

Seeds and other Diaspores in Soil Samples
from Danish Town and Monastery
Excavations, dated 700-1536 AD

By HANS ARNE JENSEN



Biologiske Skrifter **26**

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Abstract.

Archaeologically dated soil samples from five localities in Denmark were analysed for content of seeds and other diaspores: Ribe, 9 samples of 8th century date and 14 from 1100-1500 AD; Øm Monastery, 1 sample 1422-1450 AD; Viborg, 8 samples Late Viking-1200 AD; Kolding, 2 samples 13th century-1500 AD; Black Friars' Monastery, Odense, 8 samples Pre-Medieval-16th century AD.

The analysis results are presented in table 1-9 giving the identified species/genera, the number of "seeds" identified, the percentage of the total sum, and a grouping according to assumed origin of the seeds.

Several samples contained a rather large number of species. The maximum number of seeds was for all species 6235/litre, and for single species (*Urtica urens*) 3776/litre. Table 10 compares the seed record from the sites examined. This discloses that plants from many of the surrounding plant communities were utilized at the excavated sites. Among the 215 taxa recorded, 16% were weeds, 13% originated from bogs, swamps and wetlands, and 12% from grasslands, 11% were cultivated or collected, 9% were from ruderal soil, 5% from forests and hedges, 3% from heaths, 3% from ponds and lakes, and 2% of maritime origin. Table 11 summarizes the analysis results, arranged in four periods: 700-799, 800-1049, 1050-1199, 1200-1536 AD. The finds of 45 taxa are the oldest recorded for Denmark. 35 of these were identified to species level. These finds are specifically discussed in the paper.

KEYWORDS: Palaeobotany, macrofossils, oldest finds, cultivated plants, collected plants, weeds, ruderal soil, grasslands, bogs, swamps, forests, heaths, lakes, maritime areas, Germanic Iron Age, Viking Age, Middle Ages, Ribe, Viborg, Øm, Kolding, Odense.

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*This paper is dedicated to Professor, dr. phil. VALDEMAR M. MIKKELSEN,
Botanical Institute, The Royal Veterinary and Agricultural University, Copenhagen,
on the occasion of his seventieth birthday, 3rd of September, 1986.*

Introduction

This paper presents and discusses the results of an examination of the content of seeds and other diaspores in archaeologically dated soil samples from eight sites in five Danish localities.

The aim was to explore the seed content of the samples in order to obtain information on the plants growing in each area, transported there in different ways or collected by man for his own consumption, technical use, or as fodder for domestic animals.

Such information adds to our knowledge of the way of life of the people who formerly lived around the excavated sites and of their utilization of plants from the surrounding plant communities.

Furthermore, archaeologically dated macrofossils can supply information on time of establishment for both cultivated and wild plant species (H.A.Jensen 1985). It is therefore discussed to what extent the identified seeds and fruits further our knowledge of the contemporaneous Danish flora.

The results presented in this paper derive from "seed" analysis performed on dried material, the term "seed" being applied to generative dispersal units in general, whether seeds or fruits. Finds published by other authors are termed "macrofossils", since they may include seeds, fruits, leaves, bud scales, and other vegetable parts, as well as imprints in pottery and other fictile material.

Earlier Investigations

Finds of macrofossils in Denmark

The finds of macrofossils of higher plants, found in Denmark, Schleswig, Scania, Halland, and Blekinge from the end of the Last Ice Age (13,000 BP) to the end of the Middle Ages (1536 AD) have been summarized by H.A.Jensen (1985).

From the Viking Age, Jessen (1954) has examined material from the Aggersborg military camp, Fredskild (1971) plant remains from Århus Søndervold, and Helbæk (1974) finds from the military camp of Fyrkat.

The first extensive examinations of plant remains from urban archaeological excavations at Medieval sites were made by Rostrup (1906), who identified a great number of seeds collected in Copenhagen. Unfortunately he gave no dating of this material, but Jessen & Lind (1922-23) attempted to remedy this deficiency and their datings are employed when Rostrup's work is cited in the following.

Jessen (1917) has examined one sample from the Copenhagen ramparts dated to the late 16th century, while Helbæk (1953) published cereal finds from the fortress of Lilleborg, Bornholm, destroyed by fire in 1259.

Ødum (1965, 1978) has demonstrated the presence of several species from the Roman Iron Age and Middle Ages through germination experiments with archaeologically dated soil samples.

Bencard & J.Lange (1972) published a general description of seed finds and other plant remains in samples from Ribe's subsoil, dated to 1100-1580 AD. More details are given in Table 4 of the present publication.

A number of Medieval soil samples from four localities in Svendborg have been examined (H.A. Jensen 1979a, 1979b). The methods used were similar to the one described in this paper (cf. p. 8).

Jørgensen (1980) reports on the seed content of a barrel from Svendborg, dated to c. 1350-1400 AD.

Finds of macrofossils in neighbouring countries

The Danish flora has been influenced by the flora mainly to the south, south-east, and south-west of the country (Jessen & Lind 1922-23), no major barrier being present to prevent introduction from these quarters. During the Viking and Middle Ages, trade connections between Denmark and the surrounding countries were well established (Bendixen 1981, Skovgaard-Petersen 1981), and in these periods man has played a major part in spreading plants to Denmark. Therefore, when evaluating the finds presented in this paper, reports on macrofossils in neighbouring countries are of interest as well.

Swedish finds of macrofossils, mainly identified as imprints in pottery, have been summarized by Hjelmqvist (1979), those from Scania, Halland, and Blekinge by H.A.Jensen (1985).

Griffin (1981) has published a review including the plant remains from the Oseberg Viking ship grave (Holmboe 1927) and finds from urban archaeological excavations in Norway.

Sveinbjarnardóttir et al. (1980) have in a report on excavations at Stóraborg, Iceland, given a brief review of previous macrofossil analysis from this area.

The history of the British flora has been summarized by Godwin (1975). Later works comprise analysis of plant remains from the Graveney boat (Wilson 1975), from urban settlements in York (Greig 1976; Kenward et al. 1978; Kenward & Williams 1979), and investigations of a Medieval barrel latrine from Worcester (Greig 1981).

Prehistoric and early historic food plants from the Netherlands have been reviewed by Zeist (1968), who later published palaeobotanical studies of settlement sites in the coastal area (Zeist 1973, 1974). The finds of charred seeds and fruits from a Medieval settlement near Gaselte (Zeist &

Palfenier-Vegter 1979) and remarks on prehistoric flax in the Netherlands (Buurman & Pals 1974) have also been published.

Bibliographies covering finds of cultivated plants in Central Europe from different periods have been published by Willerding (1970, 1978, 1979a, 1979b, 1980).

Extensive macrofossil analysis has been carried out for W. Germany, e.g. from coastal settlement at Feddersen Wierde (Körper-Grohne 1967), from Roman and Medieval excavations at Neuss am Rhein (Knörzer 1967b, 1970, 1975), and from Viking settlements at Elisenhof (Behre 1976) and Haithabu (Danish: Hedeby) (Behre 1983). Finds of macrofossils from Schleswig, dated from 13,000 BP to 1536 AD, have been summarized by H.A. Jensen (1985).

E. Lange (1976a, 1976b) has by means of macrofossil and pollen finds described the development of the anthropogenic vegetation and agricultural plant production in South Scandinavia and Central Europe. Her papers include finds from Tornow (DDR) from the 7th-9th centuries.

From Poland, Gluza & Wasylikowa (1977) have described the flora in the Pleistocene and Holocene, based on finds from archaeological excavations. Extensive analysis has been performed on, for example, Medieval plant remains from Cracow (Wasylikowa 1978; Wieserowa 1979).

Archaeological and other reports from the sites examined

Bencard (1981) has written an introduction to the extensive excavations carried out in Ribe during the period 1970-1976. Skovgaard-Petersen (1981) has collected and commented on the old written sources connected with the town. The finds of sceattas and other coins, which have been of great importance

for the dating of the samples, are presented by Bendixen (1981).

The Ribe excavations revealed a number of trade and craft activities, dated to the 8th century (Bencard 1973, 1974a, 1974b, 1981; Bencard et al. 1979; Bendixen 1981; Madsen 1984).

Parasite eggs from the excavated manure layer suggest that the manure was from ruminants (Nansen & Jørgensen 1977).

