norrbottens län 1898*, 19. In Norway, there were no measurements of the first herd book cattle. Christie 1934, 13–30; Christie 1936, 11–12.

78 Solala and Honkatukia 2022, 56–57.

79 See e.g. J. F. Broman, "Några ord uti en för Norrland betydelsefull fråga". *Jämtlands läns Hushållningssällskaps Handlingar för År 1893*. Jämtlandspostens boktryckeri, Östersund 1894, 212; Arenander 1912, 8; *Pohjois-Suomen karjanjalostusyhdistys v:na 1905–1909. Pohjois-Suomen maatiaiskarjan kantakirja I*, 16, 74; Holtsmark 1908, 263, 266–267.

80 E.g. Orland 2004, 182–183.

81 *Stambok öfver Fjällboskapen inom Norrbottens län 1898*, 3–4. The amount of milk of *fjällras* at the turn of the century, e.g. Nilsson 2007, 24–26.

82 *Pohjois-Suomen karjanjalostusyhdistys v:na 1905–1909. Pohjois-Suomen maatiaiskarjan kantakirja I*, 92–113, 134–152 (collected by Juvani).

83 Christie 1936, 11–12.

As shown, there have been temporal changes in the appearance of northern native cattle. When the breeds were created and characteristics of native cattle populations were in the process of unifying in northern Sweden, Finland and Norway (stage 2, Figure 1), the basis for the Nordic Mountain Cattle breeds was chosen via the herd book system. The requirements of herd book animals were not, however, immediately solved completely, and in addition, the first herd book animals were not always as uniform as hoped according to all their characteristics. Because of the size of the change, unified breeding aims could not occur at once. Nevertheless, the establishment of herd books meant the first bottleneck[84] to the populations of the new breeds and formation towards how their looks are today began. A herd book animal had to be a typical individual of the Nordic Mountain Cattle, and consequently, much genetic material from variable populations was often excluded under the ideology of purebred breeding. In addition, even if the exactness of information of early herd book animals varied, the statistics about their characteristics showed the beginning of an understanding the new method in the breeding of all northern native cattle breeds (Figure 2).

The pedigree – The understanding of inheritance

The herd book related directly to the turning point of animal breeding according to the new aim to avoid crossing with other types of animals and breed pure breeds (stage 2, Figure 1). In addition, purebred breeding connected to the beginning of the understanding of inheritance in animal breeding, even before the development of genetics. Because of these total changes in breeding, it was seen as essential to know the ancestors of herd book animals. As Margaret E. Derry, Bert Theunissen and Harriet Ritvo, among others, have shown, the meaning of pedigree, as well as an animal's inherited characters, rose to the core of breeding.[85] This change was also seen with the breeding of northern native cattle. According to the requirements of herd book animals, for example, in the county of Jämtland in Sweden, it was demanded that herd book cattle had not been crossed with other breeds and its

[84] See also Laura Kvist, Markku Niskanen, Kristiina Mannermaa, Saskia Wutke and Jouni Aspi, "Genetic Variability and History of a Native Finnish Horse Breed". *Genetics Selection Evolution*, 2019, 51:35, DOI:10.1186/s12711-019-0480-8.

[85] See e.g. Derry 2006, 4–17, 22–23, 31–33, 232–234; Derry 2015, 4, 20–28, passim; Theunissen 2008, 654–655, 661–662; Theunissen 2012, 204–205; Ritvo 1987, 62–63, 72–79, 105; Ritvo 2010, 167–169; Ritvo 1986, 233–234, passim; Russell 1986, 99–100, 104–110; Tiina Miettinen and Hilja Toivio (Solala), "Jalorotuisuuden juurilla. Ihminen ja hevonen". *Mitä väliä on historialla?* Edited by Tiina Miettinen and Raisa Maria Toivo. Tampere University Press, Tampere 2016, 189–192, 201, 205; Solala 2021, 25–29, 33–34, 210–211, 345.

ancestors had to be studied.[86] However, it was often impossible to know an animal's ancestors at the beginning of the new method, as noted in Jämtland in 1893. At first, herd book animals had to be chosen via typical characters of the breed, and it was forced to leave the increase of pedigree knowledge to the future.[87]

Via the information on the pedigree of the herd book cattle, it can be analysed how thoroughly the new breeding method was understood. However, every known fact of animals' descent was not necessarily written in early herd books of the northern native cattle breeds. The percentages (Table 2) illustrate the relative minimum amount of knowledge.[88] According to Table 2, the ancestors of ideal animals were not often known at the beginning of the new method in Finland and Sweden. In Norway, at least one of the herd book animals' parents was known in the majority of cases (79.6%). However, the information was not always exact. In addition, the herd book was collected afterwards in Norway, which could have affected the level of information. In Sweden, information on the pedigree of herd book cattle was most often recorded in the county of Jämtland (43.5%)[89]. Jämtland was a central area in breeding Swedish Mountain Cattle, and the basis of the new method could be the most known there. However, it was quite common to be aware of the animals' place of birth or breeder in Norway, Finland and most regions in Sweden (Table 2). If the animal's place of purchase were the same as the place of birth, the percentage

Table 2. The descent of early herd book animals of the Nordic Mountain Cattle.

