

CENTRO UNIVERSITARIO EUROPEO PER I BENI CULTURALI

Ravello

Studio, tutela e fruizione dei Beni Culturali

2

# THE ARCHAEOLOGY OF CROP FIELDS AND GARDENS



edited by

**Jean-Paul Morel**

**Jordi Tresserras Juan and Juan Carlos Matamala**



EDIPUGLIA



CENTRO UNIVERSITARIO EUROPEO  
PER I BENI CULTURALI  
Ravello

STUDIO, TUTELA E FRUIZIONE DEI BENI CULTURALI

# THE ARCHAEOLOGY OF CROP FIELDS AND GARDENS

Proceedings of the 1st Conference  
on Crop Fields and Gardens Archaeology  
Barcelona (Spain), 1-3 June 2006

edited by

**Jean-Paul Morel**  
**Jordi Tresserras Juan and Juan Carlos Matamala**

---

*OFF PRINT*

---



EDIPUGLIA  
Bari 2006

---

# New approaches to garden history; taxonomical, dendrological, pollen analytical and archaeological studies in a 17<sup>th</sup> century Renaissance garden at the Milde estate, Norway

Dagfinn MOE<sup>1</sup> - Ann-Karin HUFTHAMMER<sup>2</sup> - Svein INDRELID<sup>3</sup> - Per H. SALVESEN<sup>4</sup>

<sup>1</sup> *The natural history collection, botany, University of Bergen, Allégt. 41, N-5007 Bergen (dagfinn.moe@bot.uib.no)*

<sup>2</sup> *The natural history collection, zoology, University of Bergen, Muséplass 3, N-5020 Bergen (anne.hufthammer@bm.uib.no)*

<sup>3</sup> *The cultural history collection, archaeology, University of Bergen, H. Sheteligs plass 10, N-5007 Bergen (svein.indrelid@bm.uib.no)*

<sup>4</sup> *The arboretum and Botanical garden, University of Bergen, Mildeveien 240, N-5259 Hjellosestad (per.salvesen@bot.uib.no)*

## Riassunto

La tenuta di Milde, situata vicino a Bergen nella Norvegia sud-occidentale, prima del 1100 doveva essere il podere principale presente nell'area. Dal 12° secolo, era appartenuta a monasteri di Bergen, ma nel 1528-1530, dopo la Riforma, fu rilevata dalla Corona. Da allora, la tenuta fu utilizzata da cittadini privilegiati di Bergen fino a quando nel 1915 non fu trasformata in un collegio liberale. La storia del giardino rinascimentale ancora esistente, che circonda un parterre più o meno intatto e alcune piante tradizionalmente ornamentali, può essere tracciata fino ad appena dopo il 1700 grazie alle fonti scritte.

Si riporta l'inventario floristico delle piante da giardino presenti attualmente. Alcuni taxa, incluse specie di bulbose naturalizzate, rare rose ornamentali, ed enormi esemplari di arbusti ed alberi, possono essere stati piantati già ad uno stadio iniziale della storia del giardino.

Tre cultivar di *Buxus* sono descritte e sottoposte a studi molecolari (in corso). Qui si riportano i dati preliminari del conteggio delle cerchie annuali sui rami più grossi. La presenza del polline di *Buxus* è documentata in uno studio palinologico che ne arretra la presenza alla creazione del parterre nel giardino rinascimentale. Le forme di *Buxus* sono state presumibilmente piantate contemporaneamente durante la metà o seconda metà del 17° secolo, nello stesso momento nel quale è documentata l'introduzione di *Buxus* nel giardino del Rosendal Barony (1666).

Un primo studio archeologico nella parte sud-est del giardino mostra manufatti di pietra, costruzioni di sasso e l'impiego di stratificazioni di argilla/limo, che sono evidentemente elementi di costruzione di uno stagno per pesci. Sono stati raccolti campioni per studi su macrofossili e ossa. Per documentare con sicurezza e maggiore ricchezza di particolari la storia del giardino, sarà necessario in futuro uno scavo più completo.

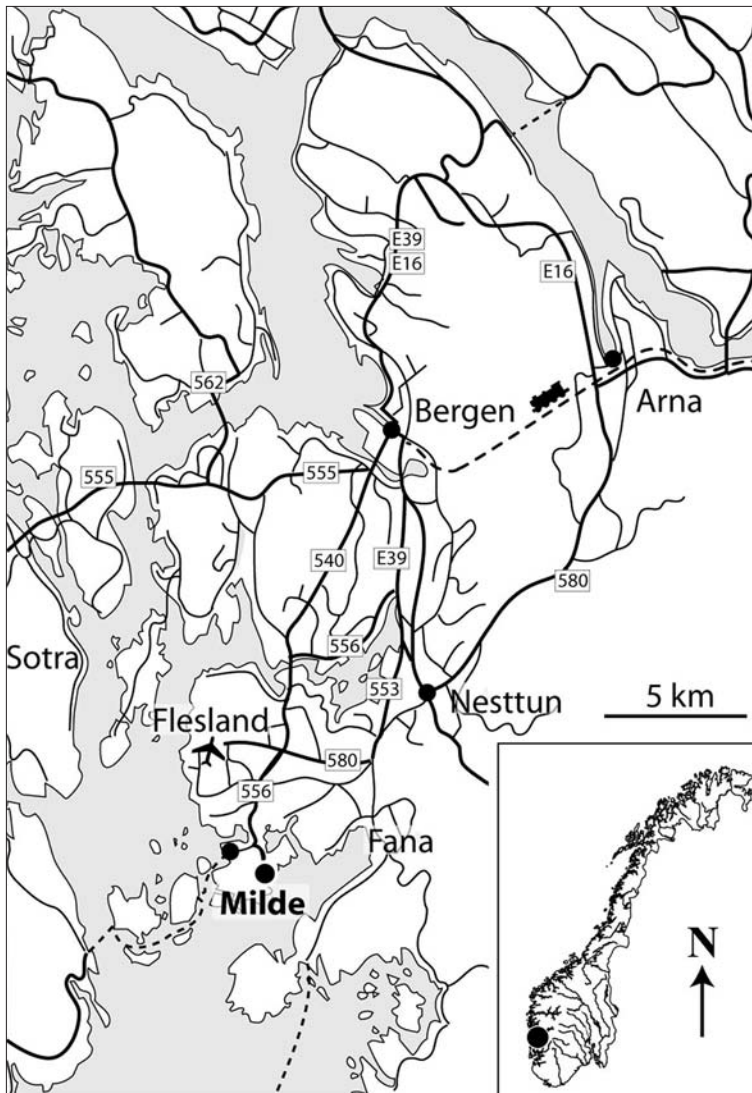
## Introduction

Natural scientific techniques have during the last 10-15 years been used in the documentation of garden history. As a part of the European project EU-CLT-CA12 2005-0697/001-001 "CULTURE 2000" the old garden at the Milde estate was selected for a case study.

The Bergen team has cooperated during fieldwork and discussions. It should however be pointed out that DM and PHS have been responsible for the general parts, PHS for the taxonomic (*Buxus*) part, DM for the parterre and

georadar part, and SI, AKH and DM for the excavation and pond part of the work.

The aims of the on going studies are first of all to give a general, multi-discipline survey of the site, including flora and vegetation, soil stratigraphy, and test excavations for establishing the history of the garden, including the existence of a historic fish pond. In addition, the aim is to study certain aspects of the renaissance parterre more in detail, including pollen and macrofossils preserved, and the genetic structure of extant relic garden plant species populations, e.g. *Buxus sempervirens*. This paper is based on unpublished material and data collected the project so far.



1. - Survey map of the Bergen and Milde area (ref. fig. 2), Hordaland, western Norway. The Bergen airport - Flesland is marked.

### Bergen, the Renaissance, and the Milde estate

The Milde estate is situated at 60°15' N lat., 5°16' E long., about 16 km south of the centre of the city of Bergen, western Norway (fig. 1). Bergen with its harbour is known since the Late Viking Age about 1000 years ago, and has since then been a commercial centre for import of almost any necessity for daily life, and as an export harbour for stockfish (dried cod) and skins. During a period of several hundred years, Bergen belonged to the Hanseatic trade network within the North and Baltic Seas. In former days the city also served as the capital of Norway and as a cultural centre.

While some gardens for pleasure are known from the 13<sup>th</sup> and 14<sup>th</sup> centuries, mostly connected

to castles, details are not recorded before the Reformation, from 1537 onwards. The first garden we learn about in writing was connected to the bishop in Bergen, Geble Pederssøn (Beyer 1552-1572), who utilised the former Franciscan monastery including garden as the new protestant church centre. The garden is described as beautiful (Beyer 1552-1572, Edvardsen 1694b: 34), and the short description includes information about different kinds of fruit trees like pears, apples, and cherries, in addition to other plants familiar as well as unknown to the writer. *Vitis vinifera* is also mentioned, most likely kept indoors during the frosty winters (Evjenth, Moe 2000). Most of the trees were, as it seems, imported from North-West European Hansa towns.

After periods of war on the European continent (mostly ended by 1648) and several fires destroying parts of Bergen, a flourishing period started at about AD 1660. Craftsmen, specialists and artists of many kinds arrived in Bergen, as demand for labour increased. Most of them came from cities on the coast of the North Sea (now Germany and the Netherlands). Churches, town gates and several sculptures and paintings found in Bergen are dated to this period. And just in this period a new type of garden

turned up. Based on contemporary descriptions and 17<sup>th</sup> to 18<sup>th</sup> century city maps, it obviously was the renaissance garden fashion that had reached Bergen and Norway. An early painting indicates the existence of a renaissance style garden in 1665 (Moe in prep.), and later on maps of the Bergenhus castle render two more gardens with a formal, symmetric architecture. One of them, probably the most beautiful one, had a centrally placed pavilion (Schnitler 1915: 127).

Between 1665 and 1674 the formal garden at the Bergen main church was renovated (Edvardsen 1694a: 81). A lot of new herbs, perennials and trees were introduced, among them *Ficus* trees, *Castanea sativa*, *Coriandrum sativum*, *Piper* spp., *Laurus nobilis*, and 'other such strange plants'. In addition also a special *Humulus lupulus* garden



2. - Air photo of the Milde area. The Milde estate (arrow: house) and garden (white outline) is marked, as well as the lake Mildevatn mentioned in the text (photo courtesy Bergen kommune).

and a fish pond existed, most likely with carps (see later chapter). Dutch made flower pots are mentioned, most likely for the climatically more sensitive plants (Moe 2005). And a garden pavilion was present. Also the neighbouring garden, owned by Hans Christoffer Hiort, had a renaissance style lay-out with a pavilion and orangery (Schnitler 1915).

While many small kitchen gardens existed into our time, the larger formal gardens of Bergen disappeared during the 19<sup>th</sup> and 20<sup>th</sup> centuries. The main reason being the general growth of the city, and need for ground for new buildings, shipyards etc. Also the bishop's garden was used for building ground as late as in the middle 19<sup>th</sup> century. Only two larger renaissance gardens survived. One of them, about 60 km southeast of Bergen, found at the Rosendal Barony estate at the Hardanger fiord, is dated to about 1660. Complete lists of plants which were imported from Germany from 1666 and 1667 onwards demonstrate the great variety of plants available, both annuals and perennials for use in the kitchen,

and shrubs and trees for the orchard and shrubbery as well (Dietze 2000).

The second surviving garden is the one found at the Milde estate (fig. 2), within the municipality of Bergen, but outside the city-centre. The garden is of great national interest, and has a great potential for scientific research. Some pilot studies have already been made. The access to the garden is easy and open to the general public. The property is to day owned by Fana Følkehøgskule (a grundtvigian boarding school), and is situated between The Norwegian Arboretum and the Botanical garden of the University of Bergen. The current owner has encouraged scientific studies to gather more information on traditions and former usage of the estate in general, and the garden in particular. A plan for conservation of the garden has been put forward (Bruun, Skjold 2003), aiming at careful restoration and maintenance, including canalizing the public interest in a way that allows preservation of the historic remains and authentic, relic plant specimens. During the last century or so, only minor alterations and soil disturbances have been made.

## The Milde estate

It is not known when people first set up a house upon the hill at Store Milde (fig. 2). It is believed that the first settlements were below the hill on the flats north and north-west of the bay Mildevågen (Hjellestad 1919, HM 1998). What existed of arable soil was found here, and the name *Milde*, first recorded in writing 1528, probably refers to the soil, being rich in clay and silt (*milðar* or *milði* in Old Norse). The cultural landscape at Milde was

probably cleared some 2200 years ago (Hartvedt 1994), and cereals were grown here from about 1800 BP (Larsen 1984). The farm was early divided into two, *Store* (larger) and *Little* (smaller) *Milde*, but the ownership remained largely united on one hand until 1816 (Table 1). During the Middle Ages, Milde belonged to the Dominican Monastery in Bergen, called “The Black friars in Holmen”. After the Reformation, Milde was transferred to the Crown, and the proprietors employed by the King enjoyed privileges and

ca. 1240-1528	The Dominican monastery at Bontelabo, Bergen.
1528-1539	The last Dominican abbot, Jens of Widaa Mortensen, by royal decree.
1539-1624	Jens Mortensen's descendants.
1624-1639	The Crown. Several officials and merchants held privileges for shorter times.
1639-1678	Merchant Sander Janson of Bergen (d. 1649), and wife, Anna Clausdr. Anna as a widow stayed at Milde for long periods.
1678-1692	Stiftamtskriver and later presiding judge in Bergen, Henrik Coch and wife, Elisabet Augusta Fabricius.
1692-1695	German merchant Johan Omsen and solicitor Hermann Diederich Beste, both living in Bergen.
1695-1699	Solicitor Hermann Diederich Beste.
1699-1701	Stiftamtskriver i Bergen, Christopher Reich (d. 1700) and wife, Birgitta Burennæa.
1701-1723	Chief officer, later Lord Mayor of Bergen, and Chief customs officer for Northern Norway, Hans S. Schreuder and wife, Beate Christine Burennæa (sister of the former owner's widow). They lived at Milde from ca. 1708.
1723-1766	Merchant in Bergen, Henrich Henrichsen Weinwich (d. 1732) and wife, Maren Gjertsdr. Heiberg from Sogn. Maren in 1735 married Commerceassessor Jean von der Lippe.
1766-1784	"Proprietor to Milde Estate" and lawyer in Bergen, David Bremer and wife, Sofia Magdalena Segelcke. They lived at Milde.
1784-1816	Captain, high ranking customs officer, and "Proprietor to Milde", Johan Frederik Cappe and wife no 1, Margareta Katrina Mariager, later with wife no 2, Maren Johanna Lem. Cappe lived in a grand style at Milde.
1816-1819	Cappe's descendants divided the property and sold out parts.
1819-1841	Lieutenant and customs officer Tomas Hammer and wife, Elisabet Cappe together with his brother in law, Johan Sivertsen, merchant in Bergen.
1841-1849	Engel Hansen of Kvalessund and wife, Anna Berertine Gunnarsdr.
1849-1858	Herman Gunnerus Stephansen of Brønnøy, North Norway.
1858-1870	Ahlert E. and Kristine M. Nicoll
1870-1909	Jørgen Coldevin of Dønna, North Norway
1909-1915	Fana Municipality.
1915 -	Fana Folkehøgskule (boarding school) with directors and rectors:
1915-1949	Martin and Målfrid Birkeland. Mrs. Birkeland known for her garden interest.
1950-1979	Kristian and Melkild Bakke
1971-1980	Rector Tor Stallvik
1980-1983	Rector Haakon Smedsvig Hanssen
1983-1985	Constituted rector Harald Lyngtun
1985-1999	Rector Knut Borge
1999-	Rector Knud Jørgen Holck

**Table 1.** - Owners to Milde estate ca. 1240 – 2000. (Sources: Hjellestad 1919, Hopland 1993, Hartvedt 1994, Hjellestad 1998).