A general description of Ribe from the first settlement to the present day has been published by Bencard & Tougaard (1978), whereas Mertz (1977) describes the subsoil of the town and geological formations in the area.

From the Cistercian Abbey at Øm (Fig. 1), there are several extant papers deriving from older examinations of building remains and the monks' activities (Garner 1973). Some results of excavations carried out in 1974-78 have been published in a news bulletin (Petersen et al. 1978). Recently, a review of the history of Øm Abbey and results from the latest excavations have been published by O. Olsen (1979).

The development of the town of Viborg during the Viking and Middle Ages has been elucidated by Nielsen (1969, 1972). In 1972, further examinations of house remains from late Viking to early Middle Ages were performed. From these Noe (1976) reports traces of ploughing found under the buildings, and Nielsen (1975, 1978) gives a preliminary description of some other finds from this excavation.

In Kolding, excavations of the site Borchs Gaard were carried out in 1976 (V. Jensen 1976, 1977a, 1977b, 1978). The pottery found indicates trade connections with northern France.

The history of the Black Friars' Monastery, Odense, and the excavation of its ruins, have been published by Thrane et al. (1982).

Materials and Methods

Sites examined

The paper comprises seed analyses from the following sites (Fig. 1): Ribe (Kunstmuseet, Dommerhaven, Tvedgade, and Sønderportsgade), Øm (Cistercian Monastery), Viborg (St. Sct. Pedersstræde), Kolding (Borchs Gaard), and Odense (Black Friars' Monastery).

Descriptions of layers examined for seed content are for each site presented in the next chapter. A profile drawing is included, indicating the provenance of each soil sample. Profile drawings, sample numbers and descriptions are in most cases published as received from the excavator, who has approved any minor modifications necessary. All information on the excavations, such as descriptions,



Fig. 1. Location of the sites from which soil samples were examined.

drawings, and artefacts, is kept on permanent file at the museums in Ribe, Øm, Viborg, Kolding, and Odense.

Analysis for seed content

Prior to examination, the soil samples were stored at a temperature of 5°C.

Each of the submitted samples was thoroughly mixed, and working samples for seed analysis taken with a spoon. Sample size was: Ribe, Kunstmuseet 0.5 litre; Ribe, Dommerhaven 0.2 litre; Ribe, Tvedgade 0.2 litre; Ribe, Sønderportsgade 0.25 litre; Øm 0.5 litre; Viborg 0.5 litre; Kolding 0.25 litre; Odense 0.25 litre.

The samples were washed on a Fenwick washing apparatus (H.A. Jensen 1969), which retained all seeds larger than 0.14 mm. Washing separated seeds and parts of plants from earth, simultaneously reducing the amount of material to be examined, since particles smaller than 0.14 mm were washed out.

Following air drying at 20-25°C, the washed sample was sieved using a 0.5 mm mesh. The quantity passing the sieve was divided into two fractions of equal size, only one of which was examined, to limit the very time-consuming work of examining the finest particles. The fraction retained by the sieve was examined without reduction.

In order to facilitate a comparison between sites, the number of seeds of the single species and of groups of species were converted into numbers of seeds per litre of soil.

The separated seeds were determined as exactly as possible. Nomenclature is in accordance with "Flora Europaea" vol. I-V. *Carex* species were classified into the sections Distigmaticae and Tristigmaticae, but since the perigynium was usually missing, a more exact identification was not at-

tempted. In the genus *Juncus*, only seeds which could be identified with certainty as *Juncus bufonius* were counted separately; the remaining seeds are listed under *Juncus* sp. The forms intermediate between *Polygonum persicaria* and *P. lapathiifolium*, and other *Polygonum* seeds that it was not possible to identify to the species level, are listed as *Polygonum* sp. The designation "sp." and not "spp." was used in each case, since it was not always possible to establish whether the seeds represented one or more species.

Figures for number of seeds per litre of soil have not been calculated when parts of stem, leaf or leaf bud only were found. Such finds are marked with "+" in the tables. Finally, many soil samples contained sclerotia of the imperfect fungus *Cenococcum geophilum* Fr. As the number of sclerotia was often very high, no determination of number has been attempted, but the occurrence of the fungus is marked with a "+" in the tables.

Nearly all species are in the tables grouped according to assumed origin of the seed, in order to permit a discussion of the plant materials found.

The assignments are in accordance with recent Danish floras (Rostrup & Jørgensen 1973; Hansen 1981).

It must be kept in mind during study of the analysis results, that the occurrence of seeds is greatly influenced by their resistance to destruction. This subject is discussed in a forthcoming publication.

Germination experiments

One sample taken at Øm Abbey and eight samples taken at Viborg were in addition to total seed content examined for occurrence of living seeds.

From each sample, 0.5 litre of soil was taken by means of a spoon. These samples were placed in boxes in a thin layer on sterilized soil substrate and covered with 0.5 cm sterilized sand.

The boxes were covered with plastic and placed in a greenhouse at 20-25°C for more than three months. As no germination took place, it is concluded that either no or very few living seeds were present in the samples.

Seed Record from the Examined Sites

Ribe, Kunstmuseet (The Art Gallery)

(Fig. 3 and Table 1)

The five examined “soil” samples were taken from phase 2 in the cellar of Kunstmuseet (Fig. 2) in the street of Sct. Nicolaj Gade (Bencard 1981). This layer (Fig. 3) is dated by coins (sceattas) to the 8th century. These coins were minted in Europe between 720 and 750 AD, but may have remained in circulation in southern Scandinavia to the end of the century (Bendixen 1981). This dating is supported by other archaeological remains, e.g. a skull fragment with a runic inscription (Bencard 1973, 1974a). Pottery from phase 2 or 1 was dated by thermoluminescence to 700 AD (Mejdahl et al. 1980).

The samples examined consisted of more or less decomposed manure with pieces of wood, wattles,

and a great number of artefacts from trade and craft activities (Bencard 1973, 1974a).

The finds indicate that in periods a rather large number of animals were kept on or close to the area, and that it has been used as a dump area and market-place or both.

Part of the seed complement may accordingly have been produced at the site. The remaining part

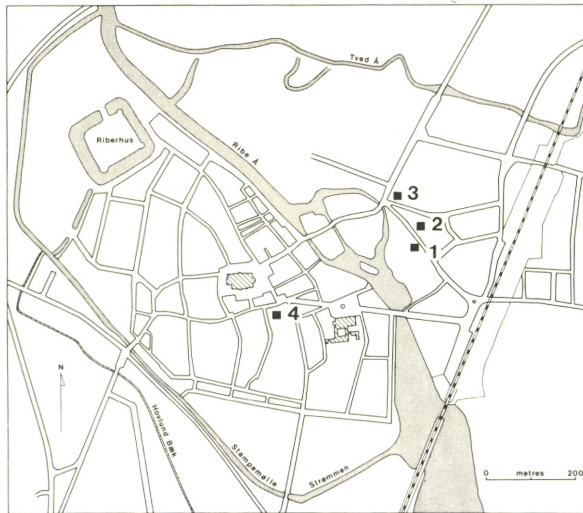
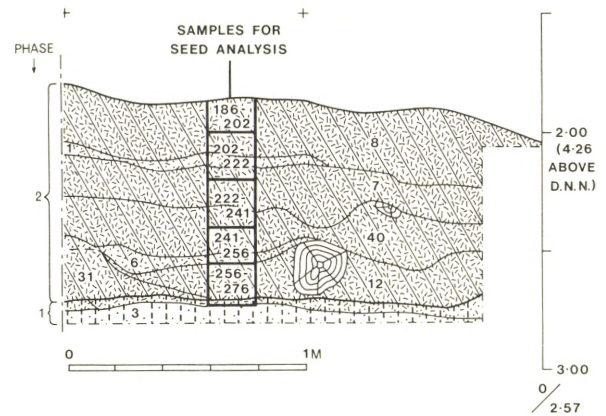


Fig. 2. Map of modern Ribe showing the excavated sites. 1. Kunstmuseet; 2. Dommerhaven; 3. Tvedgade; 4. Sønderports-gade.



