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Vegetation history of Ropphaugen in Budalen, Midtre Gauldal, Central Norway, with additional information from non pollen palynomorphs (NPP)

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Abstract

The vegetation history of Ropphaugen in Budalen is traced back to 9670±130 BP (BC 9040-8610), when the inland ice had retreated from the site. Already at this time people used the area for hunting reindeer and moose. The presence of these animals is indicated by spores from coprophilous fungi. A possible Bronze age settlement can be traced, and iron production from bog ore took place about AD 1400. The iron production changed the vegetation by removal of pine for the ovens and birch for firewood.

Key words: vegetation history, pollen analysis, use and evaluation of NPP, iron production.

Introduction and study area

The locality Ropphaugen is situated NW of Budalen valley at 620 m a.s.l. (Fig 1), and a peat column with material for pollen analysis was secured in 1990. This site was originally chosen for investigation of the general vegetation history in the area compared to sites with iron production. In Budalen iron production had taken place at Storbekkøya 8,5 km SE of Ropphaugen. At

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Storbekkøya the iron production activity with extensive use of pine *Pinus* for the furnaces and birch *Betula* for firewood by the people engaged in the production, made an impact on the vegetation (Espelid & Stenvik 1993), and pollendigrams from areas with iron production will differ from the general trends in the vegetation history (Solem 1991). The Ropphaugen peat core was stored unopened, and in 2008 appeared an opportunity to do pollen analysis in connection with a pre-investigation for the project "Management of dynamic landscapes" (DYLAN) which includes archaeology, history, plant ecology and vegetation history of four different areas in Norway, Budalen being one of these areas (Austrheim et al. 2010). In addition to the vegetation history at Ropphaugen, this paper deals with the interpretation of spores from coprophilous fungi.

Materials and methods

The peat core was secured in a PVC pipe and pollen samples were taken at each 10 cm level.

Pollen identification follows the keys of Fægri & Iversen (1989) and Moore et al. (1991) in addition to the pollen herbarium in Trondheim. Prepared samples was 1 cm^3 and a fixed number of *Lycopodium* spores added to each sample (Stockmarr 1971) to enable pollen concentration and/or pollen influx curves in addition to percentage curves. The computer program TILIAView (Grimm 2004) was used to draw the diagrams.

In addition to general pollen and spore analysis, spore-types of the coprophilous fungi of *Pyrenomycetes* ("dung fungi") were identified according to van Geel et al. (2003). These provide an interesting addition of NPP (non pollen palynomorphs) to the pollen assemblages, and species of dung fungi are presented in Appendix. A percentage pollen- and spore diagram from Ropphaugen is presented in Fig. 2. Remnants of the plants that built the peat – macrofossils – are presented in a three-grade scale of present, common and dominating in Fig. 3. Four levels of the peat at Ropphaugen are ^{14}C dated (Table 1).

Table 1: Radiocarbon dated levels of the Ropphaugen peat core.

Ropphaugen	Age in ^{14}C years BP	Calibrated age	Lab. Number	Dated event
30 cm	3100 ± 30	BC 1410-1320	TRa-816	Increase of charcoal
80 cm	5200 ± 55	BC 4355-3965	TRa 815	Alder decline
180 cm	8800 ± 40	BC 8170-8120	Beta 283912	Start *Pinus* dominance
210-212 cm	9670 ± 130	BC 9040-8610	T-19561	Oldest peat