3. - The Milde estate with its 'Sleeping Beauty Fairy Tale Garden' AD 1851, section from painting by Tycho Chr. Jaeger (from Rosland 1990).



4. - The main house and the western part of the parterre covered by Box (*Buxus sempervirens*). Note the scewed placement of the garden separated by a *Crataegus laevigata* hedge in front of the house and the stone wall. The walnut tree (*Juglans regia*) at the eastern corner (to the right) of the house mentioned in the text (photo PHS).

freedom of tax. The first privileged owner, Jens Mortensen, was also the last Dominican abbot. He was accused of setting fire to the Monastery in 1528, and for robbing much of the gold and silver valuables with him to Milde. Still he was appointed by the King in 1530, probably because he was in league with the overlord of Bergen, Vincent Lunge. Very little is known about any house or garden from the Catholic times and the first hundred years after the Reformation, but according to tradition, the first house on the hill was raised by Jens Mortensen in 1530 (Milde og Hjellestad historielag 1998). The oldest part of the house today is in the eastern end facing the court

yard (Rosland 1990). When this part was partly restored in 1979, four layers of floors from different periods were disclosed on top of thick stone walls believed to be from before 1600. The lowest floor had wooden nails. It is thought that the large stone walls surrounding the garden may be from the same time, perhaps initially constructed as a measure for more easily defending the household.

From 1630 Bergen citizens took over as privileged owners, while the descendants of Jens Mortensen were reduced to the rank of crofters. The house was presumably extended to the size of today (fig. 3, 4) during the second half of the 17<sup>th</sup>

century (Larsen 1984, HM 1998), perhaps as a consequence of the new owners' need for a suitable pleasure estate for summerly entertainments. Taxations of the forests belonging to the farm, indicates extensive building activities during these years. The ornamental garden is thought to be from the same time (Hjellestad 1919, 1933, Larsen 1984, HM 1998). If so, the house and garden may have been set up by the rich Bergen merchant Sander Janson (ca. 1595-1649) and his wife Anne Clausdtr., who owned from 1639 to 1678 (Hjellestad 1933, Larsen 1984). The widowed Anna was one of Bergen's richest property owners of her days, and according to tradition, she spent much time at Milde during the summer months. After she sold Milde in 1678, the property changed hands several times (Table 1). One taxation document dated 1691 is preserved, describing the house as large and containing six fireplaces. Probably the house was quite luxurious. The owners in this period did not, as it seems, spend much time at Milde until 1701, when Hans S. Schreuder and his wife, Beate Christine Burennæa, took over. Schreuder held several high offices, including the position as Lord Mayor, and owned several major properties in Bergen. At least at one of these he had a marvellous garden constructed. Schreuder was in charge of Customs on the coast of Norway north of Bergen, but his financial skills may seem to have been inferior. He went bankrupt, and was charged by the several creditors, including by the King, for discrepancies in the Customs accounts and failure to pay taxes. He had to sell out most of his properties, and ended up moving to Milde. In 1719 the values of his estates were appraised, and in the documents we hear of an elegant house with five large rooms on the ground floor in addition to some smaller rooms, and an arch facing west with three large and two smaller rooms. The walls in the halls were covered in linen cloth and decorated (Hjellestad 1933). The wall paintings in the so called Regence hall are dated to this period (1701-1708, Rosland 1990). The paintings on the walls in the Rococo Hall are from a later period, being signed I. C. C. Michalelsen 1786.

For the first time the existence of gardens at Milde is documented in the 1719 taxation. A garden containing fish ponds extends south and east of the house including also kitchen (vegetable) and flower quarters and several fruit trees. Six laurel trees planted in high tubs are mentioned,

along with several plants in jars, and a greenhouse with a stove and bricked chimney. Moreover, another garden, circular and fenced, is mentioned, to the west of the house, featuring a pavilion, fish ponds and fruit trees. This garden has later disappeared, and is not mentioned in any document later than 1723. The 1719-document in addition indicates that the farmers' houses were placed away from and below the Manor on top of the hill.

From the Rosendal Barony south east of Bergen, the introduction of *Buxus sempervirens* is documented from 1666 (Dietz 2000). In the Milde estate garden the first record apparently is in a sales contract dated October 6 1766 (fide Schübeler 1875, 1888, the document itself may have been lost). According to Hjellestad (1919, referring to the 1766 document) the garden at that time contained "several kinds of fruit trees, pavilions, flower quarters, pyramid trees, and fish ponds". It is not explicitly said that the "pyramid trees" were *Buxus*, but it is tempting to think that they must have been the trees of which still six specimens are left on the parterre. It also seems probable that *Buxus* was used for bordering the flower quarters, as the custom was in those days. However, the first more well documented reference to *Buxus* in the garden is by Schübeler (1875).

The old garden at Store Milde has since long been renowned for its mystic, Sleeping Beauty aura. This kind of atmosphere may have prevailed for more than 150 years, as is evident in a painting by Thyco Christoffer Jæger from 1851 (Rosland 1990) (fig. 3). The artist is known for his realistic and painstakingly detailed rendering of the motif (Ormhaug 1994). And it is probably a fairly true picture we see: The Manor on top of the hill closely surrounded by tall trees that must recently have been thinned. And the walled garden, like it is today, set to the side of the main building. Inside the walls lies the garden asleep, overgrown and in lack of a gardener's hand for a long time, with conifers, probably *Picea* (gone today), up through a dense thicket, some of which may well be *Buxus*. Outside the walls, on the other hand, the trees are pollarded and trimmed, like if they are in use for fodder production in an actively utilised landscape. This picture fits astonishingly well to the description of the same garden given more than 70 years later by Schnitler (1915): «*Overgrown and left to itself now Milde has been lying for many years like a bewitched fairy tale garden, that grows and grows, but where every life is still asleep.*



*Linden and ash in magnificent specimens predominates. Further, also balm poplars, furs, oak, elder, and a lovely sycamore are found. And large, bulging berry bushes. But first and foremost, up at the terraces, one is overwhelmed by the incredibly twisted vegetation of Box taller than a man, and furthermore by the giant ivy covering the corner and half the façade of the house. To more than one visitor's mind this beautiful estate must have brought the impressions of The Sleeping Beauty in her slumbering garden».*

The local tradition tells that the gardens still were in good keeping and that some of the owners put substantial amounts of money into garden extravagancies, culminating with Captain J. F. Cappe who moved to Milde after retiring, and lived here until his death in 1816 (Hjellestad 1919, Hjellestad 1998). In subsequent years, the estate fell into dilapidation, and gradually Nature took over. This may partly have been assisted by romantic ideas about "recreating Nature in the garden", which strongly influenced the new bourgeoisie during the early 19<sup>th</sup> century (following the so called "English" landscape garden style) (Moe 2000).

A reconstruction published in 1915 (Schnitler 1915) included first of all the small rectangular formal renaissance parterre (fig. 8), where he indicated 10 *Buxus* plants surrounded by *Buxus*-hedges, an orchard and an area for berries of different kinds (*Ribes rubrum* and *R. uva-crispa*), along with two separate pavilions surrounded by living specimens of (still existing) *Philadelphus coronarius* and a grotto as well. Schnitler also draws a large square called "Dam" in the south-eastern corner of the garden. This ought to correspond to the "Fiskepark" (fish pond(s)) mentioned in the 1719 document from this garden.

Since 1875 the garden has been mentioned and/or visited by several humanists as well as scientists, studying different aspects of the garden (e.g. Nøvik 1901, Schnitler 1913, Naustdal s.a., 1943, Skard 1963, Hopp 1990, Bruun, Eggen 1992, Moe 1994, Ihlen 2003). Contrary to the mentioned Rosendal barony and its gardens, the exact time of establishment of the Renaissance ornamental garden at Milde is not known. In the present paper data indicating a minimum age about 1660 to 1670 is given.

The present day garden covers an area of about 7000 sqm (fig. 15, see fig 2), south and southeast of the house with several old trees (Vink 1999,

Ihlen 2003, Moe 2003). The garden appears relatively undisturbed, and has not been restored during the last 100 years or more. The parterre is still there in front of the manor house, a rectangle of about 25 x 15 m, almost covered by the *Buxus*-shrubs. The berry hedges indicated by Schnitler (1915) just outside the parterre are today gone. Only remnants of the *Buxus* hedges indicated by him to the east of the house are still marked by huge, surviving shrubs. Several specimens of white and red forms of *Ribes rubrum* and green and "brown" *Ribes uva-crispa* are, however, found scattered within the garden, as well as on top of, and outside the walls, indicating which cultivars may have been used for hedging in former days. The original fruit trees in the orchard area are also gone, substituted for more modern cultivars during the 1950-ies. The wet part in the south-eastern corner of the garden where Schnitler (1915) indicates a fish pond has no obvious constructions visible. The romantic atmosphere is, however, still possible to feel because of the vegetation (fig. 8).

## Methods

The following methods are used:

- A digital map of the southern part of the garden, for detailed mapping of the garden elements has been constructed.
- Floristic and morphological survey of extant garden plants.
- Stratigraphic survey utilising a georadar, accomplished in 2002 by the help of the Norwegian company, Interconsult, ICG ASA, Bergen, using a 7 cm/ns antenna.
- Pollen analysis field sampling and laboratory preparations following standard methods (Fægri 1989), using volumetric 1 cm<sup>3</sup> sub sampling (Birks 1986), proposed lithostratigraphical descriptions (Troels-Smith 1955) (Table 4), and available keys for spore and pollen identification (Fægri, Iversen 1989) and the reference slide collection at Museum of Botany/Dept. of Biology, University of Bergen. The pollen analysis is presented in diagrams using the Core data program (Department of Botany, University of Bergen), and the pollen sums are added in the diagram.
- Archaeological excavations, detailing the

remains preserved in sediments in the fish pond area in the South-Eastern part of the garden.

- Macrofossil and osteological techniques to analyse samples taken from the parterre and fish pond area
- Molecular studies. So far roses and *Buxus* have been sampled. A test study on roses using RAPD have been performed at The Institute of Biology, University of Bergen, and AFLP analyses of *Buxus* are in progress by Dr. Birgit Kanz at Grunelius-Möllegaard lab, Forschungsinstitut Senkenberg, Frankfurt am Main, Germany. Aims in the latter case include evaluation of the possible effects of somatic mutations, testing within and between morph variability, and search for specific markers separating the morphs, and thus verifying the morphological variation observed.

## Results and Discussions

### *The present day vegetation*

The vegetation in and around the garden today (Table 2, nomenclature according to Elven *et al.* 2005) is characterized by large trees of ash (*Fraxinus excelsior*), oak (*Quercus robur*), linden (*Tilia europaea*), sycamore (*Acer pseudoplatanus*), norway maple (*A. platanoides*), birch (*Betula pendula*), aspen (*Populus tremula*), willow (*Salix caprea*), bird cherry (*Prunus padus*), hazel (*Corylus avellana*), rowan (*Sorbus aucuparia*), and hawthorn (*Crataegus laevigata*). Several of these trees may originally have been planted and some have spread offspring in and around the garden. Specimens of planted trees also include *Juglans regia*, *Populus tristis*, *Laburnum anagyroides*, and *Carpinus europaeus*. Many of the trees house a rich epiphyte flora, including several rare lichens (Ihlen 2003, Tønsberg pers. comm.).