	SAND / MAINLY SAND	MIXED	HUMUS / MAINLY HUMUS	ACTIVITY HORIZON
PHASE 4	.	/	/	
PHASE 3	/	/	/	/
PHASE 2	/	/	/	
PHASE 1	/	/	/	

Fig. 3. Profile drawing from the cellar of Kunstmuseet, Ribe (Segment V, No. 6M73D), from which five samples were taken for seed analysis. Surveyed by Mogens Bencard.

Table 1. Ribe, Kunstmuseet. Taxa and number of seeds per litre of soil grouped according to assumed origin of the seed.

Abbreviations:

C = Cultivated or collected
 Fo = Forests and hedges
 G = Grasslands
 H = Heaths
 Ma = Maritime areas

Me = Bogs, swamps, wetlands
 (incl. meadows)
 P = Ponds and lakes
 Ru = Ruderal soils
 W = Weeds

Origin/taxa	Sample number					Per cent of		
	256- 276	241- 256	222- 241	202- 222	186 202	Sum	total sum	Additional habitat
<u>Cultivated or collected</u>								
<i>Corylus avellana</i> L. (+ = part of fruit)	+	+	+	+	+	+		Fo
<i>Hordeum vulgare</i> L.	2					2	0.1	
<i>Myrica gale</i> L.		2				2	0.1	H, Me
<i>Rubus</i> cf. <i>fruticosus</i> L. group		2				2	0.1	Fo
<i>Spergula arvensis</i> L.	2		2	2		6	0.3	W
<u>Weeds</u>								
<i>Anthemis arvensis</i> L.			2			2	0.1	G, Ru
<i>Bilderdykia convolvulus</i> (L.) Dumort. (<i>Polygonum</i> <i>convolvulus</i> L.)		4				4	0.2	Ru
<i>Bromus</i> cf. <i>secalinus</i> L.	2					2	0.1	Ru
<i>Polygonum hydropiper</i> L.					4	4	0.2	Fo, Me
<i>Polygonum lapathifolium</i> L.	10	12	8	4		34	1.8	Ma, Me, Ru
<i>Polygonum persicaria</i> L.		2	2			4	0.2	Ru
<i>Rumex acetosella</i> L.	44	110	76	76	12	318	16.6	Fo, G, Ma
<i>Sonchus arvensis</i> L.					2	2	0.1	Ma, Ru
<i>Stellaria media</i> (L.) Vill.	4	2				6	0.3	Ma, Ru

Table 1 (continued)

Origin/taxa	Sample number					Per cent of total Additional sum habitat		
	256- 276	241- 256	222- 241	202- 222	186 202	Sum	sum	habitat
<u>Ruderal soils</u>								
<i>Chenopodium</i> cf. <i>album</i> L.	32	68	60	30	26	216	11.3	Ma, W
<i>Polygonum</i> <i>aviculare</i> L.	18	30		10	4	62	3.2	G, Ma, W
<i>Rorippa</i> <i>islandica</i> (Oeder) Borbás (<i>R. palustris</i> (L.) Besser)	2					2	0.1	Me
<i>Rumex</i> <i>crispus</i> L.	2	2		2	2	8	0.4	G, Ma
<i>Solanum</i> cf. <i>nigrum</i> L.					4	4	0.2	W
<i>Urtica</i> <i>dioica</i> L.	2			6		8	0.4	Fo, G, Me
<i>Urtica</i> <i>urens</i> L.	2	4			4	10	0.5	W
<u>Grasslands</u>								
<i>Potentilla</i> <i>reptans</i> L.		8				8	0.4	Ma, Me
<i>Rumex</i> cf. <i>acetosa</i> L.					2	2	0.1	Me
<u>Bogs, swamps, and wetlands (incl. meadows)</u>								
<i>Alopecurus</i> <i>geniculatus</i> L.			2			2	0.1	Ma
<i>Eleocharis</i> <i>palustris</i> (L.) Roemer & Schultes et <i>E. uniglumis</i> (Link) Schultes in Schultes & Schultes fil.	6	18	192	46	56	318	16.6	Ma
<i>Lychnis</i> <i>flos-cuculi</i> L.					2	2	0.1	
<i>Mentha</i> <i>aquatica</i> L. et <i>M. arvensis</i> L.			2			2	0.1	W
<i>Ranunculus</i> <i>flammula</i> L.		10	4	4	4	22	1.1	P
<i>Ranunculus</i> <i>sceleratus</i> L.	2	14	2		6	24	1.3	Ma, W

Table 1 (continued)

Origin/taxa	Sample number					Per cent of total Additional habitat		
	256-276	241-256	222-241	202-222	186-202	Sum	total sum	habitat
<u>Maritime areas</u>								
Scirpus lacustris L. subsp. tabernaemontani (C.C. Gmelin) Syme in Sowerby (S. tabernaemontani C.C. Gmelin)			8	2		10	0.5	P
<u>Heaths</u>								
Andromeda polifolia L.				2		2	0.1	Me
<u>Miscellaneous</u>								
Agrostis sp.				2		2	0.1	
Aphanes sp.					2	2	0.1	
Arctium sp.			2			2	0.1	
Brassica sp.	2					2	0.1	
Carex sect. Distigmaticae	64	60	28	34	22	208	10.8	
Carex sect. Tristigmaticae	16	18	6	10	2	52	2.7	
Carex sp.		6	4		4	14	0.7	
Cirsium sp.				4		4	0.2	
Cruciferae		2				2	0.1	
Cyperaceae	20	8	8	16	10	62	3.2	
Galeopsis sp.	4					4	0.2	
Hypericum sp.			2			2	0.1	
Juncus sp.	44	92	22	32	192	382	19.9	
Lolium sp.			2			2	0.1	
Polygonum sp.	10			2		12	0.6	

Table 1 (continued)

Origin/taxa	Sample number					Per cent of total		Additional habitat
	256- 276	241- 256	222- 241	202- 222	186 202	Sum	sum	
<u>Miscellaneous</u> (continued)								
Potentilla sp.			2	4	4	10	0.5	
Ranunculus sp.	2	4	8	10	2	26	1.4	
Rumex sp.			2		2	4	0.2	
Scleranthus sp.				2		2	0.1	
Sonchus sp.					2	2	0.1	
Veronica sp.				2		2	0.1	
Viola sp.			2			2	0.1	
Not determined	10	10	4	4	2	30	1.6	
Cenococcum geophilum Fr. (+ = sclerotia)	+	+	+	+		+		
Sum	302	488	452	306	372	1920		

would then have been transported there in fodder for animals, in manure from animals browsing in the surrounding plant communities, in refuse, and by wind dispersal, etc.

Table 1 gives the results of the examination for content of seeds, including the identified taxon, number of seeds per litre of soil in each of the samples examined, the sum of these figures, and the percentage of the total seed content. The taxa are listed according to the origin of the seed.

The average content of seeds in the five samples proved to be 384 seeds per litre of soil. 32 species, including the fungus *Cenococcum*, could be identified. The identification of seeds marked "cf." was attended by some uncertainty. Seeds of 22 genera or families were too badly damaged to allow a more precise determination.

Most frequent were *Juncus* sp., constituting a total of 19.9% of the counted seeds from Kunstmu-seet; *Rumex acetosella* represented 16.6%, *Eleocharis palustris* et *uniglumis* 16.6%, *Carex* sp. 14.2% and *Chenopodium* cf. *album* 11.3% of the total number of seeds. The above-mentioned taxa were represented in all samples.

The finds of *Alopecurus geniculatus*, *Anthemis arvensis*, *Potentilla reptans*, *Rorippa islandica*, and *Sonchus arvensis* are of specific interest, being the oldest known records from Denmark.

Each species is, as mentioned, grouped according to the assumed origin of the seeds. Additional habitats have been added for species with a broad ecological amplitude. Taxa listed under "Miscellaneous" have not been referred to any habitat group.

Corylus avellana, *Hordeum vulgare*, *Myrica gale*, *Rubus*

cf. *fruticosus*, and *Spergula arvensis* represent the cultivated or collected species. They could have grown on, or at some distance from, the excavated site.