Region (years in herd books)	The number of animals	At least one of parents was known	The herd book animals of the second generation	The place of birth/ the breeder was known
Finland (1906 - 1909)	210	28.1%	16.7%	75.7%
Norway (1893 - 1900)	93	79.6%	35.5%	94.6%
Sweden				
Västernorrland (1899)	181	11.6%	0.6%	90.6%
Västerbotten (1898 - 1900)	104	24.0%	2.9%	87.5%
Norrbotten (1898)	56	10.7%	10.7%	100.0%
Jämtland (1898)	168	43.5%	35.7%	90.5%
Kopparberg (1899)	125	31.2%	31.2%	10.4%
Gävleborg (1900)	41	29.3%	7.3%	31.7%

Sources: see Table 1.

86 *Stadgar för premiering af nötboskap inom Jämtlands län*. Jämtlandspostens boktryckeri, Östersund 1898, 10. For example, it was mentioned that the breeding of northern native cattle must be based on purebred breeding in Finland as well. *Pohjois-Suomen karjanjalostusyhdistys v:na 1905–1909. Pohjois-Suomen maatiaiskarjan kantakirja I*, 16.

87 *Jämtlands läns Hushållningssällskaps Handlingar för År 1893*. Jämtlandspostens boktryckeri, Östersund 1894, 127–128.

88 In addition, the information on a few animals was not exact enough in Sweden and I excluded these animals from the percentages. For example, the animal's place of birth was sometimes only recorded at the county level in Västernorrland.

89 In Jämtland, the rest of the animals were recorded as descendants of *fjällras*.

would also be more significant in the county of Gävleborg.[90] During the early period of herd books of the Nordic Mountain Cattle, herd book animals of the second generation were rare in all three countries. They were most common in the counties of Jämtland and Kopparberg in Sweden and in Norway where they were approximately one-third of herd book animals (Table 2).

The question about the pedigree of herd book animals is more significant than it may be thought in the first place. Because of the completely new ideology of breeding, information on ancestries could not instantly be realised perfectly in herd books of the northern native cattle breeds. The pedigree was unknown, the method was not wholly understood yet, or the consequences of many earlier crossings of other cattle types[91] affected the realisation of purebred breeding in all three countries. For example, there was a bull after an Ayrshire bull in the first Norwegian herd book for northern native cattle.[92] The other observation is that, in some cases, a herd book animal's ancestor – or even the animal itself – was an individual of northern native cattle from the other country.[93] Knowing the pedigree of a herd book animal is also related to the nativeness of the breed. As many scholars have indicated, the desired pureness of the breed was not obvious when establishing herd books in general.[94] In any case, the understanding of the principles of the new breeding method had now spread among northern native cattle breeding (Figure 2). The pedigree was seen as essential to mark to some extent in every herd book of the Nordic Mountain Cattle at the turn of the century.

Conclusion

The changing characteristics of animals – one of the premises when studying the history of domestic animals – were at the core of this article from the viewpoint of northern native cattle. Many studies, not least by historian Margaret E. Derry, among others, but also studies from other fields of science, have shown one of the most marked effects on animals' characteristics, the international turning point of breeding, especially in the latter part of the nineteenth century. The establishment of

90 *Stambok öfver ayrshire- och fjäll-boskap inom Gefleborgs län. III 1902*, 17–22, 26.

91 E.g. Holtsmark 1897, 241; Hallander 1989, 190–195; A. Peltovuoma, "Karjanjalostuksesta". *Perä-Pohjolan Maamiesseuran vuosikertomus V:lta 1906*. Sanomalehtiosuuskunta Liiton i. l. kirjapaino, Oulu 1907b, 243–245. The crossing was also used in Finland, even if the situation is estimated better in northern Finland than in the south. Myllylä 1991, 19–20.

92 Christie 1934, 44.

93 E.g. Christie 1934, 15; *Pohjois-Suomen karjanjalostusyhdistys v:na 1905–1909. Pohjois-Suomen maatiaiskarjan kantakirja I*, 80, 106 (collected by Juvani).