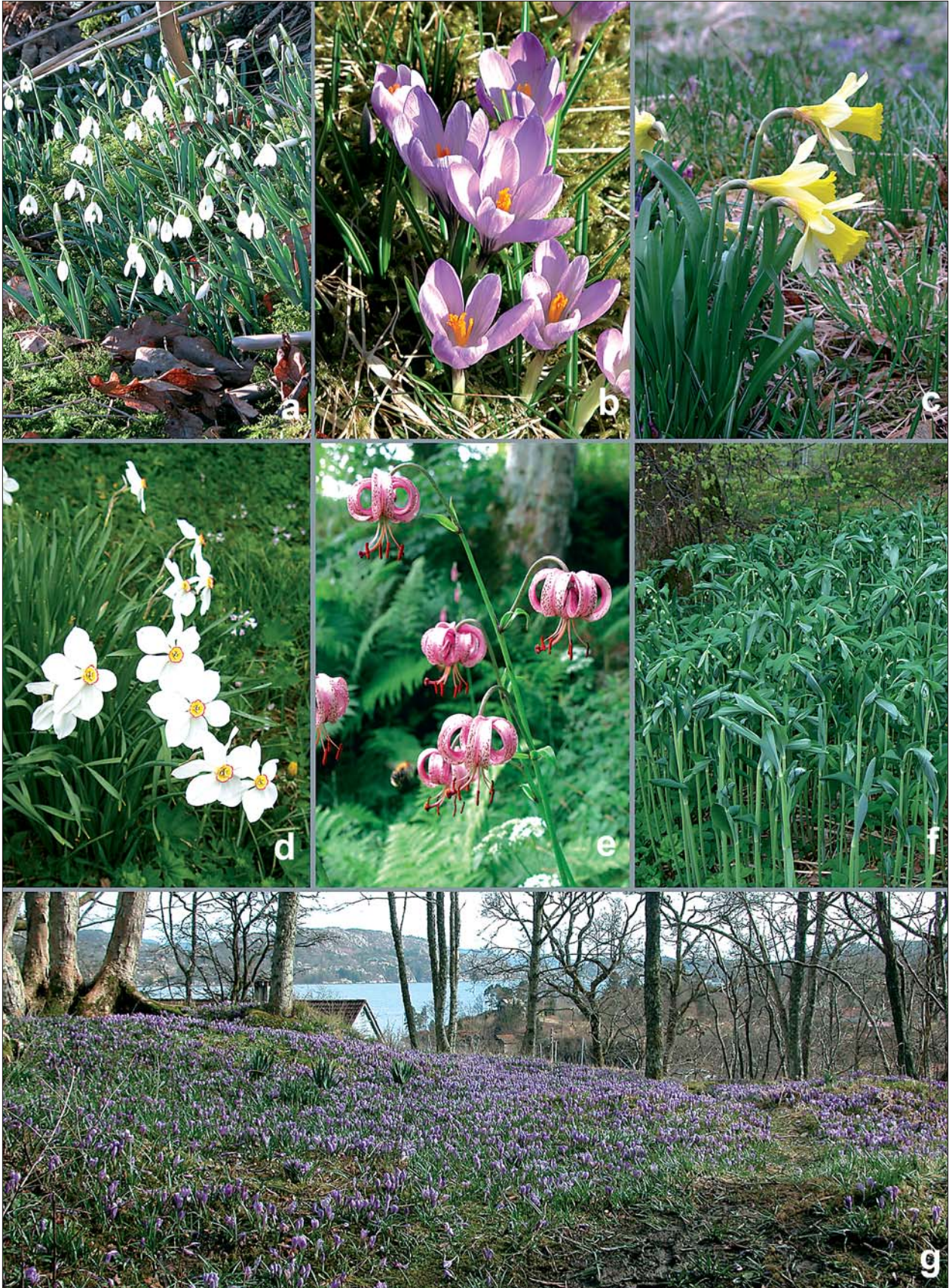
Some shrub thickets are found, consisting of planted species like *Philadelphus coronarius*, *Symphoricarpos albus*, *Syringa vulgaris*, *Buxus sempervirens* and others. Within the tree stands and in the thickets one finds several species of *Ribes*. The understory vegetation is dominated by grasses and herbaceous plants and is being maintained as hay-fields in an old fashioned way, with little or no fertilization and being cut rather late in the season (around 1 July). Conspicuous species (fig. 5) include naturalised *Lilium martagon*, *Galanthus*

*nivalis*, *Crocus vernus*, *Cardamine pratensis*, *Myrrhis odorata*, *Lysimachia nummularia*, *Bellis perennis*, and *Centaurea montana*. Along with these are found common species like *Athyrium filix-femina*, *Gymnocarpium dryopteris*, *Phegopteris connectilis*, *Dryopteris dilatata*, *Polypodium vulgare*, *Agrostis capillaris*, *Poa nemoralis*, *Phalaris arundinacea*, *Alopecurus pratensis*, *Dactylus glomerata*, *Schoenodorus pratensis*, *Poa trivialis*, *Poa pratensis*, *Elytrigia repens*, *Anthoxanthum odoratum*, *Arrhenatherum elatius*, *Holcus lanatus*, *Holcus mollis*, *Deschampsia cespitosa*, *Festuca rubra*, *Luzula multiflora* ssp. *multiflora*, *Juncus articulatus*, *Juncus effusus*, *Carex leporina*, *Carex nigra*, *Urtica dioica*, *Rumex obtusifolius*, *Rumex longifolius*, *Rumex acetosa*, *Silene dioica*, *Lychnis flos-cuculi*, *Ranunculus acris*, *Ranunculus ficaria*, *Ranunculus auricomus* agg., *Ranunculus repens*, *Rubus idaeus*, *Geum urbanum*, *Geum rivale*, *Alchemilla xanthochlora*, *Potentilla erecta*, *Filipendula ulmaria*, *Fragaria vesca*, *Lathyrus linifolius*, *Vicia sepium*, *Trifolium repens*, *Trifolium pratense*, *Lathyrus pratensis*, *Oxalis acetosella*, *Geranium sylvaticum*, *Epilobium montanum*, *Anthriscus sylvestris*, *Conopodium majus*, *Angelica sylvestris*, *Aegopodium podagraria*, *Prunella vulgaris*, *Ajuga pyramidalis*, *Stachys sylvatica*, *Veronica chamaedrys*, *Digitalis purpurea*, *Plantago lanceolata*, *Succisa pratensis*, *Campanula rapunculoides*, *Achillea millefolium*, *Cirsium palustre*, *Hypochaeris radicata*, *Taraxacum* sp., *Hieracium* sp.

### *Living heritage in Milde estate garden: remaining garden plants*

The relic garden plants found at the Milde estate are currently being propagated and planted in duplicates in the collections of The Arboretum and Botanical Garden at Milde, to secure this genetic heritage for future use, for example in restoration of old gardens in the Bergen district, where authentic material is needed.

Perennial plants. The first documented introduction of *Lilium martagon* L. to Scandinavia was to Bergen in 1596, where it flowered for the first time in 1597 (Lundquist 2005). Bulbs were received there by the town surgeon, dr. Høyer, from Holland, sent by Carolus Clusius of the botanical garden in Leiden, in 1596. Together with



5. - Traditional bulbous perennials found in the garden at Milde: *Galanthus nivalis*, naturalised (a); *Crocus vernus*, naturalised and locally widespread (b, g); *Narcissus pseudonarcissus*, extant (c); *Narcissus poeticus*, extant (d); *Lilium martagon*, naturalised (e); *Polygonatum hybridum*, extant (f) (photos PHS & DM).

Trees	Shrubs	Perennials
<i>Abies nordmanniana</i> <i>Picea abies</i> (till 1940) <i>Picea sitchensis</i> <i>Acer platanoides</i> (*) <i>Acer pseudoplatanus</i> (*) <i>Betula pendula</i> 'Dalecarlica' (till 2003) <i>Carpinus betulus</i> <i>Crataegus laevigata</i> (*, 2 ff.) <i>Fagus sylvatica</i> 'Atropunicea' (till 2003) <i>Fraxinus excelsior</i> (planted & native) <i>Juglans regia</i> <i>Populus tristis</i> <i>Malus domestica</i> <i>Prunus avium</i> (*!) <i>Prunus insititia</i> <i>Prunus domestica</i> <i>Laburnum anagyroides</i> (*) <i>Tilia Heuropaea</i>	<i>Berberis vulgaris</i> <i>Buxus sempervirens</i> (*, 3 ff.) <i>Cotoneaster lucidus</i> (*) <i>Cotoneaster divaricatus</i> (*!) <i>Cotoneaster moupinensis</i> (*!) <i>Cotoneaster adpressus</i> (*) <i>Hedera hibernica</i> <i>Hydrangea</i> 'Hortensia' <i>Partenocissus inserta</i> <i>Philadelphus coronarius</i> <i>Rhododendron catawbiense</i> cv. <i>Ribes alpinum</i> <i>Ribes divaricatus</i> (*) <i>Ribes rubrum</i> (*!, 2 ff.) <i>Ribes glutinosum</i> <i>Ribes uva-crispa</i> (*!) <i>Rosa majalis</i> var. <i>foecundissima</i> <i>Rosa villosa</i> 'Duplex' ("Milderosa") <i>Rosa</i> 'Le Rêve' <i>Rubus vestitus</i> <i>Sambucus nigra</i> (*) <i>Symphoricarpos albus</i> <i>Syringa vulgaris</i>	<i>Allium schoenoprasum</i> <i>Aquilegia vulgaris</i> (*) <i>Aconitum stoeckianum</i> <i>Bellis perennis</i> (*) <i>Bistorta officinalis</i> <i>Centaurea montana</i> (*, 2 ff.) <i>Crocus vernus</i> (*!) <i>Galanthus nivalis</i> (*!) <i>Leucojum vernum</i> (*) <i>Lilium martagon</i> (*!) <i>Lysimachia nummularia</i> <i>Myosotis palustris</i> <i>Myrrhis odorata</i> (*!) <i>Narcissus poëticus</i> <i>Narcissus pseudonarcissus</i> (2 ff.) <i>Narcissus</i> cvs. <i>Ornithogalum angustifolium</i> (*) <i>Polygonatum hybridum</i> <i>Pulmonaria montana</i> <i>Sedum spurium</i> (*) <i>Othocallis siberica</i> <i>Tanacetum vulgare</i> (before 1970) <i>Veronica filiformis</i> (*)

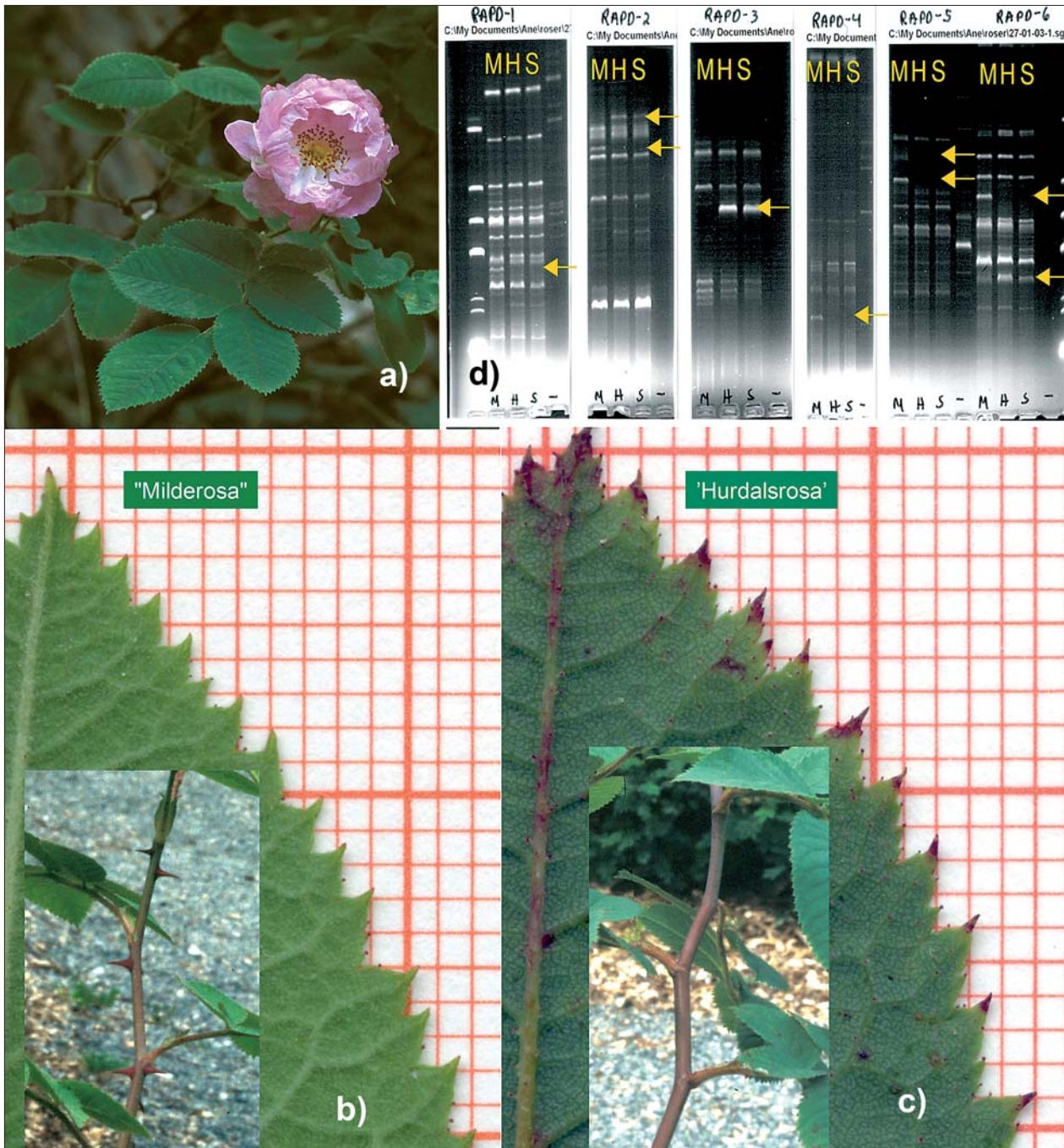
**Table 2.** - Extant garden plant species and cultivars not in active cultivation at Milde today. (**Boldface:** Species of historical interest, believed to be dating from before 1900; \* Species successfully establishing seedling offspring; ! Species forming fully naturalised populations. Nomenclature according to Elven *et al.* 2005).

*Lilium martagon*, Høyer also seemingly received bulbs of *Crocus*, *Narcissus*, and other species that are believed to have flowered in Bergen the following years (Eckblad 1991, Lundquist 2005). A direct connection with the species of bulbs today found at Store Milde (table 2, fig. 5), can hardly be established, and any documentation in the form of herbarium specimens or otherwise of the species in question from Milde, is lacking before the 1930-ies. From preliminary datings of the trees in the garden and an evaluation of the populations of the *Crocus vernus* and other naturalised herbaceous species at Milde, however, one may indicate that several species probably have a history dating before 1900.