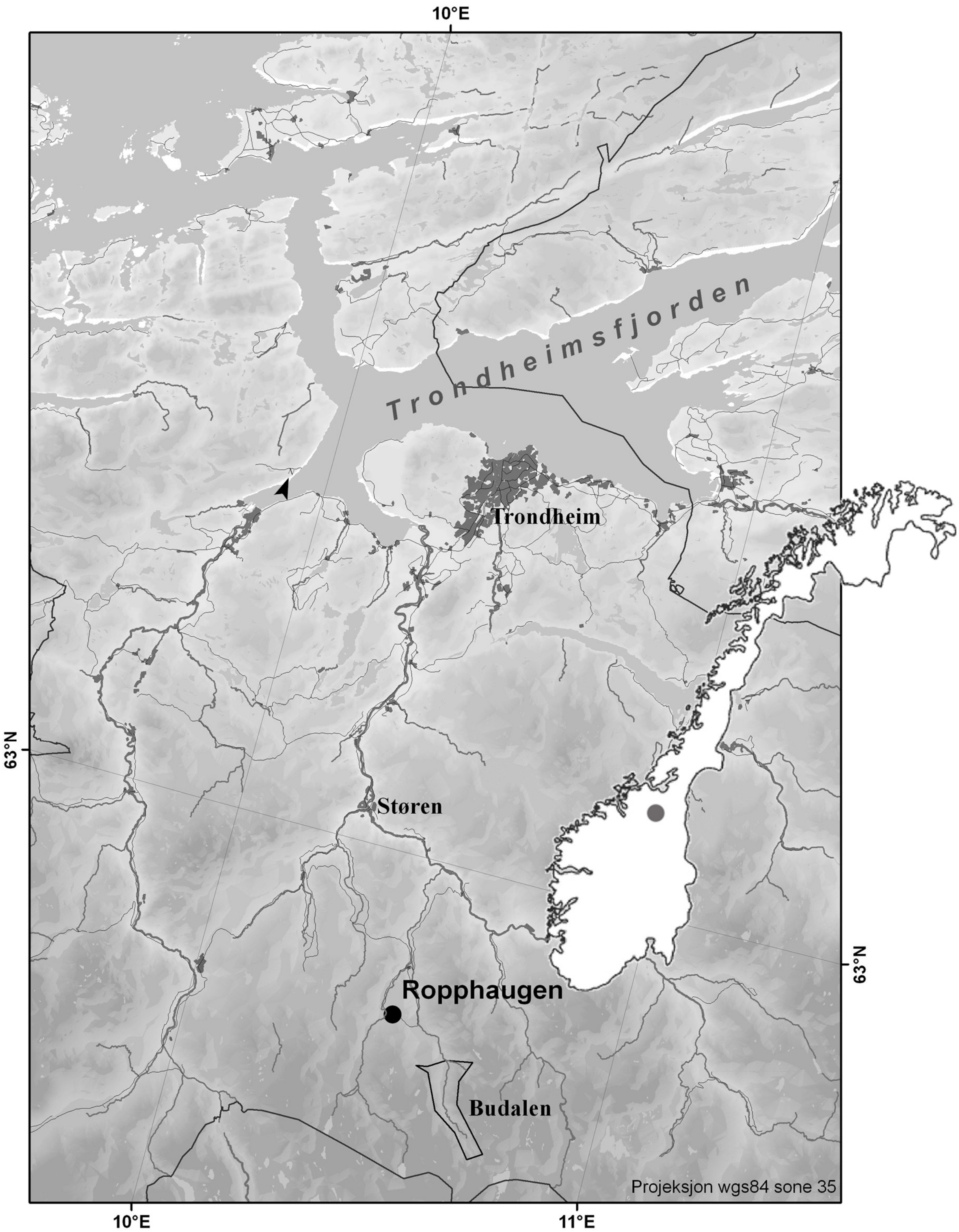

Fig. 1:
Map showing Ropphaugen site and the area in Budalen that is under investigation in the DYLAN-project (map compiled by Marc Daverdin).

Results

Vegetation history

Pollen assemblage zone (PAZ) 1, 210-180 cm: Betula-Cyperaceae-Poaceae

Peat accumulation started in water: The presence of the algaes *Botryococcum* and *Pediastrum integrum* var. *scutum* which are planctonic species, indicates a certain volume of water. Based on only one peat core it is impossible to define the size of the prehistoric water or tarn, but pollen of *Menyanthes* and *Callitriche stagnalis* suggest that the core is close to the edge of water as does the moss *Fontinalis* which prefer moving water (Fig. 3). The bottom peat has the age 9670 ± 130 BP (BC 9040-8610). In Budalen the disappearance of the inland ice may have been as early as 10.300 BP – the Hoklingen stage of ice marginal deposits (Reite 1994, Sveian 1997). Sveian consider the ice retreat to have been between 10.300 and 10.000 BP (pers. comm.). So far the only radiocarbon date from Budalen concerning the ice retreat is from Grytdal, Kotsøy at 10.560 ± 80 BP, but this dating is not considered valid due to contamination of the sample (Olsen et al. 2001).

The vegetation on land does not reflect the earliest phase after the disappearance of the inland ice, since there already existed birch *Betula* trees when peat accumulation started.

In addition to dwarf birch *Betula nana* and *Salix* shrubs grass *Poaceae* and sedges *Cyperaceae* dominated the vegetation. Pollen of mountain species as *Saxifraga oppsitifolia*, *Saxifraga stellata/nivalis* and *Astragalus alpinus* were present in addition to *Rumex acetosella* and *Chenopodiaceae* and emphasize the light-demanding vegetation that existed before the birch forest became denser. Sparse birch vegetation is not considered likely to burn when struck by lightning (Jacobi et al. 1976, Solem 2000) so the charcoal curve at 210 cm level indicates human activity. Early hunters were using the area and had at least a temporary presence here. The small lake or tarn will have added to the site's attraction, and the open vegetation in mountainous terrain made hunting easy. Also from Gråfjell area in Hedmark county further south in Norway the presence of people was evident soon after the last ice disappeared (Solem 2002). Towards the end of the zone pine *Pinus* pollen is increasing.

Spore-types of dung fungi, *Podospora*, *Sordaria* and *Sporormiella* emphasize the presence of grazing animals like moose and reindeer (Appendix). The species in these genera live semi-immersed to superficial on animal dung (Lundquist1972, Eriksson 1992), this is also reported by Cugny, Mazier & Galop (2010).

An abundance of *Sphagnum* spores indicates that this moss filled in the water toward the end of the pollen zone, and *Sphagnum* leaves in the peat support this (Fig. 3).

Pollen assemblage zone 2, 180 – 130 cm: Pinus-dominance

From 8800 ± 40 BP (BC 8170-8120) pine trees start to dominate the vegetation, the pollen percentage rise to about 90 % of the total in this zone. The pine dominance in Budalen is later than in areas further north in Tynset (Paus 2010) and Røros (Haugland 2010) where it starts about 9600 BP and 10000 BP accordingly.

Since the algae have disappeared in this zone, the water is probably extinct or at least reduced in areal. Types of dung fungi spores are still present with *Arnium*, *Cercophora*, *Podospora* and *Sordaria*. Of these only *Sordaria*-type indicates presence of reindeer, while the remaining three types reflect species growing on moose dung, and especially *Arnium*-spores are numerous at 160 cm level (Fig. 4). The charcoal curve in this zone has lower values than in PAZ 1, but the presence of animals suggests that hunters continued to use the area.