Due to the activities at the excavated area, the soil was frequently disturbed and rich in nitrogen, providing excellent growing conditions for grassland, ruderal, and weed plants. Therefore seeds of the following species (Table 1) may either have been produced in or close to the excavated area, or transported there from surrounding habitats: *Anthemis arvensis*, *Aphanes* sp., *Arctium* sp., *Bilderdykia convolvulus*, *Bromus* cf. *secalinus*, *Chenopodium* cf. *album*, *Polygonum aviculare*, *P. hydropiper*, *P. lapathifolium*, *P. persicaria*, *Potentilla reptans*, *Rorippa islandica*, *Rumex acetosella*, *R. crispus*, *Solanum* cf. *nigrum*, *Sonchus arvensis*, *Stellaria media*, *Urtica dioica*, and *U. urens*.

The main part of the species listed below, occurring in bogs, swamps and wetlands (incl. meadows) was most likely transported to the area as fodder, dung or refuse: *Alopecurus geniculatus*, *Eleocharis palustris* et *uniglumis*, *Lychnis flos-cuculi*, *Mentha aquatica* et *arvensis*, *Ranunculus flammula*, and *R. sceleratus*.

Scirpus lacustris subsp. *tabernaemontani* and a number of other species listed under different groups occur on wet land either near or on the coast. Land of this type is found not far from Ribe.

Arctium sp., *Corylus avellana*, *Polygonum hydropiper*, *Rubus fruticosus*, and *Urtica dioica* may indicate connection with forests and hedges, although they are not strictly confined to such habitats.

Heath plants were represented by *Andromeda polifolia* and *Myrica gale*.

In conclusion, the seeds identified consisted most likely of locally produced seeds as well as seeds from a number of the surrounding habitats mentioned above.

Ribe, Dommerhaven (Judge's Yard)

(Fig. 4 and Table 2)

In Dommerhaven in Sct. Nicolaj Gade (opposite Kunstmuseet), an extensive excavation took place in 1974 (Bencard 1981).

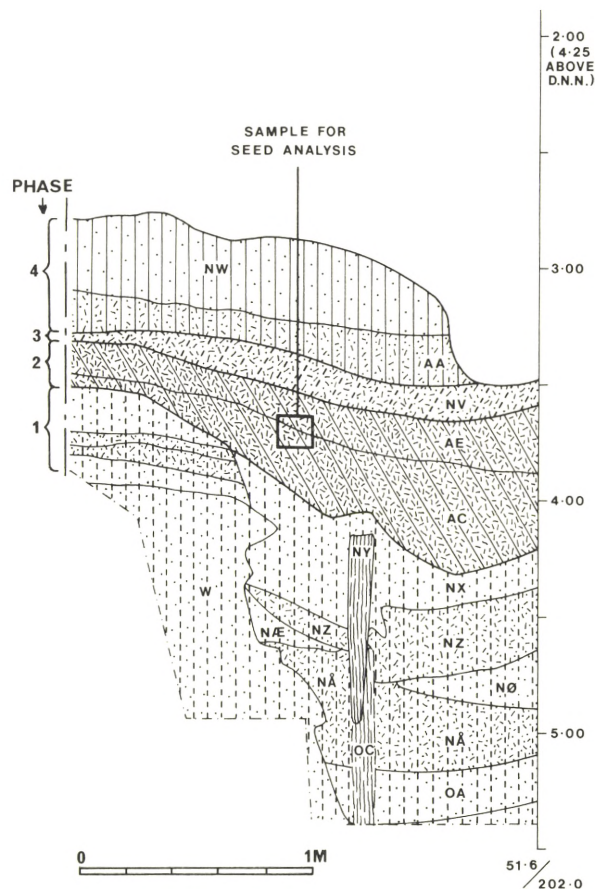


Fig. 4. Profile drawing from Dommerhaven, Ribe (Segment 5M74D), from which one sample was taken for seed analysis. OC: part of well construction, mentioned in the text. Legends - see Fig. 3. Surveyed by Mogens Bencard & Ole Schiørring.

From a manure layer, believed to be of phase 2 and connected with the layer in Kunstmuseet, one sample was taken for seed analysis (Fig. 4). A great number of remains from trade and craft activities were found in the area. On the basis of finds of sceattas and other archaeological remains, the sample is dated to the 8th century, most likely between 720 and 750 (Bencard 1981; Bendixen 1981).

A piece of oak timber, part of a well construction to be seen in Fig. 4 underneath the manure layer was dated by dendrochronology to approximately 710 AD (Bencard pers. comm.).

Table 2. Ribe, Dommerhaven. Taxa and number of seeds per litre of soil (manure) grouped according to assumed origin of the seed.

Origin/taxa	Additional			Origin/taxa	Additional		
	Sum	Per cent of total	Per cent of total habitat. Abbreviations cf. Table 1		Sum	Per cent of total	Per cent of total habitat. Abbreviations cf. Table 1
<u>Cultivated or collected</u>				<u>Ponds and lakes</u>			
<i>Fragaria vesca</i> L.	5	0.4	Fo, G	<i>Alisma plantago-aquatica</i> L.	10	0.8	
<u>Weeds</u>				<u>Martime areas</u>			
<i>Polygonum lapathifolium</i> L.	35	3.0	Ma, Me, Ru	<i>Scirpus maritimus</i> L.	5	0.4	
<i>Polygonum persicaria</i> L.	5	0.4	Ru	<i>Zostera noltii</i> Hornem. (<i>Z. nana</i> Roth pro parte)	5	0.4	
<i>Raphanus raphanistrum</i> L. (+ = parts of silique)	+			<u>Heaths</u>			
<i>Rumex acetosella</i> L.	25	2.1	Fo, G, Ma	<i>Calluna vulgaris</i> (L.) Hull (+ = leaf)	+		Me
<i>Stellaria media</i> (L.) Vill.	5	0.4	Ma, Ru	<i>Potentilla erecta</i> (L.) Rauschel	5	0.4	Fo, Me
<u>Ruderal soils</u>				<u>Miscellaneous</u>			
<i>Chenopodium</i> cf. <i>album</i> L.	15	1.3	Ma, W	<i>Atriplex</i> sp.	5	0.4	
<i>Polygonum aviculare</i> L.	15	1.3	G, Ma, W	<i>Carex</i> sect. <i>Distigmatica</i> e	40	3.4	
<i>Solanum nigrum</i> L.	5	0.4	W	<i>Carex</i> sect. <i>Tristigmatica</i> e	10	0.8	
<i>Urtica urens</i> L.	5	0.4	W	<i>Chenopodium</i> sp.	15	1.3	
<u>Bogs, swamps, wetlands (incl. meadows)</u>				<i>Cyperaceae</i>	15	1.3	
<i>Eleocharis palustris</i> (L.) Roemer & Schultes et <i>E. uniglumis</i> (Link) Schultes in Schultes & Schultes fil.	30	2.5	Ma	<i>Juncus</i> sp.	810	68.6	
<i>Poa trivialis</i> L.	5	0.4	G	<i>Polygonum</i> sp.	5	0.4	
<i>Ranunculus flammula</i> L.	5	0.4	P	<i>Rumex</i> sp.	5	0.4	
<i>Ranunculus sceleratus</i> L.	90	7.6	Ma, W	Not determined	5	0.4	
				<i>Cenococcum geophilum</i> Fr. (+ = sclerotia)	+		
				Sum	1180		

The seed flora is, as discussed for Kunstmuseet, assumed to be a mixture of locally produced seeds and seeds transported to the site.

The sample revealed a content corresponding to 1180 seeds per litre of soil (Table 2). 20 species (including *Cenococcum*) and a further 8 genera or families could be identified.

The most common was *Juncus* sp., representing 68.6% of the total amount of seeds. 7.6% comprised *Ranunculus sceleratus*, 4.2% *Carex* sp., 3.0% *Polygonum lapathifolium*, 2.5% *Eleocharis palustris* et *uniglumis*, and 2.1% *Rumex acetosella*.

Of specific interest are the finds of *Poa trivialis*, *Scirpus maritimus*, and *Zostera noltii*, being the oldest known records from Denmark.

Fragaria vesca represents the cultivated or collected species (Table 2).

Seeds of the following weed, ruderal and grassland species could either have been produced on or transported to the excavated site: *Chenopodium* cf. *album*, *Polygonum aviculare*, *P. lapathifolium*, *P. persicaria*, *Raphanus raphanistrum*, *Rumex acetosella*, *Solanum nigrum*, *Stellaria media*, and *Urtica urens*.