**Roses.** Two rare old garden roses are found extant in the garden at Milde; *Rosa majalis* var. *foecundissima* (Münchhausen) Koch and *Rosa villosa* 'Duplex' Weston 1770 (local name "Milderosa", syn. 'Wolley Dod's Rose', see Willmott 1914, Salvesen 2002). The former has been known here for some time (Naustdal 1943, s.a.), while the latter has not previously been recorded in old gardens in Norway. At Milde it survives in the garden as a large, straggling shrub partly shaded by the swelling *Buxus* and large *Fraxinus* trees overtopping it. A morphological study revealed the identity of it (Salvesen 2002,

fig. 6), and a molecular test using RAPDs (Salvesen unpubl.) have verified differences in several bands between the 'Duplex' ("M" = "Milderosa") and two provenances of the resembling cultivar, 'Hurdalsrose', grown in The Arboretum and Botanical garden at Milde ("H" = standard trade material, and "S" = collected in an old garden at the Island Svanøy, Sogn & Fjordane). Between the two samples of 'Hurdalsrose' on the other hand, no differences were found in RAPD markers.

**Box, *Buxus sempervirens* Linn. (Linnaeus 1753: 983,  $\alpha$ ).** Box according to current literature (Tutin 1968, Castroviejo *et al.* 2000, Batdorf 2004) makes an irregular, broad shrub or a little tree some 3-7 (- 9) m high. The shoot initially is somewhat pubescent, later more or less smooth and glabrous, longitudinally ridged and olive green; leaves densely set in pairs, winter green, ovate or elliptic (7-20 x 15-30 mm), without stipules; usually dark olive green and glossy above, and more dull and light green beneath, and with a rounded or emarginated apex; the leaf margin commonly deflexed giving the leaf blade a distinctly convex shape. Flowers inconspicuous, monoicous, in small heads formed by several staminate flrs. with 2+2 tepals and 4 anthers, around one pistillate flr. with 3+3 greenish white



6. - Rose studies. *Rosa villosa* 'Duplex' found at Milde (a, b) is similar to 'Hurdalsrosa' (c). Leaf margin serrate and stems prickly in 'Duplex' (b), leaf margin doubly serrate and stems virtually thornless in 'Hurdalsrosa' (c). Banding pattern in RAPD different between 'Duplex' from Milde (M in d) and 'Hurdalsrosa' (H, S in d). See text for details (photos PHS).

tepals. Pollinated by insects collecting pollen and nectar secreted by nectaries between the 3 stigma. Flowering in April-May. The spherical capsule opens with three valves each with 2 small horns, ejecting 6 hard, glossy black seeds. Native from Caucasus and Asia Minor through the Mediterranean area to North Africa and Western Europe including Iberia, W France and S England. Escaped and naturalised many places in

N Europe, including coastal parts of S and W Norway (Elven *et al.* 2005).

Box may have survived the last (Weichsel) Glaciation in isolated refugia in The Caucasus and SW Europe. Fossils show it occurred in SW France (Pyrenées) more than 9000 y BP (Jalut 1974), and that it reached England already some 8000 years ago (Batdorf 2004).

In cultivation, the Box is known since Ancient



7. - Comparison of leaves (a-c) and stems (d-e) of these different morphs of *Buxus* found in the Milde estate garden. *Buxus sempervirens* 'Pendula', convex lamina (a) and largest stem (d, coin diameter 2.5 cm); *B. sempervirens* 'Suffruticosa', flat lamina (b) and stems with green adventitious shoots (e, background right); *Buxus*, Yellow-leaved morph, concave lamina (c) and bare stems (e, front left) (see text, photo PHS).

Times (see Batdorf 2004). In written sources, it is mentioned as useful for hedging and in topiary during Roman Times. The description by Pliny the Younger in *Epistolae* (book V, *littera* iv, ca. 100 AD) tells that in front of the pillars at his villa in Tuscany, there was an open terrace encircled by *Buxus* formed into different animal shapes, and around it all a pathway densely flanked by shrubs trimmed in different ways. From plant remains disclosed in Pompeii (Ciarallo 2004) it is evident

that *Buxus* was among the plants grown in the gardens there at AD 79.

It is claimed that the Romans brought the species and the garden style with them on their conquests. It has also been pointed out as a possibility that *Buxus sempervirens* was part of the inventory of the Royal gardens of the Middle Ages. When *Buxus sempervirens* today is found seemingly native in small, isolated stands in the United Kingdom, Germany, and France, the distance to archaeological sites is often rather

short. As a consequence it proves difficult to decide whether the species occurs as a native or is an escapee or survivor from gardens long time abandoned (Decocq 2004).

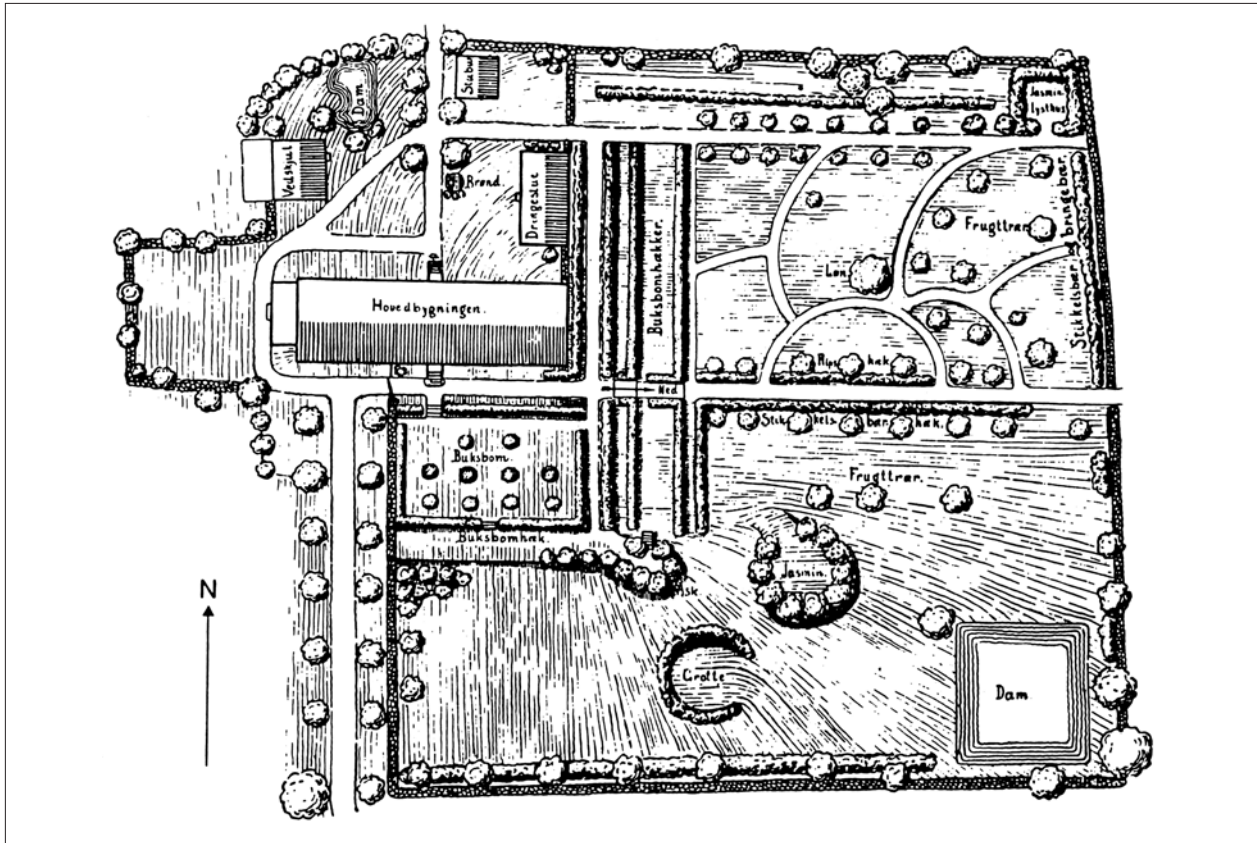
Even if an introduction of *Buxus sempervirens* to the Nordic countries before or during the Middle Ages cannot be ruled out, no evidence substantiating this is known. The species is not mentioned in our oldest herbals, dating from the 14<sup>th</sup> and 15<sup>th</sup> centuries. These works were, however, mostly transcripts from older writers, treating plants for medicinal uses, and in that context, *Buxus* never played any significant role. The earliest mentioning's are in Danish herbals dating from 1510 and 1577 (Lange 1999). By this time Norway and Denmark were united as one kingdom, under the Monarch in Copenhagen. Even in Nobility gardens, the few references to the species indicate that the knowledge of its use was limited. This being the case, the Renaissance style, requiring squared patterns of bordered beds, was still well known to the northern outposts of Royalty. For instance, at The Gottorp castle in Holstein, one still used painted planks and tiles for bordering beds, when Johannis Clodius took over as the Prince's gardener in 1625. He was experienced in nobility gardens in Italia (Firenze and Roma), England, Holland, and Germany. Already the next year he arranged for the delivery of *Buxus* from Friedrichstadt, where merchants imported it from Holland. The novel style spread quickly, and the need for *Buxus* increased. In 1635 The Prince wrote to the King's gardener at Rosenborg, David Konig, for "6 Ziegen Buxbom", and in 1642 he ordered 40 barrels of Box for the ornamental Garden at Nykøbing. At the same time Block (1647) describes *Buxus sempervirens* as by far the most important bordering plant. By then the species was in extensive use for bordering and ornaments in the Royal Gardens at Rosenborg in Copenhagen, where Block was working (Block 1647, Christensen 1999:64). The Royal Gardens gradually produced substantial quantities of *Buxus*, and the nobility became more and more self sufficient. From the gardens at Rosenborg 25 barrels were delivered to The Queen's estate by 1668, and the Queen's gardener, Christoffer Schalen, on his side, by 1675 was able to deliver 24 barrels (Christensen 1999: 293). On the death of Queen Sofie Amalie, her gardens contained several quarters bordered by *Buxus*, and in one of them she had her monogram with the Royal

Crown planted in *Buxus* (inventories 1681, 1685, Christensen 1999: 174-178).

From Norway little is recorded in writing from the introduction of the species. The earliest mention is made by Gartner (1694), a gardener working in Trondheim, but trained in the royal gardens in Paris. He mentions *Buxus* as an example of what could be used for bordering in foreign countries. In Trondheim he did not consider it suitable, and recommended leek and grass instead. Still, we know from preserved receipts that *Buxus* was purchased to the Rosendal Barony in 1666 (Dietze 2000). Possibly the extant large shrubs of the species still found today in the former renaissance parterre stems from this introduction. And, we suspect that well situated citizens were quick at adopting the new garden fashions from European nobility, at least in the ports along the southern and western coasts of Norway.

*Buxus sempervirens* at Milde. Studies indicate that three distinct forms or morphs of Box are found in The Old Garden (Salvesen 2005) (fig. 7). One fairly certainly is the classical Bordering Box, known as *Buxus sempervirens* 'Suffruticosa'. Another seems to be *B. sempervirens* 'Pendula'. While the last, a morph with yellowish green leaves on young shoots, is of uncertain affinity. In the following a preliminary description of the three morphs is presented. A more thorough morphological study is in progress, involving multivariate statistics, to test this classification and establish more firmly the extent of within morph variation and between morph discontinuities. Results from the AFLP studies in progress are not yet available, but DNA has been extracted and the first tests indicate that the method is functioning satisfactory. Future studies will hopefully give more specific evidence as to the genetics, affinities, and origins of the garden relic *Buxus* at Milde.

*Buxus sempervirens* 'Pendula' Dallimore (1908: 228, cf. "The common form" Lorentzon 1998, non Batdorf 2004). Six large specimens belonging to this morph is found in the parterre S of the Manor House at Store Milde. The specimens still seem to be standing in three rows, close to their original position in the renaissance garden. Probably they are the remaining six of the eight specimens mentioned by Schübeler (1875, 1888). Schnitler (1915) draws ten solitary specimens in three rows, but his drawing is a



8. - A reconstruction of the estate made in 1915 by F.C. Schnitler. The *Buxus parterre* (*Buxus* = buksbom) is seen in front of the main house. Rows of Box, berries as well as areas for fruit trees, grotto, two *Philadelphus coronarius* (= Jasmin) groves. In addition one small and one large pond (= dam) is marked (up to the left and down to the right, see text).

reconstruction, and hardly represents a true picture of the situation at that time.

The following description is based on these specimens (fig. 7a, d): One-stemmed small trees, reaching heights of 3.5 m and widths of more than 5.5 m (2005). Branches long and slender, elegantly pendulous, rooting. Annual shoots are stiff, quadrangular, and deflexed. Leaves 10-16x20-27 mm (width/length-ratio 0.47-0.62) strongly convex, upper side glossy, dark green (young leaves S3560-G30Y, aging to S5040-G20Y, SCI 1998). Lower side lighter green except for a dark green rim (young leaves S2060-G40Y, aging to S2040-G40Y). Main nerve of leaves and petiole finely pubescent on the upper side (also in the petiolar furrow along the shoot). This morph flowers and sets seeds freely. The stem of the largest specimen measures 102.5 cm in circumference at the base (fig. 7 d) and 81.6 cm 1.25 m above ground (4 October 2005). Probably the stem dimension measurements by Schübeler (1875, 1888) refer to this specimen, which was remeasured by Moe (1990, 1991a,b). According to

Lorentzon (1998, cp. Dallimore 1908) there are several pendulous cultivars, and the reference of the specimens at Milde to 'Pendula' should be considered preliminary. 'Pendula' has not previously been recorded in Norway, but Lorentzon (1998) states that the more common pendulous form seen in Sweden has leaves resembling 'Rotundifolia': big, ovate with an emarginated apex and deflexed margins. This corresponds well with the characters seen in the plants at Milde. According to Batdorf (2004) the leaves of 'Pendula' are rather narrow, and the shoots are slender and flexible. This does not quite agree with "our" plants.