Pollen assemblage zone 3, 130 – 80 cm: Alnus-dominance

Alder *Alnus* expantion and domination marks the post glacial warmth optimum in Central Norway (Hafsten 1987) as most of the traditional warmth demanding tree species either are missing or scarce this far north. Nevertheless pollen of hazel *Corylus* and elm *Ulmus* are present in this pollen zone but in so small amounts that it is considered rather as long distance transport, these species could be growing at lower elevations. The 130 cm level has a calculated age of about 7000 BP (ca. BC 5900-5800). The alder forest has a posh undergrowth of *Polypodiaceae*, *Filipendula* and *Cicerbita alpina*. Spores of dung fungi are totally missing in this zone except for *Arnium*-type in level 120 cm. The alder forest on the whole was probably too dense to be attractive to grazing animals. The charcoal curve is very low, but charred fragments are registered in the peat at 110-80 cm level (Fig. 3), these may originate from camp fires even if the alder forest was a difficult hunting ground. The earliest spruce *Picea* pollen occurs at 90 cm, and the 80 cm level is ^{14}C dated to 5200 ± 55 BP (BC 4355-3965).

Pollen assemblage zone 4, 80 - 30 cm: Betula-Pinus

The climate has started to decline, the alder dominance is over and birch and pine constitute the forest now. Pine occupies the drier habitats while birch replaces alder in moister places. Spruce *Picea* is present, but does not have an important role in the vegetation. The grass pollen curve increase in this zone; so does the diversity of herbs, and pollen of plants like *Artemisia, Rumex acetosa, Solidago, Galium, Valeriana* and *Hieracium* indicate meadow-like vegetation. 40 and 30 cm levels both contain charred fragments in the peat, and at 30 cm level

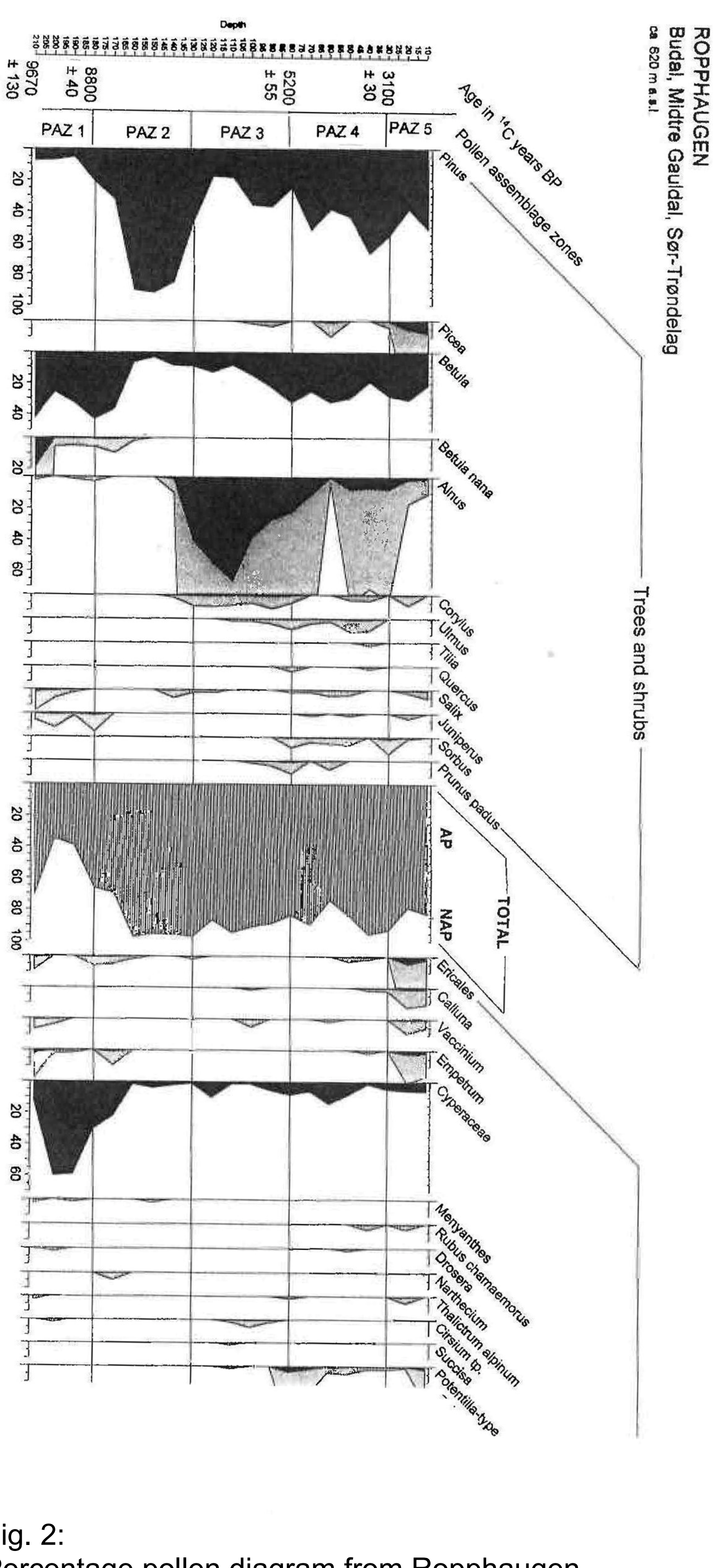

Fig. 2:
Percentage pollen diagram from Ropphaugen.
Selected curves are enlarged x 10.