Alisma plantago-aquatica, *Eleocharis palustris* et *uniglumis*, *Poa trivialis*, *Ranunculus flammula*, and *R. sceleratus* may originate from bogs, swamps, wetlands (incl. meadows), or ponds. *Scirpus maritimus*, *Zostera noltii*, and perhaps other species, indicate transport of plant materials from the coast.

Heath communities were represented by *Calluna vulgaris* and *Potentilla erecta*.

It is concluded that the identified seeds were most likely a mixture of local production and seeds transported there from the surrounding meadows, ponds, maritime areas, and heaths.

Ribe, Tvedgade

(Fig. 5 and Table 3)

At Tvedgade, not far from Kunstmuseet and Dommerhaven (Fig. 2), an area of 4.5 x 1.5 m was examined in 1976 (Bencard pers. comm.).

Samples 1 and 2 were taken from the layer BS (Fig. 5) which consisted of compressed manure alternating with straw from cereals and grasses. The manure contained numerous pieces of wood, specifically as a layer of twigs under the straw. The twigs were arranged systematically and formed a path through the manure. They seem not to have been used as fodder for the animals. Sample 3

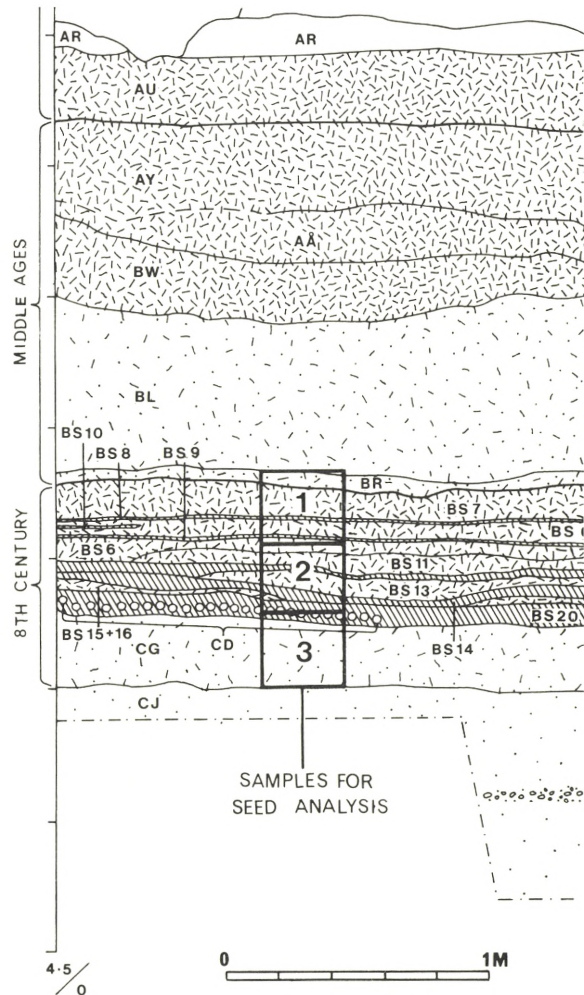


Fig. 5. Profile drawing from Tvedgade, Ribe (Segment No. 10M76D), from which three samples were taken. Layer from 8th century: compressed manure with straw, twigs and humus/sand; layer from Middle Ages: humus or humus/sand. Legends - see Fig. 3. Surveyed by Mogens Bencard & Charlotte Danckert.

Table 3. Ribe, Tvedgade. Taxa and number of seeds per litre of soil (manure) grouped according to assumed origin of the seed.

Origin/taxa	Sample number			Sum	Per cent of total sum	Additional habitat. Abbreviations cf. Table 1
	3	2	1			
<u>Cultivated or collected</u>						
<i>Corylus avellana</i> L.	5	5		10	0.1	Fo
<i>Fragaria vesca</i> L.		55		55	0.4	Fo, G
<i>Humulus lupulus</i> L.		10		10	0.1	Fo
<i>Hyoscyamus niger</i> L.	5	5		10	0.1	Ma, Ru
<i>Myrica gale</i> L.			5	5	-	H, Me
<i>Spergula arvensis</i> L.		5		5	-	W
<u>Weeds</u>						
<i>Anthemis arvensis</i> L.		5		5	-	G, Ru
<i>Polygonum hydropiper</i> L.	25	100		125	0.9	Fo, Me
<i>Polygonum lapathifolium</i> L.		25	5	30	0.2	Ma, Me, Ru
<i>Polygonum persicaria</i> L.	10			10	0.1	Ru
<i>Raphanus raphanistrum</i> L. (+ = parts of silique)		+		+		
<i>Rumex acetosella</i> L.	45	25	20	90	0.6	Fo, G, Ma
<i>Sonchus arvensis</i> L.	5			5	-	Ma, Ru
<i>Stellaria media</i> (L.) Vill.		5	5	10	0.1	Ma, Ru
<u>Ruderal soils</u>						
<i>Aethusa cynapium</i> L.	5			5	-	W
<i>Chenopodium album</i> L.	35	30	35	100	0.7	Ma, W
<i>Polygonum aviculare</i> L.	15	10		25	0.2	G, Ma, W

Table 3 (continued)

Origin/taxa	Sample number			Sum	Per cent of total sum	Additional habitat. Abbreviations cf. Table 1
	3	2	1			
<u>Ruderal soils</u> (continued)						
Rorippa islandica (Oeder) Borbás (R. palustris (L.) Besser)	10	15	5	30	0.2	Me
Rumex crispus L.	5			5	-	G, Ma
Rumex cf. obtusifolius L.	20	35		55	0.4	G, Me
Solanum nigrum L.		30	10	40	0.3	W
Urtica dioica L.		30		30	0.2	Fo, G, Me
Urtica urens L.		20		20	0.1	W
<u>Grasslands</u>						
Carduus crispus L.		5		5	-	Fo, Ru, W
Cerastium fontanum Baumg. subsp. triviale (Link) Jalas			5	5	-	Ma, W
Dactylis glomerata L.		5		5	-	
Trifolium repens L.	5			5	-	Ma, Me
<u>Bogs, svamps, wetlands (incl. meadows)</u>						
Eleocharis palustris (L.) Roemer & Schultes et E. uniglumis (Link) Schultes in Schultes & Schultes fil.	150	130	735	1015	7.2	Ma
Juncus bufonius L.			20	20	0.1	Ma, W
Lychnis flos-cuculi L.		20	30	50	0.4	
Pedicularis palustris L.		65	35	100	0.7	
Potentilla palustris (L.) Scop. (Comarum palustre L.)			5	5	-	H, Ma
Ranunculus flammula L.	5	65	25	95	0.7	P

Table 3 (continued)

Origin/taxa	Sample number			Sum	Per cent of total sum	Additional habitat. Abbreviations cf. Table 1
	3	2	1			
<u>Bogs, swamps, wetlands</u> (incl. meadows) (continued)						
Ranunculus sceleratus L.	1250	2165	10	3425	24.2	Ma, W
Scirpus cespitosus L.	5			5	-	H
Scirpus setaceus L.		20		20	0.1	
Scirpus sylvaticus L.	5			5	-	
<u>Ponds and lakes</u>						
Menyanthes trifoliata L.		25		25	0.2	Me
<u>Forests and hedges</u>						
Betula pendula Roth	5			5	-	
<u>Heaths</u>						
Potentilla erecta (L.) Rauschel	5			5	-	Fo, Me
<u>Miscellaneous</u>						
Agrostis sp.	10			10	0.1	
Aphanes sp.		5	5	10	0.1	
Barbarea sp.		25		25	0.2	
Brassica sp.			5	5	-	
Carex sect. Distigmaticae	35	1070	530	1635	11.6	
Carex sect. Tristigmaticae	15	80	20	115	0.8	

Table 3 (continued)

Origin/taxa	Sample number			Sum	Per cent of total sum	Additional habitat. Abbreviations cf. Table 1
	3	2	1			
<u>Miscellaneous</u> (continued)						
Compositae	5			5	-	
Cyperaceae	5		10	15	0.1	
Gramineae		5	5	10	0.1	
Juncus sp.	530	2095	4080	6705	47.4	
Leguminosae			5	5	-	
Myosotis sp.		10		10	0.1	
Polygonum sp.			5	5	-	
Potentilla sp.		5		5	-	
Ranunculus sp.		5		5	-	
Rubus sp.	5			5	-	
Solanum sp.			5	5	-	
Sonchus sp.			5	5	-	
Umbelliferae			5	5	-	
Viola sp.		5	5	10	0.1	
Not determined	20	20	35	75	0.5	
Cenococcum geophilum Fr. (+ = sclerotia)	+	+	+	+		
Equisetum sp. (+ = parts of stem)		+		+		
Sum	2240	6235	5670	14145		

originated from layer CG in which the manure was more or less decomposed and mixed with sand.