The name 'Pendula' has since long been in use in Great Britain (Elwes, Henry 1908, Dallimore 1908, Bean 1970, Hillier, Coombs 2002) and Germany (Beissner 1903, Krüssmann 1965, 1976). According to Batdorf (2004) it originated by the middle of the 19<sup>th</sup> century, and was apparently first mentioned (as *Buxus sempervirens* var. *pendula*) in a catalogue issued by the firm Simon-Louise of Metz in N France (Simon-Louis, Cat. 1869, s. 21



ex. Elwes 1908). The plants found at Milde must be much older (see below), and may thus belong to a cultivar not in cultivation anymore.

*Buxus sempervirens* ‘Suffruticosa’ (Linnaeus 1753: 983, β) Today, 15-20 specimens of a form corresponding closely to the classic Bordering Box, also known as Dwarf Box or ‘Suffruticosa’, is found at Milde. Along the southern border of the parterre, seven specimens are standing about 1 foot apart in a row. They are now being overgrown by larger specimens of the two other forms, and struggle to reach up into the light. At the south-eastern corner of the house two low shrubberies are seen, each some 3 m in diameter and formed by 2-3 plants. They obviously were cut back in relatively recent times, but hold stems of considerable dimensions, the largest one measuring 33 cm around the base.

The following description is based on these specimens (fig. 7 b, e): Low and broad shrub with ascending, and spreading branches, to 1.7 m high and 4.1 m wide (2005). New shoots form easily on even quite old stems. Annual shoots are slender and thin. Lamina 11-14x20-24 mm (w/l-ratio 0.50-0.60), rather flat, not distinctly convex or concave, upper side glossy, yellowish to fresh green (young leaves S2050-G50Y, older S5040-G30Y), lower side lighter yellowish green (young S2040-G50Y, older S2050-G50Y). Petiole and main nerves are finely pubescent. A few flowers observed at Milde, but fruiting not seen, in spite of the terminal flower being female.

‘Suffruticosa’ in old literature is generally described as a dwarfed form characterised by not setting seeds (Albertus Magnus ca. 1250, see Jessen 1867, Parkinson 1629, Linnaeus 1737). According to more recent studies, flowers are formed at a low rate (Batdorf 2004), thus corresponding to the findings at Milde. The laminar dimensions of ‘Suffruticosa’ are, however, given as slightly more narrow (9-10x15-25 mm) by Batdorf (2004) than observed at Milde.

The Dwarf Box probably is a very old cultivar. Its origin is given as Southern France (Schübeler 1888) or Holland (Hobhouse 1992, 167; Christensen 1999, 302). But there are indications that it may be dating back to antiquity. We find the description given by Albertus Magnus from the 13<sup>th</sup> century interesting in this respect. He writes (Jessen 1867, 359-360, translation from latin by PHS): “*There are furthermore two kinds of this*

*wood: one which is more tall growing, has less spreading branches and carries small, globular fruits (capsules), each with horns; and another one that is less tall growing, has more spreading branches, and never sets seeds*”. He obviously knew both forms from gardens, since he was familiar with the fact that “*both are replanted (propagated) by breaking off twigs and putting them into the soil*” (Jessen, l.c.). At the middle of the 16<sup>th</sup> century the dwarf form was referred to as *Humibuxus* (Dodoens [Dodonaeus] 1554, 1557) and later as *Buxus humilis* (Dodoens 1616, Parkinson 1629). Dodoens also in his “*Crujideboeck*” (1554) states that both forms are planted in the gardens in Holland. According to Hobhouse the Dwarf Box was first used to form a “*parterre à broderie*” in a larger castle garden by Claude Mollet in Saint-Germain-en-Laye, France in 1595 (Jacques, van der Horst 1998 fide Christensen 1999, 302). In the second decennium of the 17<sup>th</sup> century, the broiderie motifs became a fashion throughout Northern Europe. As we have seen, *Buxus sempervirens* was introduced at Danish castles from Holland 1626. In an inventory from 1642 of the King’s garden in Copenhagen (Rosenborghaven, Sperling 1642, Christensen 1999), ‘Suffruticosa’ is mentioned. The first mentioning of “Suffruticosa” from Norway in oNly by Schübeler in 1888. But knowing, as we have seen, that it was available in the trade from; Holland, and probably also as surplus from Danihs nobility gardens, it is not unlikely that it may have reached Bergen and Milde as early as the middle of the 17<sup>th</sup> century, at a time when trade flourished along the coast.

*Buxus*, Yellow leaved morph. The number of specimens of this morph at Milde is difficult to ascertain. Several more or less well delimited thickets (approx. 12-13 multistemmed specimens) are found east of the house. And on the parterre on the south side of the houses 3-4 large thickets (a dozen shrubs) reach heights of more than 4.2 m and widths of 7 m and more. This morph is always multistemmed, and several stems reach 60 cm of circumference, the largest measuring 62 cm at the base.

The following description is based on these specimens (fig. 7 c, e): Coarse, multistemmed shrubs with upright or ascending, twisted and stiff branches reaching above 4.2 m and more than 7 m wide (2005). Annual shoots are long and flexible.

Lamina 14-17x22-28 mm (w/l-ratio 0.58-0.71) shiny, but not glossy above; the leaf margin mostly curves upwards, making a boat form (concave); on new shoots distinctly and evenly yellowish green (S3060-G50Y above, S3040-G60Y below), gradually becoming more green above (S3560-G30Y), more yellow below (S2040-G70Y), and often somewhat discoloured by rust. Shoots, petiole and main nerve of lamina smooth or with only scattered puberulence on upper side of petiole and nerve base.

We have not succeeded in finding a named form of *Buxus* in the literature that corresponds to the morph found at Milde. It may correspond to one of the yellow forms described from nobility gardens in the 17<sup>th</sup> and 18<sup>th</sup> centuries (Parkinson 1629, Tournefort 1700, 1719; Boerhaave 1720, Linnaeus 1737), but it seems to be notoriously difficult to identify such plants, since they are not constant (Lorentzon 1998). They are known to revert to the wild type with green leaves or change in appearance during time. This has obviously contributed to the existence of several not very well defined names, like ‘*Latifolia Aurea*’ (Batdorf 2004), ‘*Rotundifolia Aurea*’ (Dippel 1893), ‘*Cucullata*’ (Koch 1872, Dippel 1893), and ‘*Navicularis*’ (Koch 1872, Dippel 1893). There is also an intriguing affinity with the apparently extinct variegated cultivar ‘*Alba*’ belonging to *Buxus microphylla* var. *japonica* (syn. ‘*Variegata*’ Dippel 1893, see Batdorf 2004). Hopefully future comparisons with material kept in Botanical collections may give an answer.

Forms with “golden” leaves were considered especially valuable, and are recorded at Danish castles during the 2<sup>nd</sup> half of the 17<sup>th</sup> century (Christensen 1999, 148-149). In an inventory made by the French gardener Francois Bernier May 26 1685 in the Queen’s “Liden Ljsthaug” outside Østerport in Copenhagen, 6 jars of “vergülte Bux Beüme oder mit gelbe Blettern” is mentioned. Two yellow leaved plants in jars are also mentioned in 1681. These plants were probably taken inside during winter, and in 1695 two jars containing “bunten Buchsbaum” are mentioned in the inventory of the new “Pommerantz-house”. The first mentioning of yellow leaved forms grown in Norway is by Schübeler (1888), referring to “*Buxux sempervirens foliis luteo-maculatis*”.

The gardener of the King of Denmark, Hans Razsmussen Block, does not in his “*Horticultura Danica*” (Block 1647) specify which forms of

*Buxus* he recommends, but from what he writes on the prevailing garden fashion, it is hard to believe he was not familiar with the most outstanding cultivars available at his time. He writes on the excellence of *Buxus* in designing the patterns required to decorate the Royal Garden (l.c. 54, 56):

«*In this Garden the Emblem of the King of the Danes is perfectly set in Buxus in the Quarter closest to the Gate....*” “*...besides the one holding the Emblem, and the details of the Emblem have taken half of it. The other half is divided into two Parts, and in each there is a very lovely Piece, indeed these Pieces are sitting just in front of the House. There, bordering each fourth Part is set with Buxus, placed along the outside of the straight Sides very neatly and are tidily trimmed very even, and in the middle of each Line there is an Entrance into the squared Pattern, and on each Side of this Opening an exceedingly well trimmed Buxus stands somewhat higher than the others. These Mouldings ornate so well that a Man who has not seen it before, and who unwarily enters upon them, then he will not believe otherwise than that they are some very fine and grand Beams, bordering the Patterns with large Knobs on them, so that People shall not run among the Herbs, especially when someone stands upon the Hill above and looks down into the Garden, then these green Buxus Mouldings ornate much more than I can say or write*» (Translated from Danish by PHS).

The garden book of Mr. Block led the fashion into the 18<sup>th</sup> century also in Norwegian gardening. At length, he treats mazes (“Trojborger”), i.e. square garden plans shaped as labyrinths, and aims at teaching the common citizen how to construct a garden that adopts this royal style. He admits that in small spaces one will have to reduce the numbers of Quadrats, and one may even depart from the quadratic form, adopting a rectangle in cramped places. The Renaissance style parterre in front of the house at Store Milde could very well have been taken out of one of Block’s designs. It measures ca. 25 x 15 m in rectangle, and the six specimens (originally eight or ten) of ‘*Pendula*’ are placed in three lines parallel to the house, in what appears to be remnants of a crossed pattern. Surrounding them are the other two forms of *Buxus* placed along the outer edges of the parterre. It is possible to envisage ‘*Suffruticosa*’ planted in trimmed rows, like green beams, interrupted at the corners and openings by the yellow-leaved form, trimmed into rounded knobs, in the fashion described by Block.

Author	Years	Circumf. mm	Radius med mer	Annual increment (mean)			Estimated age (AD) (at 1.25 m high)		
				1874	1887	1990			
Schübeler	1874	470	74.8	-	-	-	-	-	-
Schübeler	1887	500	79.6	0.37	-	-	1670	-	-
Moe	1990	770	122.6	0.45	0.42	-	1718	1696	-
Salvesen	2005	816	129.9	0.42	0.43	0.49	1696	1685	1724

**Table 3.** - Growth rate and estimated age of largest *Buxus sempervirens* specimen.

Dimensions, growth, and estimated age of *Buxus*. The large specimens of *Buxus sempervirens* at Store Milde were studied in some detail by Schübeler (1875, 1888) and Schnitler (1915). Schübeler (1875) mentions 8 specimens measuring 2.5-3.1 m in crown width and stem height, and record the circumference of the largest stem as 47 cm at 1.25 m above ground. A dozen of years later, he found the shrubs to be around 3.1x3.1 m and the stem had increased to 50 cm (Schübeler 1888). In 1990 the *Buxus* plants were studied again (Moe 1990, 1991a). The largest stem then was recorded to measure 77 cm. Today (2005) the same stem measures 81.6 cm in circumference 1.25 m above ground. Under the assumption that the largest stem has been measured on the same specimen each time, a comparison is set up in table 3 below, also featuring calculations of mean radial annual increments and estimated age. The latter is based on the maximum circumference, 102.5 cm, measured at the base of the thickest stem (fig. 7 d).

Considering total height and width (crown measurements), the largest shrubs are today 4.2 m high and more than 7 m wide. These figures pertain to the yellow leaved morph, whereas the pendulous morph, carrying the largest stem, measures slightly less. Several specimens of this morph extend long branches sideways, rooting at a distance from the main stem. The main stem on most 'Pendula' plants are in the process of decay, and 2-3 specimens are obviously weakened from shade and age.

Based on studies of annual rings in a branch cut from one of the 'Pendula' specimens, the annual mean increment along the radius was calculated at 0.4 mm annually by Moe (1990, 1991a). This would give a dating of the largest stem at around 1680. Recently (summer 2005) additional data have been collected, also from 'Suffruticosa' and the yellow leaved morph, allowing calculations of

adjusted ages for all three morphs. Annual increments were measured on branches of all the three morphs.

Based on the measurements from 2005 and the values referred to by Schübeler (1875), it is now possible to indicate a more robust mean annual increment, and a crude estimate for the variation and uncertainty of the measurements. Schübeler does not give any data as to what year his measurements were taken. We may for simplicity anticipate, in accordance with Moe (1991a), that they were taken the year before publication, i.e. in 1874 and 1887 respectively. This gives mean growth increments along the radius of 'Pendula' between 0.42 and 0.45 mm annually over 131 or 118 years. Calculations made on Schübeler's data alone give a lower value (0.37 mm/yr), whereas a comparison of the data in Moe (1990) and today's situation, results in a slightly higher rate (0.49 mm/yr). This may indicate an increased growth rate during recent years, but the differences probably fall well within a reasonable uncertainty in these measurements. Calculations based on these data, give somewhere between 1670 and 1724 for the year the largest stem reached the height of 1.25 m above ground, and a seedling year between 1564 and 1672 based on the circumference at the base. The median increment is 0.42 mm, giving an estimate for the seedling year to be 1617.

Annual ring measurements in sections of larger branches in the 'Pendula' form gives a mean increment of 0.39 mm/yr, or 93% of the rate estimated for the main stem. For comparison we have calculated datings corrected for a lower growth rate in branches than in the main stem, but in 'Suffruticosa' and the yellow leaved form, the growth habit is multistemmed and shrubby, making it plausible to assume similar growth rates in major branches and thinner twigs.