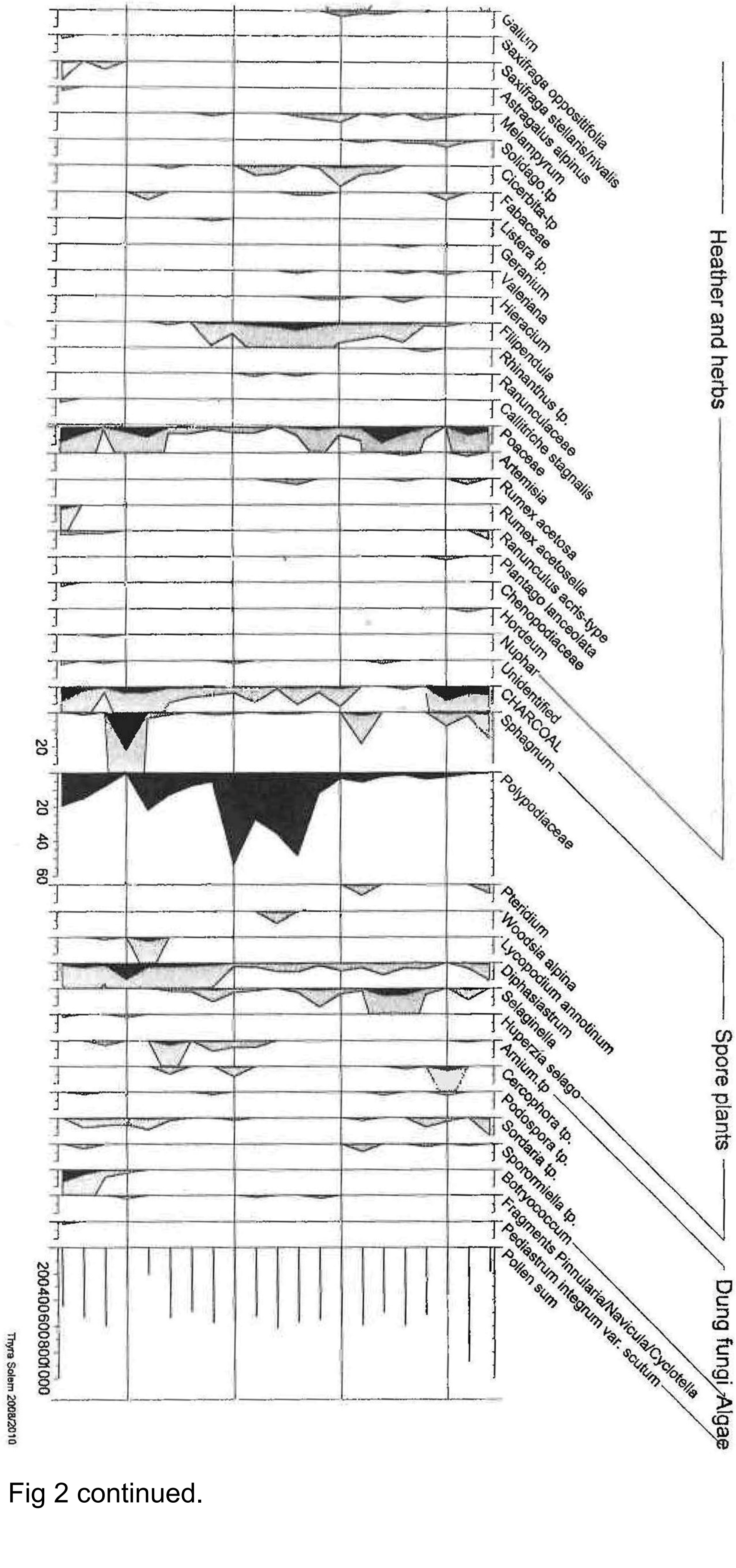

Fig 2 continued.

also the charcoal curve increases and indicates the presence of people on a permanent basis, probably they cleared patches of forest with fire to create grazing areas, pollen of *Plantago lanceolata* at this stage supports this. The level is dated to 3100 ± 30 BP (BC 1410-1320). The amount and diversity of dung fungi are at its largest in this zone and emphasize the presence of grazing by domesticated animals. These evidences point to a settlement on a permanent basis in late Bronze Age.