The archaeological remains in these layers were of the same type as those from Kunstmuseet and Dommerhaven; thus in spite of the lack of sceattas, the samples were dated to the 8th century.

It is assumed - as discussed for Kunstmuseet - that the seeds recovered comprise a mixture of local production and seeds transported to the site.

On average, the samples contained 4715 seeds. The lowest number was present in sample 3, which contained some sand and less organic matter than

samples 1 and 2. Altogether, 41 species (including *Cenococcum*) and a further 21 genera or families were identified.

Most frequent were *Juncus* sp., constituting 47.4% of the total, followed by *Ranunculus sceleratus* with 24.2%, *Carex* sp. with 12.4% and *Eleocharis palustris* et *uniglumis* with 7.2%. The high percentage for *Juncus* sp. was due to the 4080 seeds per litre found in sample 1 and 2095 seeds in sample 2. *Ranunculus sceleratus* was in samples 2 and 3 represented by 2165 and 1250 seeds, respectively.

The above-mentioned species/genera were present in each of the examined soil samples.

From the excavated layer, one fruit of *Iris pseudacorus* L., containing several seeds, has been identified by Johan Lange (pers. comm.).

The following species/genera listed from Tvedgade are the oldest recorded finds from Denmark: *Anthemis arvensis*, *Barbarea* sp., *Carduus crispus*, *Dactylis glomerata*, *Hyoscyamus niger*, *Juncus bufonius*, *Pedicularis palustris*, *Rorippa islandica*, *Rumex* cf. *obtusifolius*, *Scirpus setaceus*, and *Sonchus arvensis*.

The cultivated or collected plants were represented by *Corylus avellana*, *Fragaria vesca*, *Humulus lupulus*, *Hyoscyamus niger*, *Myrica gale*, and *Spergula arvensis*.

The site contained seeds from the following weed, ruderal, and grassland plants: *Aethusa cynapium*, *Anthemis arvensis*, *Aphanes* sp., *Carduus crispus*, *Cerastium fontanum* subsp. *triviale*, *Chenopodium album*, *Dactylis glomerata*, *Polygonum aviculare*, *P. hydropiper*, *P. lapathifolium*, *P. persicaria*, *Raphanus raphanistrum*, *Rorippa islandica*, *Rumex acetosella*, *R. crispus*, *R. cf. obtusifolius*, *Solanum nigrum*, *Sonchus arvensis*, *Stellaria media*, *Trifolium repens*, *Urtica dioica*, and *U. urens*.

Bogs, swamps, wetlands, and ponds were represented by *Eleocharis palustris* et *uniglumis*, *Juncus bufonius*, *Lychnis flos-cuculi*, *Menyanthes trifoliata*, *Myrica gale*, *Pedicularis palustris*, *Potentilla palustris*, *Ranunculus flammula*, *R. sceleratus*, *Scirpus cespitosus*, *S. setaceus*, and *S. sylvaticus*.

No species strictly belonging to maritime plant communities were present, but *Rumex crispus* and *Sonchus arvensis* and possibly other species may originate from the coastal vegetation.

The following species may either have grown locally or originate from forests and hedges: *Betula pendula*, *Corylus avellana*, *Fragaria vesca*, *Humulus lupulus*, *Polygonum hydropiper*, *Potentilla erecta*, and *Urtica dioica*.

The heath communities were represented by *Myrica gale*, *Potentilla erecta*, and *Scirpus cespitosus*.

The representation of seeds from different plant communities was similar to that in the finds from Kunstmuseet and Dommerhaven. The excavated sites were close together (Fig. 2) and the layer is dated to the 8th century. Several species were present at more than one site, but the fact that a species was present at only one site may reflect nothing more than the heterogeneous conditions on dump sites, part of the assemblage being there by chance.

The finds of coins, pottery and other artefacts show that in the 8th century Ribe was trading with other European countries (Bendixen 1981, Skovgaard-Petersen 1981). Thus, even though it cannot be proved, some of the seeds found may have been brought to Ribe from rather distant places.

Ribe, Sønderportsgade 1

(Fig. 6 and Table 4)

During excavation in the garden "Lydoms Have" (Sønderportsgade 1), 14 samples were taken for seed analysis. A list of the identified seeds and other plant remains has been published by Bencard & J.Lange (1972).

Further information on the content of seeds in each sample is given below.

The samples were dated by means of pottery (Fig. 6). From the figure it appears that the oldest samples marked 440-450, 410-420, 380-390, 350-360, 320-330, 290-300, and 260-270 are from c. 1100 to c. 1225 AD; the samples 230-240, 200-210, 170-180, and 140-160 from about 1250-1350 AD; and the samples 110-120, 80-90, and 50-60 from the period 1400-1580 AD.

Throughout the period 1100-1580 the area was - on non-botanical evidence - either a backyard or a garden. From time to time it has most likely also served a variety of other purposes such as a dump

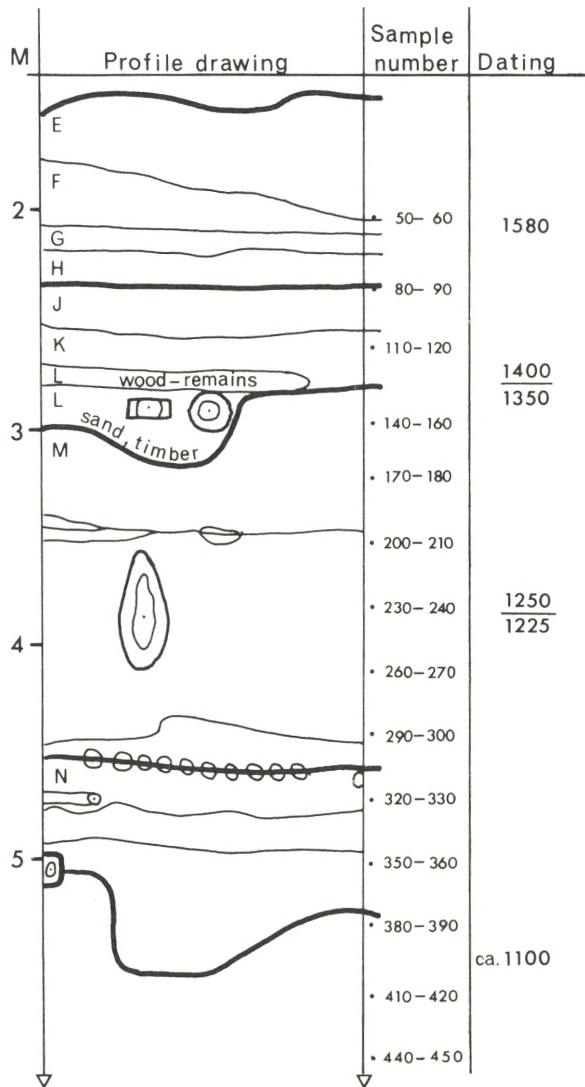


Fig. 6. Sønderportsgade, Ribe. Profile drawing of the layers from which the 14 examined samples were taken. E: brick debris; F: burnt clay, etc., on a thin layer of charcoal; G: stone pavement; H: sand; J-K: house remains, wood, sand, etc.; M: humic culture layer; N: humic culture layer, more decomposed than layer M. (Adapted from Bencard & Lange 1972.)

area or enclosure for domestic animals, and it can therefore be most accurately described as a garth.

The seeds identified were, accordingly, most likely a mixture of local production and seeds transported to the garth in fodder, refuse, etc.

The samples from this locality were not examined for the occurrence of *Cenococcum geophilum*.