Morph	Branch		Largest stem		Estimated age (AD)	
	circumf.	rad. incr.	cicumf.	radius	branch	stem (corrected)
Pendula	159	0.42	1025	163.2	-	1617
Suffruticosa	87.5	0.25	330	52.5	1792	1807
Yellow form	120	0.29	620	98.7	1665	1689

**Table 4.** - Growth rate and estimated age of *Buxus sempervirens* morphs (measurements in mm).

Batdorf (2004) indicates a mean radial increment of 0.33 mm/yr as a rule of thumb for ‘Suffruticosa’ in Great Britain. In our case, this would indicate 1846 for the largest stems in ‘Suffruticosa’. The lower age estimates for this shrubby morph makes sense, since it was probably trimmed closely in the early period when the garden was maintained, making the low hedges grow more slowly than later, when they were allowed to grow freely. Presumably older stems would also have been removed at intervals to renew the hedges in an early phase, to keep them low and well trimmed. The same would not have been the case with ‘Pendula’, being grown as an ornamental solitary and one-stemmed tree. It is, however, probably safe to assume that the ‘Pendula’ form was introduced and planted as larger specimens, already shaped. Thus we may assume a year of planting some time later than the seedling year. Taken together, it is concluded as a working hypothesis, that the three *Buxus* cultivars were planted at the same time at Milde, possibly at the middle of or during the later half of the 16<sup>th</sup> century. Hopefully it will be possible to study more wood samples and also collect samples from the larger trunks of the specimens at Milde.

### The history of the parterre

The longer sides of the parterre run from west to east parallel to the main house. Along it and between the parterre and the house runs a 1 m broad pathway on top of an 80 cm high terrace (fig. 9). The ground floor of the house sits approx. 100 cm above this terrace. A stairway runs from the double garden doors of the house down to the pathway on the terrace. And another stone stairway is made in the north-western corner of the garden, connecting the pathway and the lawn on the parterre. On the side of the parterre opposite the house, there is a centrally placed, smaller stairway

(of 2 steps, now partly destroyed) leading from the parterre into the southern part of the garden. Except for a small lawn, the parterre is overgrown with *Buxus sempervirens* looking like a jungle, and the pathways that may have crossed the parterre in former days are now covered by turf and leaf litter. Of ornamental species only small *Galanthus nivalis* and *Bellis perennis* stands and an expansive specimen of *Hedera hibernica* are seen within the parterre periphery.

A general study of the parterre and the constructions surrounding it, gives some information about some earlier improvements or amendments to the garden construction. In the lowest part of the stone stairway leading from the front pathway to the parterre, some steps are of younger age than the rest. In addition, a stone edging along the parterre border and parallel to the terrace is found, today 5-10 cm below the lawn surface, indicating the former existence of a flower bed about 70-80 cm broad. Parallel to this flower bed and just outside the stone edging, the existence of a former path was verified by the use of a soil auger, again 5-10 cm below the lawn surface.

Along the southern margin of the parterre, a concrete wall (about 10 cm thick and 50 cm high above the terrain below the parterre) is seen, set ca. 60 cm away from, running parallel to, and level with what appears to be the original margin of the parterre. The use of this wall, today partly covered by Box, may have been to make room for a new path along the parterre outside the swelling Box hedges, but further studies are needed for more fully understanding this structure.

Georadar profiles and a test excavation. After having used a simple soil auger in the parterre, several georadar profiles were made. The main profile was taken from the east to the west, parallel to the house. Marked reflector levels were found about 30 cm below the top soil. One shorter profile was then made from the north to the south (fig.



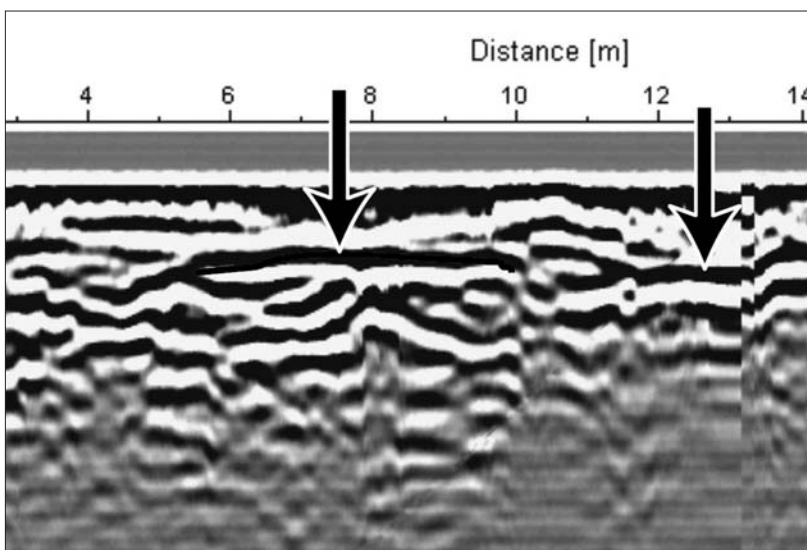
9. - The parterre overgrown in Box (*Buxus sempervirens*) seen from the pathway in front of the main house (a). Note the lawn in front of the terrace and the steps leading from the house to the terrace pathway. Two soil samples for pollen analysis were taken in the lawn (b). The stone steps from the terrace down to the parterre behind the Box in the back ground. Open soil section (c) in the parterre lawn, showing the clay horizon at approx. 30 cm depth (see fig. 10 and 11, photos DM).

10). Again a marked reflector level was found, at about 30 cm toward the north and shallower towards the south. The diagrams pointed to a certain level of interest at about 30 cm below the surface.

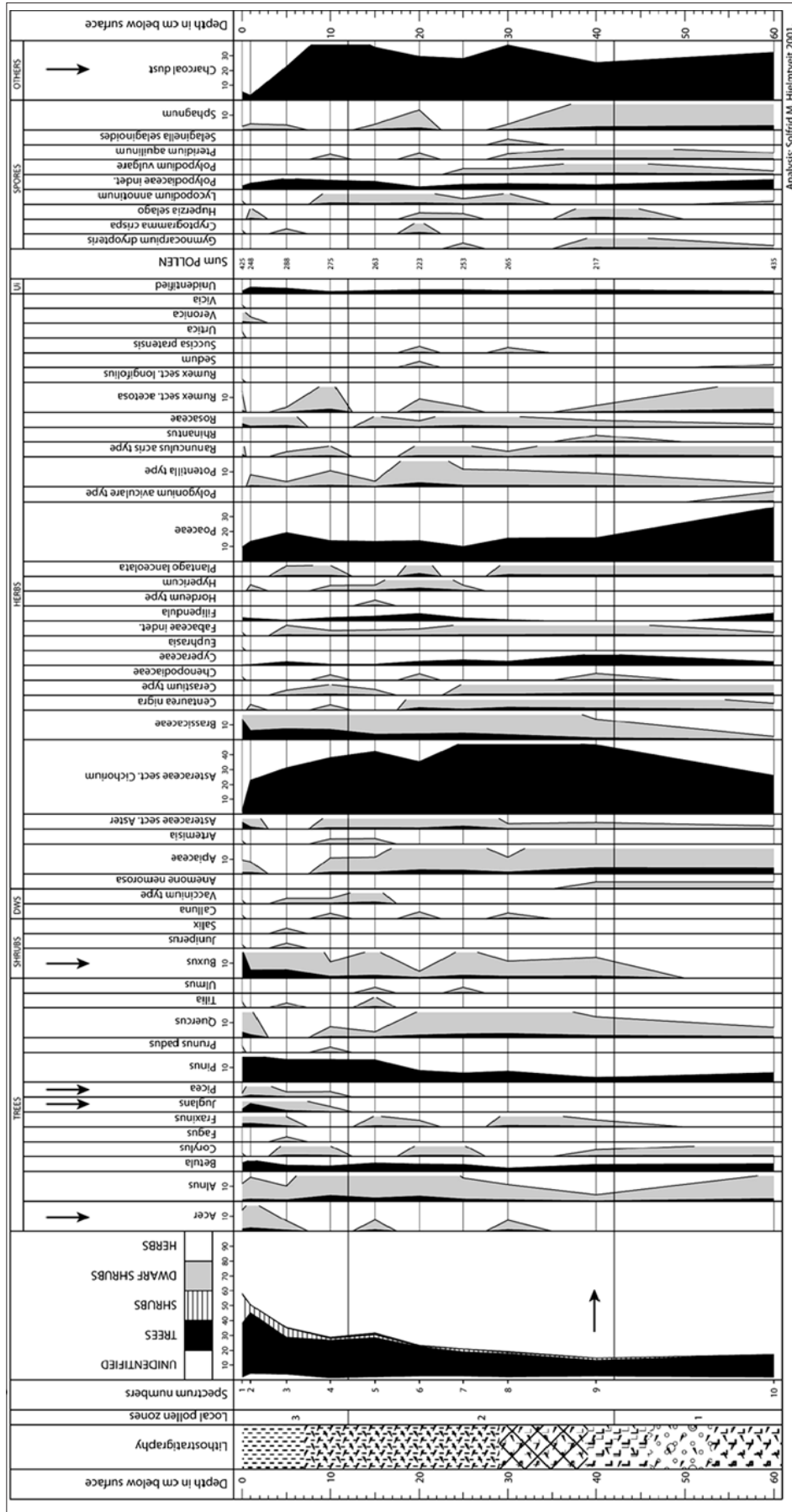
A test excavation in the central part of the lawn was made. The uppermost layer, from 0 to 7-8 cm, consisted of grass turf with living roots, followed by a sequence, from 7-8 cm to about 29-30 cm below the surface, with detritus and a well decomposed soil. From this level downwards, lenses of clay or silty clay surrounded by organic matter were found (fig. 9c). In the lowermost part, small stones, along with pieces of bricks occurred. The clay/silt lenses were hard and consolidated,

and most likely have given the reflections noted in the georadar study. An old Norwegian garden book (Gartner 1694, see also Adtzleu 1747) describing how to make and prepare the ground before constructing a garden, include a level of clay/silt below the upper soil layer for planting. The clay/silt level found thus seems to correspond to the technique used at the end of the 17<sup>th</sup> century. A similar layer is recently found also at the Gravdal estate in Bergen (Røen 1999, Moe unpubl.)

**Pollen analysis.** Two different soil columns were sampled from the present day open lawn and preparations for pollen analysis were made (fig. 9, 11). The different pollen curves were just like copies of each other, and only one diagram is presented in this paper (fig. 11). Two surface samples were also made within the Box canopy, giving pollen frequency values for Box between 15 and 25 %. The diagrams from the open lawn show continuous occurrence of *Buxus* pollen from the top soil down to a level about 30-35 cm, close to the clay/silt layer at the bottom. This clearly indicates an introduction of the species at the same time as the establishment of the parterre. If the estimated age of the Box is about 350 years



10. - A section of the georadar profile at the parterre with marked level of reflection (see clay/silt layer in fig. 9c and text).



11. - Pollen diagram from the central part of the parterre (see fig. 8b). Arrows indicate certain pollen taxa and charcoal dust (see discussion in text), Horizontal arrow indicates level for the establishment of the parterre, about 35 cm below the present level.



12. - Georadar used from the south-eastern part of the garden crossing the large "Dam" (see fig. 8 and 13, photo DM).

(Moe 1990, 1991a, b, see above), the lawn has grown about 9 cm each 100 years.

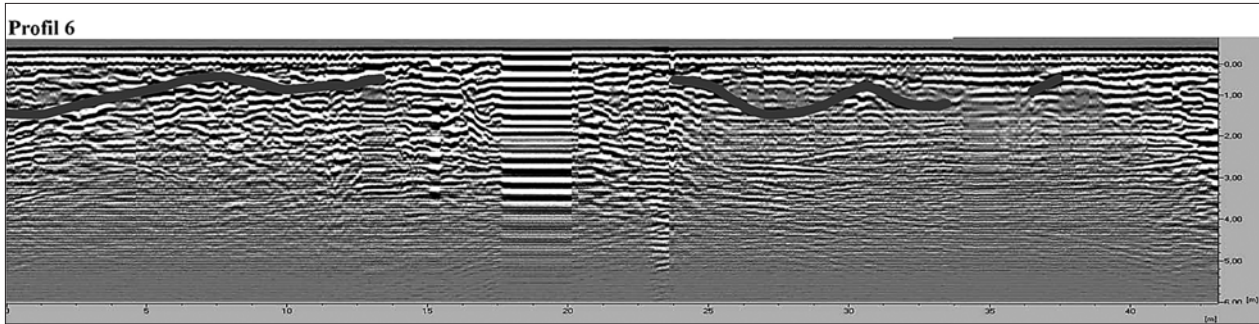
An early introduction in the profile is pollen of *Ligustrum* type. *Syringa* species as well as *Ligustrum* spp. belong to this pollen morph. Since today only *Syringa vulgaris* possessing the *Ligustrum* pollen type is found, one may anticipate that the garden quite early contained cultivars of this species. Another plant of interest, which does not produce much pollen, is *Fraxinus*. Despite the species being well known as a native tree of local economical interest in Norway far back in time, it has still been introduced into gardens from exotic sources. It obviously has been present at Milde in former times as well as to day. Pollen from the non native and clearly introduced genus *Juglans* is seen from the central part of the pollen diagram upwards. The species *Juglans regia* is today represented by one specimen at the north-eastern corner of the parterre in front of the house (fig. 4). Judging from old pictures (Rosland 1990) it came up in the latter part of the 19<sup>th</sup> century, probably from the stump of an older specimen taken down

in 1883 according to Schübeler (1888). The species is also mentioned in garden documents from the Rosendal barony from 1746 (Dietze pers. comm.) and from Bergen in a document dated to 1712 (by courtesy of 'Statsarkivet i Bergen'). The species is known to suffer nearly every winter with reduced flowering the following spring, and was probably present at Milde before 1800. Pollen of *Picea* is found in both diagrams, relatively late, presumably planted during the first half of the 19<sup>th</sup> century as an exotic element in the garden. This would correspond to the conifer trees clearly seen in the painting by Jæger (fig. 3), and also to the fact that what appears to have been the last specimen of *Picea abies* within the garden walls was cut down in 1940 (Naustdal 1943).

Some changes seen in the diagram from about 15 cm upwards, may be within normal statistical uncertainties, but may also include changes in garden management and plant assortment. The increase in trees and shrubs, including *Buxus*, may indicate lacking maintenance. The flower bed disclosed along the northern margin of parterre, may indicate the introduction of new species, that may easily have affected the pollen deposit pattern. A change from firewood to electricity heating is indicated by the lower amount of charcoal at the top (separate curve in the diagram).