94 E.g. Ritvo 2010, 167–169; Ritvo 1986, 231; Theunissen 2012, 204–205; Theunissen 2008, 654–655; Derry 2006, 31–33; Russell 1986, 95–96, 99–100; Solala 2021, 216. More about nativeness, see also Woods 2017.

specific breeds, instead of non-uniform populations, can be seen as one of the most significant changes animal breeding has ever faced. At the same time, breeding had begun to become scientific. It changed from an art-like practice to a more rationalised activity: systematic breeding.[95]

A three-stage model of the birth of native animal breeds shows the complexity of the formation of present-day native animal breeds (Figure 1), highlighting its turning point: the establishment of the breed (Figure 2). Every native breed has a detailed history of how these processes occurred. This article is one of the studies bringing Nordic native breeds[96] to the field of the history of animal breeding, as well as an addition to the studies of the construction of animal breeds in other fields of science.[97] This is basic research on the history of the emergence of native animal breeds, especially the Nordic Mountain Cattle. Many angles to the construction of these breeds are still left for further investigation, such as detailed analyses of the reasons for breeding these animals[98] or the agency of cattle. The important multidisciplinary questions are also the level of the relationship between the whole ancient cattle population in northern Fennoscandia and the joint history of the three Nordic Mountain Cattle breeds.

The turning point of breeding (stage 2, Figure 1; Figure 2) significantly affected local cattle types in northern Sweden, Finland and Norway at the turn of the twentieth century. With the breakthrough of their herd books, the Nordic Mountain Cattle breeds – Swedish Mountain Cattle, Northern Finncattle and Coloursided Troender and Nordland Cattle – were established as a part of the international modernisation of animal breeding. As a result, the characteristics of northern native cattle began to unify. When defining – in other words, creating – these breeds, part of the previous variable populations was excluded on the grounds of their characteristics, such as colour or horns. These breeds are now known as white and polled, but the uniformity of the northern native cattle breeds did not occur at once. Previously, these cattle were not systematically bred to have specific characteristics, and crossing with other cattle types had been even abundant, affecting the non-uniformity of stocks. The descent of early herd book cattle of these breeds was not always known at the beginning of understanding the meaning of inheritance. Therefore, their breed purity

95 E.g. Derry 2006, 3–25; Derry 2022; Kvist, Niskanen, Mannermaa, Wutke and Aspi 2019. See also e.g. Ritvo 1986. More about the history of selective breeding, e.g. Derry 2015; Theunissen 2012. Breeding became completely scientific after the rediscovery of Mendel's law and a full understanding of heredity. See also e.g. Theunissen 2008.

96 Outside the Nordic countries, e.g. Woods 2017.

97 E.g. Eriksson and Petitt 2020; Petitt and Eriksson 2022.

98 For example, some observations about the effect of nationalism on the construction of Finncattle are stated. Tamminen 2019. However, I have preferred, above all, more practical reasons for establishing Finnhorse. Solala 2021. For the Nordic Mountain Cattle, they could be, for example, an adaptation to the local circumstances. However, this question would be a good one for further investigation.

based on the pedigree was not always apparent. Even if the ideology and practice did not completely meet in establishing the breeds,[99] the first necessary steps were taken to construct northern native cattle as their own unified breeds. On the other hand, the early herd books also revealed such data from the backgrounds of these present-day native breeds that would otherwise be forgotten. In Sweden, for example, only part of a vast number of the earliest herd book animals was recorded – without any information on their characteristics – in the later herd book of Swedish Mountain Cattle.[100]

The establishment of the Nordic Mountain Cattle breeds was the basis of the existence of these conserved native breeds today (stage 2, Figure 1; Figure 2). Contrary to the present-day white cattle of the north, some other local animal types have become extinct in the Nordic countries, mainly because of crosses with other animal populations. Since establishing the native animal breeds, their existence has still depended on the choices made in history, as well as today (stages 3 and 4, Figure 1). All in all, a model of the birth of native breeds (Figure 1) helps us notice the risks of losing not only rare native animals but also parts of genetic resources, the natural environment and the cultural heritage. By conserving native animal breeds, it maintains biodiversity and, for example, food security in changing climate conditions for the future.

Abstract

In recent years, human's shared past with animals has been recognised as one of the topical issues in the field of history. This article raises one question about the history of domestic animals, which is little known in previous studies conducted in Finland – animal breeding and native animals. First, I outline the stages of the birth of native animal breeds. Second, I analyse how this manifested in breeding local cattle types in northern Sweden, Finland and Norway at the end of the nineteenth century and beginning of the twentieth century. In the modern sense of the concept, establishing breeds was the basis for the white cattle of northern Fennoscandia, now conserved as at-risk or endangered native breeds and known as the Nordic Mountain Cattle.

[99] The situation was similar, for example, to Finnhorse. Solala 2021.

[100] *Riksstambok över svensk fjällboskap (vit kullig svensk lantras). I. Delen 1892–1915*, III–XI, 1–147.