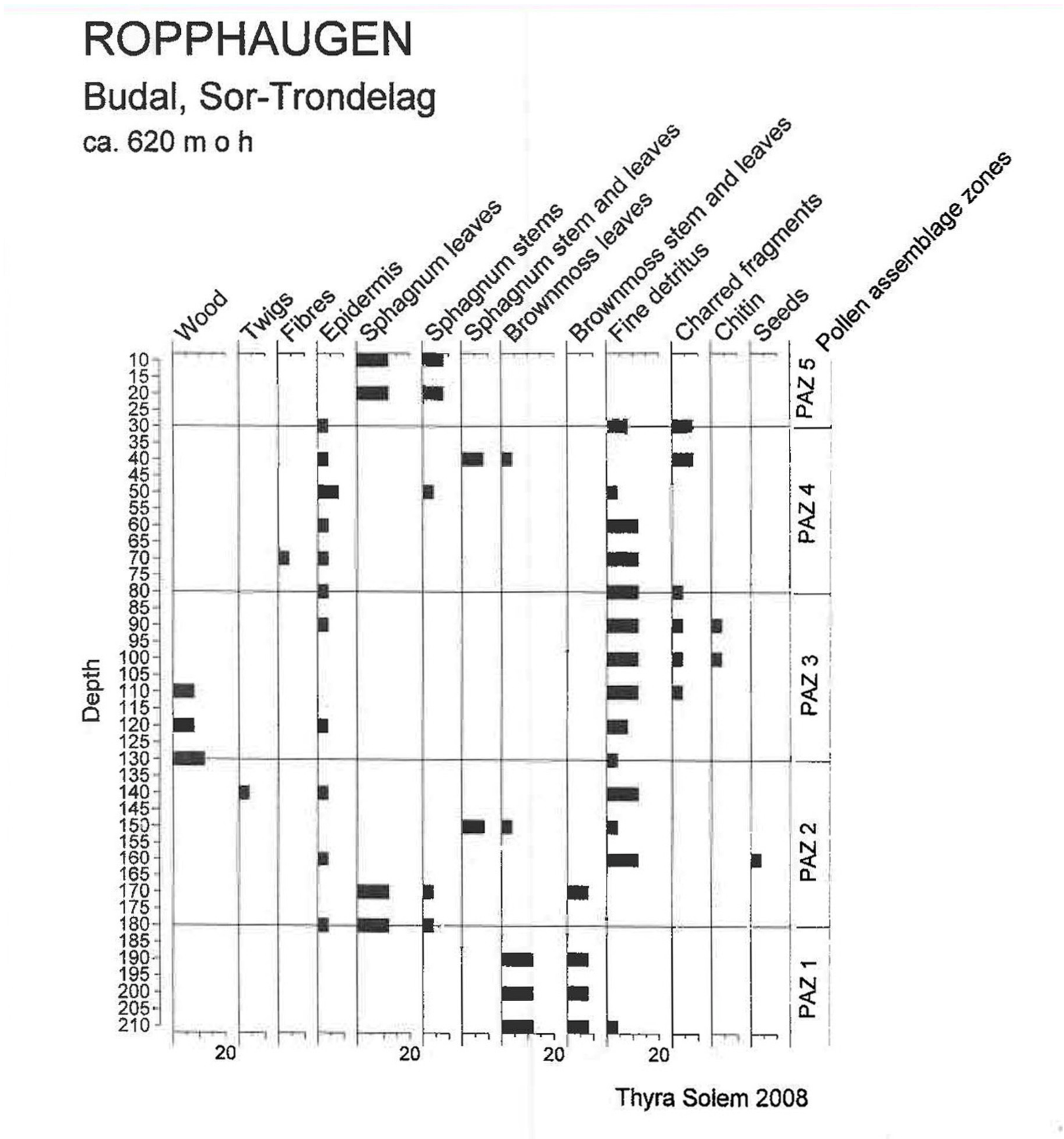

Fig. 3:
Plant parts that build the peat in a 3-graded scale of present, common and dominating. The term “brown moss” includes mosses in general with the exception of Sphagnum species, but in the 210-190 cm levels it comprises Fontinalis sp.

Pollen assemblage zone 5, 30-10 cm: Betula, Pinus, Picea
At 20 cm level there is a change in peat humification and hence accumulation (Fig. 3). It seems improbable that only 30 cm peat has accumulated in about 3000 years, and a hiatus or peat removal are suspected. In the vicinity of Ropphaugen a single iron production site that dated to the period with use of the Evenstad-type oven (L. Stenvik pers.comm.), the youngest of the techniques for processing bog ore, was eventually discovered. The technique was in use from AD 1500 to AD 1800, and the ovens were fuelled with pine wood (Stenvik 1989, 1990). It is tempting to connect the increase of the charcoal curve at 20 cm level to the iron production even if it is shown that spread of microscopic charcoal from a production site does not reach far (Solem 1991). The increase in microscopic charcoal rather reflects on the presence of people staying temporarily or living at the iron production site where they used birch wood for heating and cooking. As a result of this activity, pollen concentration curves of both birch and pine decrease at 20 cm. Removal of peat containing bog ore can explain the gap in peat accumulation.

At 10 cm level there is a pollen grain of barley *Hordeum*. Pollen of cereals is often found in connection to iron production sites (Solem 1991). A single pollen grain may have been brought there by people coming from farms in the lowland, but on the other side some small plot of barley might as well be tended since people were there anyway. It is speculated that summer farming started at such sites where both pine and birch were removed and areas of open grassland created (Solem 2011).

Discussion

The pollen diagram (Fig. 2) show that the overall vegetation history at Ropphaugen is in accordance to that considered typical of Trøndelag area in Central Norway (Hafsten 1987). Its importance lies in the date of the earliest peat that brings it close to the retreating inland ice where the activity of the early hunters is documented by their use of fire and the animals they hunted. The use of NPP (non-pollen palynomorphs) seems to be a useful tool in this case. For want of a better term they are referred to as “dung fungi” and included in the pollen diagram. The dung fungi belong to *Pyrenomycetes* where several genera have the majority of species growing on animal dung where the fruit bodies are more or less embedded in the dung (Lundquist 1972, Eriksson 1992). The spread of spores will clearly be in the vicinity of the dung (Petersen 1995). These spore-types are dark and extremely solid, and in conditions where pollen tends to be corroded, observations show the spores unaffected by this process.

Van Geel et al. (2003) these spores for additional knowledge of conditions in and around a roman dwelling site with grazing cattle. The spores are identified only to spore-type which is a drawback since the species included in the types usually occur of a variety of dung. Eriksson (1992) have investigated these fungi in Sweden and listed them according to what kind dung they grow on. His results are tentatively transferred to Norwegian conditions. In the analyses from Ropphaugen the following spore-types are identified according to van Geel: *Arnium, Podospora, Cercophora, Sordaria, Sporormiella* and *Chaetomium.*

In Appendix the species that constitute each spore-type are listed together with the type of dung they live on. Lemming- and rabbit dung are omitted from the table since only one species occur on lemming dung and rabbit dung is extremely unlikely this far north. Quite a few of the dung fungi are considered good indicators of animal husbandry (Van Geel et al. 2003, Cugny et al. 2010). But the spore types can in addition be used as a tool to detect the wild ungulents in times earlier than the existence of domestic animals introduced in Norway 5000-4000 BP (Hufthammer 1992).