## The ponds

Preliminary results. One east-west georadar profile was made from the south east corner of the garden crossing the wet area parallel to and at about 5 m distance from the main stone wall (fig. 12, 13, 14, 15). The profile gave most valuable ideas about significantly sloping soil layers both in the eastern and in the western parts of the profile, indicating different depressions, the biggest one to the east, and probably 2 or 3 smaller ones to the west. The georadar study was followed by sediment coring showing the existence of from 1.2 m to about 0.5 m depths of organic debris above a basement of a hard, almost solid clay-silty material. This layer is strongly consolidated and impossible to penetrate with spade and corer. A similar basement has previously been found as the bottom layer in the fish pond connected to the Damsgaard estate in Bergen (dated to about 1770) (Indahl 1989), – still today intact and fully functional in that garden as a framework against



13. - The georadar profile parallel to the east-west garden stone wall, from the “Dam” area (fig. 12) with marked level of reflection. Tree or four depressions are likely. The excavation covered the western part (see fig. 14).



14. - The test excavation in the “Dam” area. Marked stone settings were found partly parallel to the main stone, partly from the left and upper side. Heavy clay/silt layer were found left to the stone setting and not between the main stone setting and the main stone wall (see fig. 15 and text, photo DM).

water penetration. Comparing with the situation at Milde, these results indicate that the depressions and the clay-silty layers are man-made, and presumably are the remains of a fish pond system.

The excavations have also uncovered man-made ridges made of small, irregular rocks, partly mixed with brick fragments, superimposed onto the clay basement (fig. 15). These nicely made stone ridges may either be connected to a drainage systems or a part of the construction of the pond system. An estimated depth of the pond(s) may vary between 10-20 cm and about 50-75 cm.

A paving of rounded pebbles, 5-10 cm in size

‘mounted’ into hard clay was uncovered in the eastern part of the excavated area (fig. 15). This pavement, more than 50 cm broad, was found at a higher level, sloping down into what may have been one of the shallow ponds. The pavement corresponds with similar settings found nowadays, mostly made with pebbles mounted in hard clay or concrete, used for private roads and paths. The conclusion so far is that the pavement may have been used as a path down to and possibly into the water.

The full understanding of the extensions of the fish pond and its drainage system is so far not fully established. The pond may have been used as the local kitchen reservoir for the cultivated fish species. The cultivation itself may have taken place in the lake Mildevatn (fig. 2).

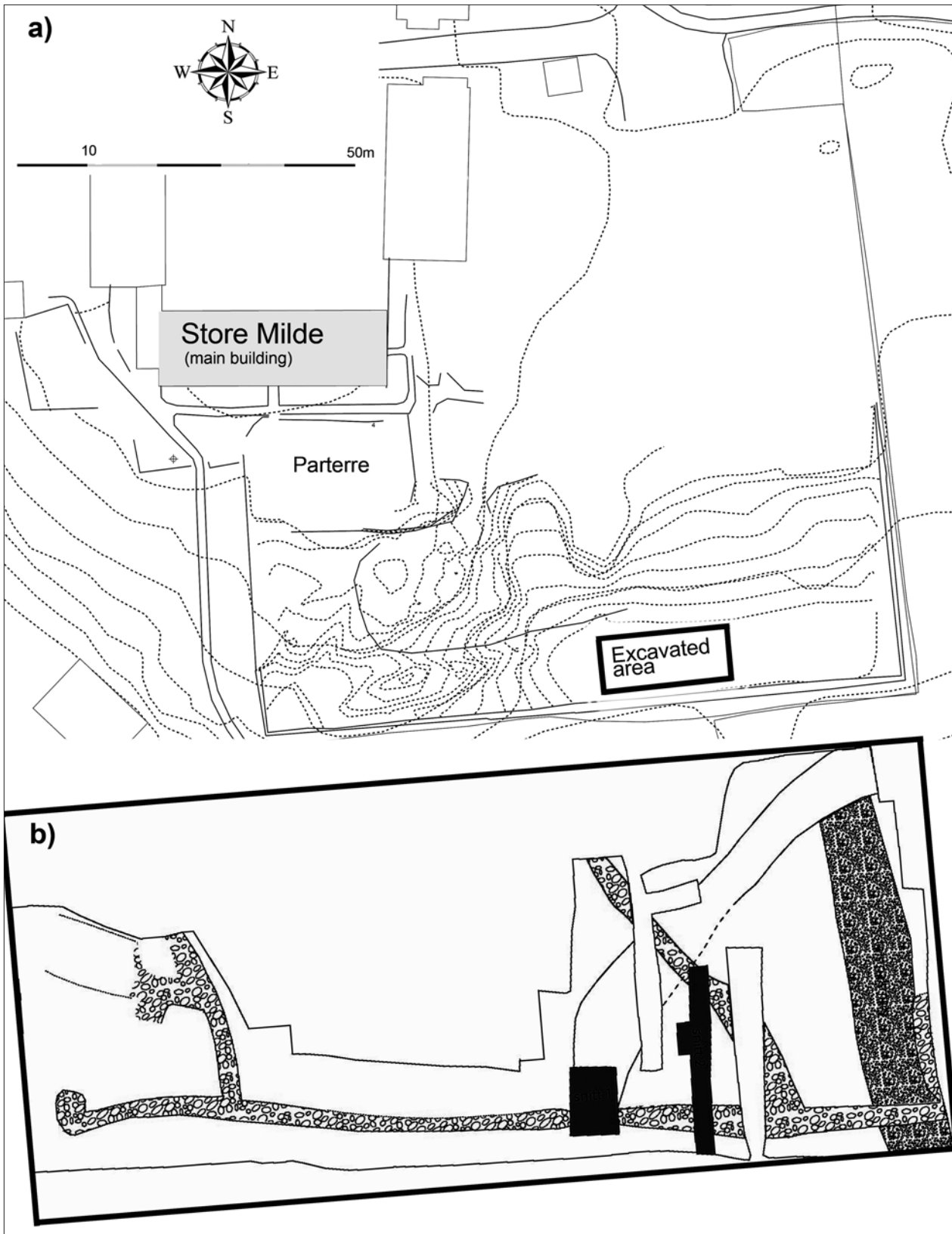
Only two fish ponds have so far been archaeologically studied in Norway (Noreide 1993, Espeland 2004), and they are both different, and also different from what is found at Milde.

Parallel to the main garden wall, about 1 m wide, runs a ridge of pure black soil. In the west the ridge ends into the rising slope of the terrain. In the east the ridge stops where a drainage tunnel made of stone enters under the wall (about 9 m from the wall corner).

Fish species of current interest. Several fish species have been cultivated in fresh water systems in Norway. The earliest species introduced probably were the crucian carp (carouse) (*Carassius carassius*, syn. *Cyprinus carossius*) and, somewhat later, the common carp (*C. carpio*) (Kålås 1995a), - both belonging to the carp group. The term ‘carp’ is a bit confusing, since it may refer both to the group and to the species (Kålås, Johansen 1995b; Noreide 1993).

A third fish, a *Lecius* species in the same group,





15. - Topography of the old garden south of the main house with the position of the parterre and the excavated area indicated (a). The excavation plan (b) showing the main and nicely made stone ridges running from north to south and parallel to the main stone wall (see fig. 14); and also the dense and broad pavement running north to south, being made of 3-6 cm large pebbles placed into hard clay (see text).

has been found in Trondheim (Middle Norway) in a pond that belonged to the Archbishop estate, and has been dated to about AD 1500. During the 16<sup>th</sup> through 18<sup>th</sup> centuries both eel (*Anguilla* sp.) and pike (*Esox lucius*) (Vibe 1896) were used in ponds. Close to the Milde estate, in the lake Mildevatn, not only carp species, but also a small fish called ruffe (*Gymnocephalus cernuus*, syn. *Acerina cernus*) have been found (Kålås 1995), so far the only record from western Norway. The fish was in former days known in Norway as a delicacy, despite the many bones (Pontoppidan 1752-53, 2:192), but is not used any more.

The present study has so far not given any osteological records concerning fish from the studied fish pond at Milde, but ruffe and carp species are expected to have been used and cultivated in the lake Mildevatn (fig. 2), which belonged to the estate (ref. Kålås 1995).

It may seem a bit strange that documentation indicates that rather large scale cultivation of freshwater fish took place in a coastal area, and only 2-300 m from the sea during the 17<sup>th</sup> through 19<sup>th</sup> centuries (Moe 2005). Probably this was more dependent on cultural traditions within certain ranks of the community, rather than a true need for fresh fish supply. In this connection it may be noted that a salt lake pond is documented during the 17<sup>th</sup> and 18<sup>th</sup> century at the Bergenhus castle (Moe 2005). It was presumably used for keeping alive trapped sea-fish.

## Summary

The present study has given most valuable information about the history of the Milde estate: a flora and vegetation survey is accomplished, indicating the existence of several rare garden plants, including three rare morphs of *Buxus* and also an interesting variation within certain naturalised species. The morphological survey will be followed up by molecular methods for finding DNA markers for critical characterisation of old garden cultivars, viz. the morphs of *Buxus sempervirens* reported. Annual ring countings in *Buxus* and the use of pollen analysis has given evidence for the introduction of this species since the establishment of the renaissance garden, probably during the later half of the 17<sup>th</sup> century. Pollen analyses also give indications for the introduction of *Juglans* and *Picea* during a later

phase. The introduction of garden archaeological studies into this kind of problem, where evidence for drainage pattern are found and man-made clay deposits so far need to be connected to an activity using water, has proven useful.

The present work has given increased knowledge of local, regional, national, and probably also international interest, and improved and partly developed techniques for documentation and registration of ancient gardens. The work will support the present planning for a careful restoration of the garden (Bruun, Skjold 2003). The established interdisciplinary team has been successful.

Parallel to publication work, the new knowledge about the garden will be presented to the public- from visiting school classes to the general public-orally, in printing and using the web. The results will hopefully stimulate the general interest in garden traditions and garden history, locally and nationally.

Applications will be made for fulfilling the dendrological and molecular work on *Buxus*, and for following up the archaeological excavations in progress.

## Acknowledgements

We are grateful to the owner of the Milde estate and to the regional representative for the National board of antiquity (Riksantikvaren) and the municipality of Bergen for their cooperation. A special thanks to dr. Anna Maria Mercuri for linguistic support, to the participants in the garden history course (SEVU/University of Bergen, Sept. 10-13 2001), and to Jan Berge, Solfrid Hjelmtveit, Ingvild Mehl, Alf Helge Søyland, Tor Egil Larsen (Interconsult), Tor Arne Waraas and Erik Bouer Utne for various technical support, pollen analysis work and archaeological assistance. The project has been granted by EU-project: EU-CLT-CA12 2005-0697/001-001 "CULTURE 2000" (project no 630203), the University of Bergen, and the Olaf Grolle Olsen legate (University of Bergen).

## Bibliography

**Adtzleu 1747:** M. Adtzleu - *Kort simpel anviisning til en Frugt, Urter og Blomster-Hauges Indretning og Opvartning forfattet i Spørsmal*