Sample 50-60 did not contain any seeds. The remaining samples contained an average of 1131 seeds per litre of soil (Table 4). The seed content ranged from 4536 seeds per litre in sample 380-390 to 8 in the sample 80-90 and sample 440-450.

A total of 41 species and in addition 16 genera or families were identified.

Urtica urens represents 26.5% of the total number of seeds, the greatest number being found in sample 380-390, which contained 3776 seeds per litre.

Juncus sp. amounts to 20.8% of the total seed content. Of these 15.0% were identified as *Juncus bufonius*, all found in sample 320-330. *Chenopodium* cf. *album* constituted 11.1%, *Polygonum lapathifolium* et *persicaria* 9.8%, *Rumex acetosella* 6.2% and *Myrica gale* 4.8% of the total seed content.

Despite the fact that the samples represent a period of more than 400 years, several of the species/genera have been present in the area most of the time. Thus the following were found in eight or more of the samples: *Atriplex* sp., *Chenopodium* cf. *album*, *Galeopsis* sp., *Juncus* sp., *Myrica gale*, *Polygonum aviculare*, *P. lapathifolium* et *persicaria*, *Polygonum* sp., *Ranunculus sceleratus*, *Rumex acetosella*, *Scirpus* sp., *Solanum* sp., and *Urtica urens*.

The finds of *Bupleurum rotundifolium* in sample 320-330 and 230-240 are the oldest from Denmark.

Seeds of the following cultivated or collected species were identified: *Hordeum vulgare*, *Hyoscyamus niger*, *Linum usitatissimum*, *Malus sylvestris*, *Myrica gale*, *Rubus idaeus*, *Sambucus nigra*, and *Spergula arvensis*.

The following weed, ruderal and grassland species were found: *Agrostemma githago*, *Anthemis arvensis*, *A. cotula*, *Aphanes arvensis*, *Arctium* sp., *Atriplex* sp., *Bilderdykia convolvulus*, *Bupleurum rotundifolium*, *Centaurea cyanus*, *Chenopodium* cf. *album*, *Cirsium* cf. *arvense*, *Echinochloa crus-galli*, *Leontodon autumnalis*, *Odontites*

Table 4. Ribe, Sønderportsgade 1. Taxa and number of seeds per litre of soil grouped according to assumed origin of the seed.

Origin/taxa	Sample number												Per cent of total		Additional habitat. Abbreviations cf. Table 1	
	440-450	410-420	380-390	350-360	320-330	290-300	260-270	230-240	200-210	170-180	140-160	110-120	80-90	Sum		total sum
<u>Cultivated or collected</u>																
<i>Hordeum vulgare</i> L.				12	4							8		24	0.2	
<i>Hyoscyamus niger</i> L.						8								8	0.1	Ma, Ru
<i>Linum usitatissimum</i> L.							4		4					8	0.1	Ru
<i>Malus sylvestris</i> Miller												4		4	-	Fo, G
<i>Myrica gale</i> L.		84		140	88	108	160	64	52	8				704	4.8	H, Me
<i>Rubus idaeus</i> L.				32	4							4		40	0.3	Fo
<i>Sambucus nigra</i> L.								4						4	-	Fo, Ru
<i>Spergula arvensis</i> L.			4		16	4	8		100	4				136	0.9	W
<u>Weeds</u>																
<i>Agrostemma githago</i> L.				4	8	4	56		4					76	0.5	Ru
<i>Anthemis arvensis</i> L.				16			4			4				24	0.2	G, Ru
<i>Aphanes arvensis</i> L.						4								4	-	
<i>Bilderdykia convolvulus</i> (L.) Dumort. (<i>Polygonum convolvulus</i> L.)		4					4	4	4					16	0.1	Ru
<i>Centaurea cyanus</i> L.		4		4						4				12	0.1	G, Ru
<i>Cirsium</i> cf. <i>arvense</i> (L.) Scop.				4					4					8	0.1	G, Ma, Ru
<i>Odontites verna</i> (Bellardi) Dumort.												4		4	-	G, Ma, Me
<i>Polygonum hydropiper</i> L.							16	12	8	12				48	0.3	Fo, Me
<i>Polygonum lapathifolium</i> L. et <i>P. persicaria</i> L.		144	28	20	96	220	176	220	260	276				1440	9.8	Ma, Me, Ru
<i>Raphanus raphanistrum</i> L. (+ = parts of silique)		4						8	+					12	0.1	
<i>Rumex acetosella</i> L.	4	100	36	16	44	76	144	76	320	92	4			912	6.2	Fo, G, Ma
<i>Sonchus asper</i> (L.) Hill			4			4	4		44					56	0.4	Ru
<i>Sonchus oleraceus</i> L.								4	8					12	0.1	Ru
<i>Stellaria media</i> (L.) Vill.			96	4		4	20	4	16	4				148	1.0	Ma, Ru
<i>Thlaspi arvense</i> L.							8							8	0.1	Ru

Table 4 (continued)

Origin/taxa	Sample number												Sum	Per cent of total sum	Additional habitat. Abbreviations cf. Table 1		
	440- 450	410- 420	380- 390	350- 360	320- 330	290- 300	260- 270	230- 240	200- 210	170- 180	140- 160	110- 120				80- 90	
<u>Ruderal soils</u>																	
<i>Anthemis cotula</i> L.				4											4	-	Me
<i>Bupleurum rotundi- folium</i> L.					20			4							24	0.2	
<i>Chenopodium</i> cf. <i>album</i> L.	192	92	40		72	168	228	204	412	196	16	8	4	1632	11.1	Ma, W	
<i>Echinochloa crus-galli</i> (L.) Beauv.						4								4	-	W	
<i>Polygonum aviculare</i> L.	20	44			20	24	16	4	20	8				156	1.1	G, Ma, W	
<i>Urtica dioica</i> L.								12						12	0.1	Fo, G, Me	
<i>Urtica urens</i> L.	28	3776	48		16	12		4	4	4				3892	26.5	W	
<u>Grasslands</u>																	
<i>Leontodon autumnalis</i> L.						4								4	-	Ma, Me	
<i>Potentilla anserina</i> L.						4			4		8			16	0.1	Ma, Me	
<i>Potentilla argentea</i> L.	4													4	-	Ma	
<i>Taraxacum officinale</i> group										4				4	-	Ma, Me, Ru, W	
Bogs, svamps, wetlands (incl. meadows)																	
<i>Eleocharis palustris</i> (L.) Roemer & Schultes et <i>E. uniglumis</i> (Link) Schultes in Schultes & Schultes fil.	20	4	24		24	16			60	16				164	1.1	Ma	
<i>Juncus bufonius</i> L.					2200									2200	15.0	Ma, W	
<i>Lycopus europaeus</i> L.									4					4	-		
<i>Ranunculus sceleratus</i> L.			4	4	8		24	440	24	60	28			592	4.0	Ma, W	
<u>Forests and hedges</u>																	
<i>Betula pendula</i> Roth	4			4										8	0.1		
<i>Lapsana communis</i> L.				4	4	8	4	4						24	0.2	Ru, W	
<u>Heaths</u>																	
<i>Empetrum nigrum</i> L.				12			4							16	0.1	Me	

Table 4 (continued)

Origin/taxa	Sample number												Per cent of total sum	Additional habitat. Abbreviations cf. Table 1	
	440- 450	410- 420	380- 390	350- 360	320- 330	290- 300	260- 270	230- 240	200- 210	170- 180	140- 160	110- 120			80- 90
<u>Miscellaneous</u>															
Arctium sp.							4							4	-
Atriplex sp.		60	8	8	4	100	36	52	72	44				384	2.6
Euphorbia sp.						8	48	16	8	12				92	0.6
Galeopsis sp.		16		8	4	8	28	4	4	4				76	0.5
Juncus sp.			296		120	4	8	20	180	16	216			860	5.8
Lamium sp.		4	24											28	0.2
Papaver sp.							8							8	0.1
Polygonum sp.		12	24	12		8	28	4	8		4	4		104	0.7
Potentilla sp.		4	4	8	4	4	8	12						44	0.3
Ranunculus sp.		8			4		4		4	36				56	0.4
Rumex sp.					4	8	12		4					28	0.2
Scirpus sp.		48	16	32	28	12	20	20	36	8				220	1.5
Scleranthus sp.						4								4	-
Silene sp. (incl. Melandrium sp.)									4					4	-
Solanum sp.		8	68	36	4	4	8	72	4		4			208	1.4
Spergula sp.		4		4										8	0.1
Not determined		4	8	8	12	4	36	4	24	8				108	0.7
Sum	8	772	4536	508	2808	836	1128	1272	1704	820	280	24	8	14704	

verna, *Polygonum aviculare*, *P. hydro Piper*, *P. lapathifolium* et *persicaria*, *Potentilla anserina*, *P. argentea*, *Raphanus raphanistrum*, *Rumex acetosella*, *Sonchus asper*, *S. oleraceus*, *Stellaria media*, *Thlaspi arvense*, *Urtica dioica*, and *U. urens*. The seeds of these species are most likely a mixture of local production and seeds carried to the site.