A concentration diagram of the different spore-types is presented in Fig. 4, and in the following the dung fungi finds will be discussed for each of the pollen zones of Ropphaugen (Fig. 2).

Arnium-type

8 of the 11 species listed are connected to horse/cow/sheep dung and are considered good indicators of the presence of these animals, especially of horse (Appendix). 5 species are connected to moose/roe deer dung. Roe deer is excluded since the few fossil finds of roe deer bones in Norway are registered the southern part where they are dated between ca. 6470-5460 BP, and the present wide distribution of roe deer is of recent date (Hufthammer 1992). Domestic animals can also be excluded this early. Apart from hare dung, *Arnium inaequilaterale* and *A. hirtum* are registered on moose dung. Most of the registered *Arnium*-type spores occur in PAZ 2 (from 8800 BP – 5about 7000 BP) when the vegetation was dominated by pine. Since moose are known to graze on young pine trees, the evidence for presence of moose in the pine forest is very good. An antler of moose *Alces alces* from south-eastern Norway has an age of 9100 ± 50 BP (Grøndahl et al. 2010). *Arnium*-type is the only dung fungi registered in zone 3 at 120 cm level when alder dominates the vegetation (Fig. 4). It also occurs in PAZ 5 and there it is considered to represent domesticated animals. Eriksson (1992) has in addition listed *Arnium tomentosum* growing on cabbage stalks, and *A. olerum* (Appendix) can also grow on this substrate.

Sordaria-type

This includes 7 species, 3 of these on cow/horse dung and 4 on moose/reindeer dung (Appendix). The *Sordaria*-type is present in PAZ 1, 2, 4 and 5. In the PAZ 1 and 2 domesticated animals can be excluded, but late in PAZ 4 the spore-type is more likely to refer to these. *Sordaria alcina* is restricted to moose dung and in PAZ 1 – 2 and so are *S. fimicola*. Reindeer dung has rather few dung fungi, but *S. lappa* and an unidentified *Sordaria* sp. emphasize the presence of reindeer very early in the landscape close to the ice.

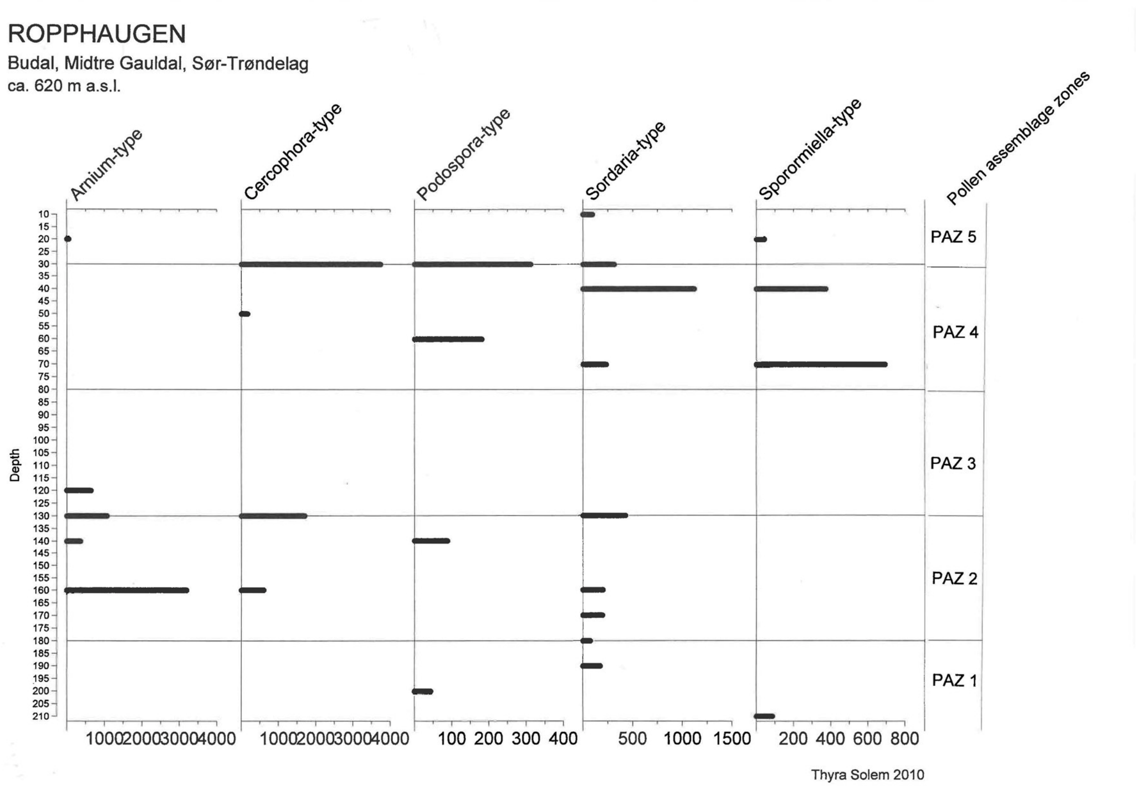

Fig. 4:
Concentration diagram of the spore types of dung fungi. Chaetomium-type is omitted. X-axis show the number of spores in 1 cm^3 of peat.

Cercophora-type

This includes 10 species 7 of which connected to horse/cow dung (Appendix). This type is a good indicator of domesticated animals, and has its highest numbers in PAZ 4. The type is also present in PAZ 2 when *Cercophora scortea* occurs solely on moose dung, and this early so does *C. septentrionalis.* Eriksson (1992) lists *C. caudate* growing on rotten wood of different deciduous trees.