- og *Giensvar*, Manus University library, University of Bergen.
- Batdorf 2004:** L.R. Batdorf - *Boxwood: an illustrated encyclopedia*, Boyce, Virginia, The American boxwood society, 2004.
- Bean 1970:** W. Bean - *Trees and shrubs hardy in The British Isles*, Vol. 1, London, John Murray, 1970.
- Beissner 1903:** L. Beissner - *Handbuch der Laubholz-Benennung*, Berlin, Paul Parey, 1903.
- Beyer 1552-1572:** A.P. Beyer - *Dagbok og Oration om Mester Geble*, Dokumentasjonsprosjektet, 2006, <http://www.dokpro.uio.no/litteratur/beyer/>.
- Birks 1986:** H.J.B. Birks - *Numerical zonation, comparison and correlation of Quaternary pollen stratigraphical data*, in B.E. Berglund (Ed.) - *Handbook of Palaeoecology and Palaeohydrology*, Chichester, John Wiley & Sons, 1986, p. 743-774.
- Block 1647:** H. Rasmussøn Block - *Horticultura Danica*, Ældste danske havebog, 1647, Facsimile Århus, 1984.
- Boerhaave 1720:** H. Boerhaave - *Index alter plantarum quae in Horto academico Lugduno-batavo aluntur*, London, 1720.
- Bruun, Eggen 1992:** M. Bruun, M. Eggen - *Hagekunstens historie i Norge*, in *Byggekunst (Oslo)* 6, 1992, p. 346-372.
- Bruun, Skjold 2003:** M. Brunn, S. Skjold - *Fana folkehøgskule Store Milde - Gamlehagen. Tilråding om skjøtsel*, manus, project.
- Castroviejo et al. 2000:** S. Castroviejo, C. Aedo, C. Benedí, M. Laínz, F. Muñoz Garmendia, G. Nieto Feliner, J. Paiva - *Haloragaceae-Euphorbiaceae*, in *Flora Iberica*, Vol. III, Madrid, Real Jardín botánico, CSIC, 2000.
- Christensen 1999:** A. Christensen - *Haverne - dengang*, Rhodos forlag, 1999.
- Ciarallo 2004:** A. Ciarallo - *Flora Pompeiana*, Roma, "L'Erma" di Bretschneider, 2004 (*Studia Archaeologica*, 134).
- Dallimore 1908:** W. Dallimore - *Yew, Holly and Box*, London, New York, 1908, 284 p.
- Decocq et al. 2004:** G. Decocq, D. Bordier, J.R. Wattez, P. Racinet - *A practical approach to assess the native status of a rare plant species: the controversy of Buxus sempervirens L. in northern France revisited*, in *Plant Ecology*, 173(1), 2004, p. 139-151.
- Dietze 2000:** A. Dietze - *1600-talls kjøkkenhagetradisjon på Baroniet Rosendal, Kvinnherad, Noreg*, in D. Moe, D. O. Øvstedal, & P. H. Salvesen (Eds.) - *Historiske hager*, Bergen, Alma Mater, 2000, p. 40-45.
- Dippel 1889-1893:** L. Dippel - *Handbuch der Laubholzkunde*, 3, Berlin, Aufl. Verlag Paul Parey, Bd. 1-3, 1889-1893.
- Dodoens 1554:** R. Dodoens - *Crujdeboeck*, Medecijn van der stadt van Mechelen, 1554. <http://plantaardigheden.nl/aardig/aardigheden/kruidenboeken.htm>
- Dodoens 1557:** R. Dodoens - *Histoire des plantes, en laquelle.....* éd. française par Charles de l'Ecluse, Jean Loë, Anvers, 1557. <http://gallica.bnf.fr/>.
- Dodoens 1616:** R. Dodoens - *Pemptades VI. Stirpum Historiae*, Antwerpen, 1616.
- Eckblad 1991:** F.-E. Eckblad - *Henrik Høyer og de første tulipaner i Norge*, in *Blyttia*, 3, 1991, p. 145-150.
- Edwardsen 1694a:** E. Edwardsen (O. Brattegard Ed.) - *Bergen, I*, Bergen, Bergens historiske forening, 1694, 1951, 526 p.
- Edwardsen 1694b:** E. Edwardsen (O. Brattegard Ed.) - *Bergen, II*, Bergen, Bergens historiske forening, 1694, 1952, 384 p.
- Elven et al. 2005:** R. Elven (Ed.), J. Lid, D.T. Lid - *Norges Flora*, 7<sup>th</sup> ed., Det norske samlaget, 2005.
- Elwes, Henry 1908:** H.J. Elwes, A. Henry - *The trees of Great Britain & Ireland*, Vol. 7, Edinburgh, privately printed, 1908.
- Espeland 2004:** E. Espeland, L.-E. Mikkelsen (Eds.) - *Spor i jord, Parken og hagen på Bogstad restaureres*, Oslo, Bogstad Stiftelse, 2004.
- Evjenth, Moe 2000:** S.C. Evjenth, D. Moe - *Hageplanter med krav til vinterlagring på 1700-tallet I Bergen*, in D. Moe, D. O. Øvstedal, & P. H. Salvesen (Eds.) - *Historiske hager*, Bergen, Alma Mater, 2000, p. 122-127.
- Fægri, Iversen 1989:** K. Fægri, J. Iversen - *Textbook of pollen analysis*, IV ed., Chichester, Wiley, 1989.
- Gartner 1694:** C. Gartner - *Horticultura*, Facsimile edition G. Balvoll, G. Weisæth, Eds. Landbruksforlaget (1694), 1994, 96 p.
- Hartvedt 1994:** G.H. Hartvedt - *Bergen byleksikon*, Oslo, Kunnskapsforlaget, 1994, 552 p.
- Hillier, Coombs 2002:** J. Hillier, A. Coombs - *The Hillier manual of trees and shrubs*, 7. ed., Hillier Nurseries, 2002.
- Hjellestad 1919:** H. Hjellestad - *Milde herregard i Fana*, in *Nordhordland og Midthordland*

- sogelag, *Aarsskrift*, vol. II, Bergen, 1919, p. 13-30.
- Hjellestad 1933:** H. Hjellestad - *Fana*, Bygdebok, Bind II, Bergen, J. D. Beyer as, 1933.
- HM 1998:** Hjellestad og Milde Historielag - *Herregarden Milde. Eigarane gjennom 290 år. 1530 – 1820*, in *Liv og lagnad i Neset*, Årbok, 1998, p. 6-15.
- Hobhouse 1992:** P. Hobhouse - *Plants in the garden history*, London, 1992.
- Hopland 1993:** T. Hopland - *Buck van Raa. Oversikt over eiere, liv og virksomhet gjennom årtier på en handelsplass i øyriket Grøningasund med nært naboskap til Hjellestad*, in *Hjellestad historielag*, Årbok, Bergen, 1993, p. 36-43.
- Hopp 1990:** Z. Hopp - *Vandringer i den gamle hagen*, in R. Storås (Ed.) - *Vokster på gamal grunn*, Bergen, Store Milde, 1990, p. 119-120.
- Ihlen 2003:** P.G. Ihlen - *Litt om lavfloraen på trær og busker i Gamlehagen ved Fana folkehøgskule*, in *Årringen*, Bergen, 2003, p. 47-54.
- Indahl 1989:** T. Indahl (Ed.) - *Damsgard Have*, in *Fortidsminneforeningen*, Årbok, Oslo, 5, 1989, p. 63-84.
- Jacques, van der Horst 1998:** D. Jacques, A.J. van der Horst - *The Gardens of William and Mary*, Bromley, 1998.
- Jalut 1974:** G. Jalut - *Evolution de la végétation et variations climatiques durant les quinze derniers millénaires dans l'extrémité orientale des Pyrénées*, 181 p. (Thèse présentée à l'Université Paul Sabatier de Toulouse, 1974).
- Jessen 1867:** C. Jessen - *Alberti Magni, De vegetabilibus libri VII, historiae naturalis pars XVIII*, Berolini, – v-xxii Praefatio, i-xxiv Botanicae Albertinae conspectus + 751 p. + 2 Tab., Berlin, 1867.
- Kålås 1995:** S. Kålås - *The ecology of ruffe, Gymnocephalus cernuus (Pisces: Percidae) introduced to Mildevatn, western Norway*, in *Environmental Biology of Fishes*, 42, 3, 1995, p. 219-232.
- Kålås, Johansen 1995:** S. Kålås, R. Johansen - *The common Carp (Cyprinus carpio L.) in Norway*, in *Fauna Norvegica, Ser. A*, 16, 1995, p. 19-28.
- Koch 1872:** K. Koch - *Dendrologie. Bäume, Sträucher und Halbsträucher*, Vol. I-II, 1872.
- Krüssmann 1965:** G. Krüssmann - *Die Laubgehölze*, 3, Berlin & Hamburg, Aufl. Paul Parey, 1965.
- Krüssmann 1976:** G. Krüssmann - *Handbuch der Laubgehölze*, 2, Berlin & Hamburg, Aufl. Paul Parey, 1976.
- Lange 1999:** J. Lange - *Kulturplanternes indførelshistorie i Danmark*, 2nd. ed., Glostrup (DK), DSR Forlag, 1999.
- Larsen 1984:** J.T. Larsen - *Fana bygdebok - 4. Gards- og ættesoge*, Bergen, Fana Bygdeboknemd, 1984.
- Linnaeus 1737:** C. Linnaeus - *Hortus cliffortianus*, Amsterdami, 1737, <http://gallica.bnf.fr/>.
- Linnaeus 1753:** C. Linnaeus - *Species Plantarum*, Holmiæ, 1753, <http://gallica.bnf.fr/>.
- Lorentzon 1998:** K. Lorentzon - *Buxbom*, in *Lustgården*, 1998, p. 5-24.
- Lundquist 2005:** K. Lundquist - *Lilium martagon L. Its introduction and early history in Sweden up to 1795 in a European context of lilies*, in *Acta Universitatis Agriculturae Sueciae*, N°. 19, 2005.
- Moe 1990:** D. Moe - *Den gamle hagen på Store Milde*, in R. R. Storaas (Ed.) - *Vokster på gamal grund- Fana folkehøgskole 75 år*, Bergen, Store Milde, 1990, p. 113-118.
- Moe 1991a:** D. Moe - *Buksbom - Buxus sempervirens - og et eksisterende renessansehageanlegg på Fana herregård, Store Milde, Bergen*, in *Blyttia*, 3, 1991, p. 121-127.
- Moe 1991b:** D. Moe - *Buksbom in Vandring i Arboretet*, in *Bergens Tidende*, Bergen, 14.3.1991.
- Moe 1994:** D. Moe - *Living garden plants used in research into ancient gardens, as demonstrated by Box (Buxus sempervirens) and elm (Ulmus glabra)*, in D. Moe, J. Dickson, P.M. Jørgensen (Eds.) - *Garden history: garden plants, species, forms and varieties from Pompeii to 1800*, Rixensart, Pact Belgium, 1994, p. 161-169 (Pact 42).
- Moe 2000:** D. Moe - *Claus F. Fasting (1746-1791), en européer i norsk hagekunst*, in D. Moe, P.H. Salvesen, D.O. Øvstedal (Eds.) - *Historiske hager*, Bergen, Alma Mater, 2000, p. 46-52.
- Moe 2003:** D. Moe - *Litt om de gamle alléer i Bergen*, in *Bergen museum Årbok 2002*, University of Bergen, 2003, p. 30-34.
- Moe 2005:** D. Moe - *De gamle hagedammene I Bergen. Hva vet vi om dem?*, in *Bergen Museum Årbok 2004*, University of Bergen, 2005, p. 53-62.
- Naustdal s.a.:** J. Naustdal - *Karplantar i Fana*, Manus., Botanisk museum, University of Bergen, s.a.
- Naustdal 1943:** J. Naustdal - *Plantar i Hagen*,

- Fana folkehøgskule*, Manus. (copy 13.1.1964), Museum of Botany, University of Bergen, 1943.
- Noreide, Hufthammer 1993:** S.W. Noreide, A.K. Hufthammer - *Fiskedam i Erkebispegården*, in *Spor* (Trondheim), 8, 15, 1993, p. 44-45.
- Nøvik 1901:** P. Nøvik - *Samlinger til havebrugets historie i Norge*. Vol 1, Christiania/Oslo, Selskabet "Havedyrkningens venner", 1901, 298 p.
- Ormhaug 1994:** K. Ormhaug - *Tycho Christoffer Jæger (1819-1889) - Landskapsmaler*. Bergen, Bergen billedgalleri/Bergen kommunes kunstsamlinger, 1994, 34 p.
- Parkinson 1629:** J. Parkinson - *Paradisi in Sole - Paradisus terrestris*. Humfrey Lownes & Robert Young, London, 1629, 612 p. + 16 p. indices.
- Pontoppidan 1752-1753:** E. Pontoppidan - *Det første Forsøg paa Norges Naturlige Historie*, Vol 1 & 2, København, De Berlingste Arvingers Bogtrykkerie, 1752-1753, 438+464 p. (Facsimile Grøndahl & Søn Forlag, Oslo, 1977).
- Rosland 1990:** T. Rosland - *Fana folkehøgskule 1915-1990*, in *Vokster på gamal grunn Fana folkehøgskule 75 år*, Bergen, Store Milde, 1990, p. 9-84.
- Røen 1999:** M.K. Røen - *Kommandantboligen i Gravdal, restaurering av historiske hageanlegg*, Thesis, Institutt for landskapsplanlegging, Norwegian agricultural highschool, Ås, 1999, 56 p.
- Salvesen 2002:** P.H. Salvesen - *Levende kulturminner i Gamlehagen på Store Milde. Rosene*, in *Årringen*, Bergen, 2002, p. 4-12.
- Salvesen, Moe 2005:** P.H. Salvesen, D. Moe - *Levende kulturminner i Gamlehagen på Store Milde: Buksbom*, in *Årringen*, 9, Bergen, 2005, p. 24-48.
- Schnitler 1913:** C.W. Schnitler - *Italiensk havekunst under renæssanse og barok in Kunst og kultur*, Oslo, Universitetsforlaget, 1913, p. 129-157.
- Schnitler 1915:** C.W. Schnitler - *Norske haver i gammel tid*, Christiania/Oslo, Norsk folkemuseum, Centraltrykkeriet, 1915, 259 p.
- Schübeler 1875:** F.C. Schübeler - *Die Pflanzenwelt Norwegens: ein Beitrag zur Natur- und Kulturgeschichte Nord-Europas*, Christiania, Brøgger's officin, 1873-1875 VIII + 468 p. (p. 1-88 printed 1873).
- Schübeler 1888:** F.C. Schübeler - *Norges Væxtrige. Et bidrag til Nord-Europas natur- og kulturhistorie*, Vol. 2, Christiania/Oslo, W.C. Fabritius & Sønner, 1888, 587 p.
- SCI 1998:** Scandinavian Colour Institute - *Natural Colour System, index 2*. - 2nd. Ed., Stockholm 1998. <http://www.ncscolour.com>.
- Skard 1963:** T. Skard - *Hagebruk og gartneri i Norge. En historisk undersøkelse fram til omkring 1950*, Oslo, Universitetsforlaget, 1963.
- Sperling 1642:** O. Sperling - *Catalogus plantarum horti regii Hafniae*, p. 1-80, in *Viridaria varia Regia & Academica publica in usum Magnatum ... collecta ac recognita* in Paulli, Simon ed. Hafniae, Literis Georgi Lamprechtii, 1653, [12], 799, [2] s.
- Tournefort 1700:** J.P. Tournefort - *Institutiones rei herbariae*, Vol. I-III, ed. 1, Paris, 1700.
- Tournefort 1719:** J.P. Tournefort - *Institutiones rei herbariae*, Vol. I-III, ed. tertia, Paris, 1719.
- Troels-Smith 1955:** J. Troels-Smith - *Characterization of unconsolidated sediments*, in *Danmarks geologiske undersøgelse*, 4, 3, 1955.
- Tutin et al. 1968:** T.G. Tutin, V.H. Heywood, N.A. Burges, D.M. Moore, D.H. Valentine, S.M. Walters, D.A. Webb (Eds.) - *Flora Europea*, Vol. 2. 243, Cambridge, Cambridge University Press, 1968.
- Vibe 1896:** J. Vibe - *Norges Land og Folk. Topografisk-Historisk-Statistisk Beskrivelse. XII. Søndre Bergenhus Amt*, Kristiania/Oslo, Olaf Norli, 1896.
- Vink 1999:** J. Vink - *Lunnabrekko, Millennium proof? - Restoration plan for an avenue from 1786 with Linden trees at Milde - Arboretum and Botanical garden*, University of Bergen, 1999, 42 p.
- Willmott 1914:** E. Willmott - *The Genus Rosa*, vol. 1-2, London, John Murray, 1914.