Podospora-type

This includes 23 species (Appendix), 16 of which occur on cow/horse dung, and is a good indicator of the presence of these animals in PAZ 4. The type is also present in PAZ 1 and 2 when *Podospora appendiculata* and *P. arenosa* live on moose dung.

Sporormiella-type
This includes 30 species (Appendix), 18 of them occur on cow/horse/sheep dung, and the presence of these are practically limited to PAZ 4 and 5. The presence of this spore-type in PAZ 1 refers to moose and reindeer dung which host 9 species. *Sporormiella bipartis, S. chaetomioides, S. splendens* (ruling out roe deer) and *S. vexans* occur solely on moose dung. *S. irregularis* occurs both on moose and reindeer dung in addition to that of cow and horse, and *S. cymatomera* is found on reindeer and horse dung. 3 more species are found on moose dung and domesticated animals dung.

The presence of *Sporormiella*- type in PAZ 1 emphasize the presence of reindeer and moose.

Chaetomium-type
10 species are found on animal dung, mostly on dung from small animals like hare, rabbit, fox and hedgehog. One species *Chaetomium murorum* is found on cow/sheep dung. The spore-type is evidently not a good indicator of domesticated animals and not at all for wild ungulents and is not included in the diagram (Fig. 2). In addition these are two doubtful species growing on plant matter (Eriksson 1992).

Conclusions

The addition of NPP, in this case the spores from fungi growing on animal dung, is an interesting tool to trace the presence of animals more directly in addition to the changes in vegetation as a result of grazing . Admittedly many of these fungi also occur on dung from small animals like hare and fox, but at any given time the amount of dung from grazing animals, wild or domestic, provide a much larger substrate for the fungi. The different spore-types include each many species, some of which are found solely on dung from a particular animal, but most of them occur on dung from several animals (Appendix). Thus there will always be an evaluation of how to interpret the result. There is an abundance of species connected to cow and horse dung, fewer to sheep dung. But grazing of these animals will more often be concentrated to particular areas and will have a larger impact on the vegetation that will show in the pollen assemblages as well. The wild ungulents scatter their grazing over large areas and the impact on vegetation is more difficult if not possible to detect. In this investigation the presence of moose and reindeer can be traced back in time long before the occurrence of domestic animals.

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Literature

Austrheim, G., Brattli, T., Solem, T. & Stenvik, L. 2009: Landskap i endring – det lange tidsperspektivet. SPOR nr. 2, 32-35.

Cugny, C., Mazier, F. & Galop, D.: 2010: modern and fossil non-pollen paly nomorphs from the Basque mountains (western Pyrenees, France): the use of coprophilous fungi to reconstruct pastoral activity. *Veget Hist. Archaeobot. 19*: 391-408.

Eriksson, O. E: 1992: *The non-lichenized pyrenomycetes of Sweden*. SBT-förlaget, Ö. Vallgatan 18, Lund, Sweden, 208 pp.

Espelid, A. & Stenvik, L. F. 1993: Ironmaking during the Roman Iron age in Mid-Norway: The bloomery site Storbekken I in Budalen. An archaeo-metallurgical study. *Bloomery Ironmaking During 2000 years. Vol. III:* 115-141.

Fægri, K. & Iversen,J. 1989: *Textbook of Pollen analysis*. Fourth edition. John Wiley & Sons, Alden Press, London, 328 pp.

Grimm, E. 2004: TGView *version 2-02*. Illinois State Museum, Springfield, Illinois. Unpublished computer program.

Grøndahl, F.A., Hufthammer, A. K., Dahl, S. O. & Rosvold, J. 2010: A prebo real elk (*Alces alces* L.,1758) antler from south-eastern Norway. *Fauna norvegica 30*: 9-12.

Hafsten, U. 1987: Vegetation, climate and evolution of the cultural landscape in Trøndelag Central Norway, after the last ice age. *Norsk geografisk Tidsskrift*. Vol. 41, 101-120.

Haugland, V. 2010: Holocene forest development and tree-limit changes in Ridalen, in the Røros mountains. Unpublished master thesis, University of Bergen, Norway. 93 pp.

Hufthammer, A. K. 1992: Prehistorical and early historical distribution of Roe deer Capreolus capreolus (L.) in Norway. Fauna norv. Ser. A. 13: 35-37.

Jacobi, R. M., Tallis, J. H. & Mellars, P.A.1976:The Southern Pennine Meso lithic and the Ecological Record. *Journal of Archaeological Science 3*, 307-320.

Lundquist, N. 1972: Nordic Sordariaceae s. lat. Acta Univeritatis Upsaliensis, Symbolae Botanicae Upsaliensis XX: 374 pp.

Moore, P. D., Webb, J. A. & Collinson, M. E. 1991: *Pollen analysis*. Second edition. Blackwell, Oxford. 216 pp.

Olsen, L, van der Borg, K., Bergstrøm, B., Sveian, H., Lauritsen, S. E. & Hansen, G. 2001: AMS radiocarbon dating of glacigenic sediments with low organic carbon content – an important tool for reconstructing the history of glacial variations in Norway. *Norsk Geologisk Tidsskrift,* Vol. 81, 59-92.

Paus, A. 2010: Vegetation and environment of the Rødalen alpine area, Central Norway, with emphasis on the early Holocene. *Veget. Hist. Archeobot 19:* 29-51.

Petersen, J. H. 1995: *Svamperiget*. Faculty of Natural sciences, University of Aarhus, Denmark.342 pp.

Reite, A. J. 1994: Weichselian and Holocene geology of Sør-Trøndelag and adjacent parts of Nord-Trøndelag county, Central Norway. *Norges geologiske undersøkelse, Bulletin 426, 1-30.*

Solem, T. 1991: Effects of early iron production on vegetation. A study by means of pollen analysis. *In* Espelund, A. (ed.): *Bloomery Iron-making During 2000 years 1*, 50-71.

Solem, T. 2000: The bountiful life in the Mesolithic at Tjeldbergodden, Møre og Romsdal county, Norway. *AmS-Skrifter 16,* 73-83, Stavanger.

Solem, T. 2002: Vegetasjonshistoriske studier innenfor Regionalfelt Østlandet, Åmot kommune, Hedmark fylke. *NIKU Publikasjoner 116,* 290-303.

Solem, T. 2011: (in print) Vegetation history in Budalen. In: (ed. Austrheim, G.). Management of dynamic landscapes. Budalen. *Rapport botanisk serie 2011. Vitenskapsmuseet*, NTNU.

Stenvik, L. 1989: Tovmoen i budal – et fysisk arkiv om bruk av utmarka langt bakover i tid. *SPOR* nr. 1:7, 4-7.

Stenvik, L. 1990: Jernvinna I Midt-Norge. *Heimen, bd 27*, 209-217.

Stockmarr, I. 1971: Tablets with spores used in absolute pollen analysis. *Pollen et Spores 13*, 615-621.

Sveian, H. 1997: Ice-marginal deposits and deglaciation chronology in Nord-Trøndelag and Fosen, Central Norway. *Norges geologiske undersøkelse*, Bulletin 433, 52-53.

Van Geel, B., Buurman, J., Brinkkemper, O., Schelvis, J., Aptroot, A., van Reenen, G. & Hakbijl, T. 2003: Environmental reconstruction of a Roman Period settlement site in Uitgeest (The Netherlands) with special reference to coprophilous fungi. *Journal of Archaeological Science 30,* 873-883.

Appendix: Pyrenomycetes connected with animal dung (Eriksson 1992).

Arnium - type	**Cow**	**Horse**	**Sheep**	**Moose**	**Roe deer**	**Rein-deer**	**Hare**	**Fox**	**Various animals**
A. arizonense	X	X	X				X		
A. caballinum	X	X							
A. hirtum		X		X					
A. inaequilaterale				X	X		X		
A. leporinum							X		
A. macrotheca	X	X							
A. mendax		X			X		X		
A. olerum	X								
A. ovale					X				Fallow deer
A. septosporum		X							
A. sudermanniae		X			X		X		
Chaetonium - type	**Cow**	**Horse**	**Sheep**	**Moose**	**Roe deer**	**Rein-deer**	**Hare**	**Fox**	**Various animals**
C. aureum									
C. bostrychodes							X		
C. caprinum							X		
C. convolutum							X		
C. crispatum								X	
C. cuniculorum									
C. elatum									X
C. funicola							X		
C. globosum									X
C. murorum	X		X					X	
Sordaria - - type	**Cow**	**Horse**	**Sheep**	**Moose**	**Roe deer**	**Rein-deer**	**Hare**	**Fox**	**Various animals**
S. alcina				X					
S. baltica		X							
S. fimicola	X	X		X					X
S. lappae	X	X				X			
S. macrospora							X		
S. superba							X		
S. sp						X			
Cercophora - type	**Cow**	**Horse**	**Sheep**	**Moose**	**Roe deer**	**Rein-deer**	**Hare**	**Fox**	**Various animals**
C. anisura	X								
C. areolata		X							
C. coprophila	X	X							
C. gossypina							X		
C. mirabilis	X	X							
C. muskokensis	X								
C. scortea				X					
C. septentrionalis	X	X		X					
C. sordarioides	X								
C. sylvatica					X		X		
Podospora - type	**Cow**	**Horse**	**Sheep**	**Moose**	**Roe deer**	**Rein-deer**	**Hare**	**Fox**	**Various animals**
P. appendiculata				X			X		X

P. araneosa				X			X		
P. australis	X	X							X
P. bifida									X
P. communis	X								X
P. curvicolla							X		X
P. dasypogon	X	X							
P. decipiens	X	X							X
P. ellisiana	X	X							
P. exentrica							X		
P. fimiseda	X								X
P. globosa	X								
P. granulostriata	X				X			X	
P. intestinacea		X							
P. myriaspora	X								
P. panciseta	X								
P. pauciseta	X								
P. perplexens	X	X							
P. pleiospora							X		
P. pyriformis	X	X							
P. setosa	X	X							
P. trichomanes									
P. xerampelina	X								
Sporormiella - type	**Cow**	**Horse**	**Sheep**	**Moose**	**Roe deer**	**Rein-deer**	**Hare**	**Fox**	**Various animals**
S: affinis		X					X		
S. americana			X						
S. australis									X
S. bifida									
S. bipartis				X			X		
S. chaetomioides				X					
S. corynespora	X	X							
S. cymatomera	X					X			
S. dubia		X		X			X		
S. excentrica									
S. heptamera		X							
S. intermedia	X	X	X				X		
S. irregularis	X	X		X	X	X			
S. lageniformis		X							
S. leporina							X		X
S. megalospora	X								
S. minima	X	X		X			X		
S. muskokensis							X		
S. octomera		X					X		
S. ontariensis			X						
S. pascua	X		X						
s. pentamera									
S. pilosa		X							
S. pleiospora									
S. pulchella	X								
S. scandinavica	X								
S. splendens				X	X		X		
S. tetramera			X	X					
S. trichomanes									
S. vexans				X					X