Seeds of the following species - associated with bogs, swamps, wetlands, ponds, maritime areas, or heaths - were most likely transported to the site: *Eleocharis palustris* et *uniglumis*, *Empetrum nigrum*, *Lycopus europaeus*, *Myrica gale*, and *Ranunculus sceleratus*, whereas *Juncus bufonius*, and *Potentilla anserina*, due to the size of these plants, may have been

produced in or close to the site. Because *Juncus bufonius* prefers soil which at least part of the year is rather moist, it is likely that such conditions were present at the examined area.

Betula pendula, *Lapsana communis*, *Malus sylvestris*, *Rubus idaeus*, *Sambucus nigra*, and *Urtica dioica*, which occur in forests and hedges, may just as well have grown in or close to the garth.

Summing up, the identified seeds leave the impression that the users of the garth through the Middle Ages allowed quite a number of species to grow there, and further, that they utilized plant materials from heaths, meadows and wet areas, which at that time were common around Ribe.

Øm, Cistercian Monastery

(Fig. 7 and Table 5)

From the Abbey of Øm, one sample was taken from a pit (BAX) under the southern wall of the cloister walk in the quadrangle (Fig. 7). This pit contained some coins, the latest being from the time of Erik of Pomerania. The sample was dated accordingly to 1412-1450 AD.

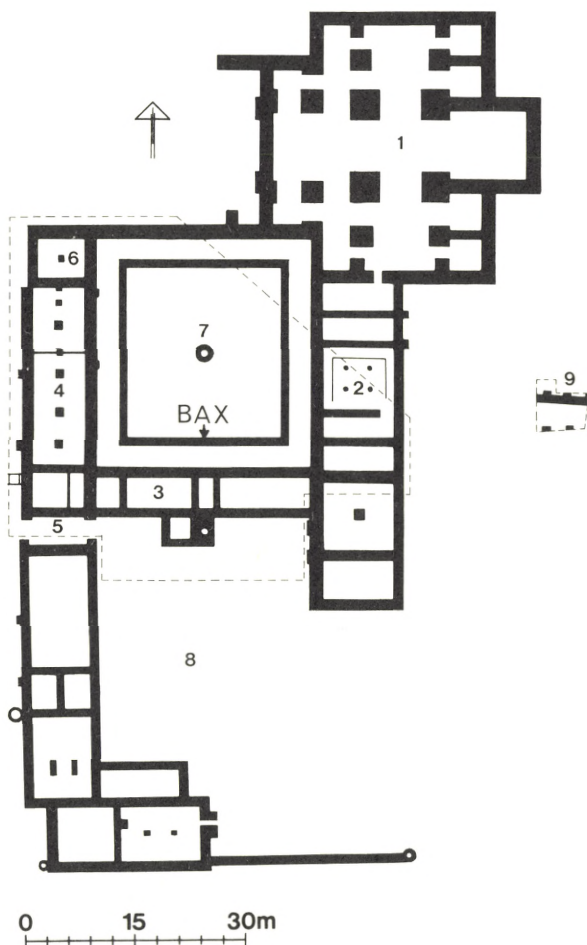


Fig. 7. Plan of the Abbey of Øm. The soil sample was taken at BAX in the cloister quadrangle. 1: church; 2: chapter-house; 3: refectory; 4: lay brethren's wing; 5: gateway; 6: oldest part of the north wing; 7: cloister quadrangle; 8: outer courtyard; 9: Medieval basement.

(Adapted from O.Olsen 1979)

Table 5. Øm, Cistercian Monastery. Taxa and number of seeds per litre of soil grouped according to assumed origin of the seed.

Origin/taxa	Sum	Per cent of total	Additional habitat. Abbreviations
<u>Cultivated or collected</u>			
<i>Chelidonium majus</i> L.	24	92.3	Ru
<i>Sambucus nigra</i> L.	2	7.7	Fo, Ru
<u>Miscellaneous</u>			
<i>Cenococcum geophilum</i> Fr. (+ = sclerotia)		+	
Sum	26		

The Abbey of Øm was founded in 1172 (Garner 1973), but recent excavations have shown that the western part of the monastery was built in the 15th century (Petersen et al. 1978, O.Olsen 1979). This means that the monastery had been functioning for about 250 years when the examined materials were covered by the cloister walls.

The sample consisted mainly of coarse sand, brick debris, gravel, and small amounts of organic matter.

The seed content was very low, and only two species, *Chelidonium majus* and *Sambucus nigra*, were identified (Table 5). Most likely they have been growing close to the monastery. Both are among plants utilized by the monks as medicine. Fruits from *Sambucus nigra* have also been widely used for beverages or as food (H.A.Jensen 1979a).

The *Chelidonium majus* seed is the oldest known from Denmark.

Viborg, St. Sct. Pedersstræde

(Figs. 8 & 9 and Tables 6 & 7)

From Viborg, two series of soil samples were examined from the same excavation. One series consisted of six samples representing the period late Viking (before 1025 AD) to c. 1200 AD, the other of two samples dated to the period 1025-1125 AD (Levin Nielsen pers. comm.).

The first series is shown in Fig. 8.

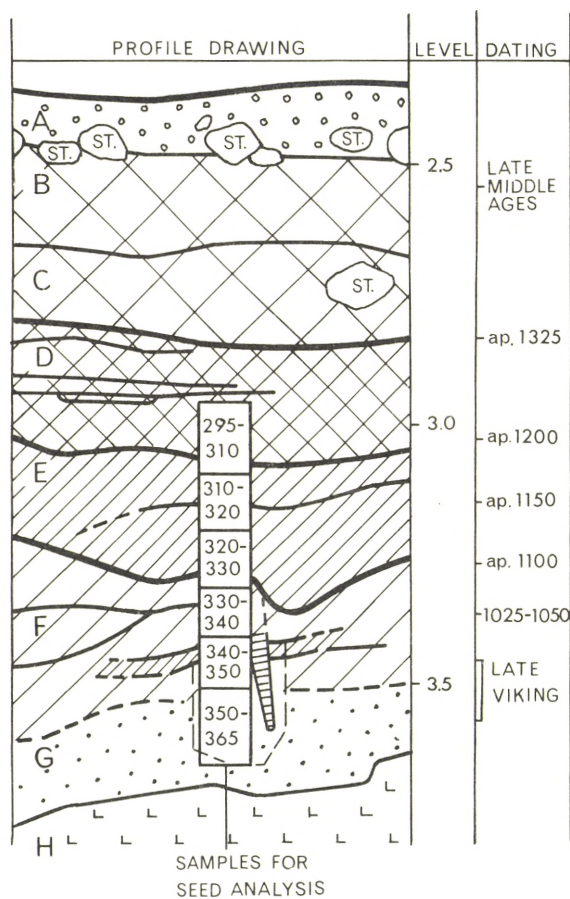


Fig. 8. Profile drawing from the excavations in St. Sct. Pedersstræde, Viborg, from which six samples were examined. A: pavement; B: cultivated soil; C: manure; D: yard; E: culture filling; F: stable; G: plough soil; H: subsoil. Surveyed by E. Levin Nielsen & Per Noe.

Sample 295-310 was taken from a layer supposed to be the surface of a yard: soil medium brown, greasy, rich in wood remains and other organic materials; c. 1200 AD.

Sample 310-320 was from a fill layer or yard surface: soil medium to light brown, greasy, and with some organic materials; c. 1150 AD.

Sample 320-330 derived from a fill layer in a post-hole or a hole from other digging: soil black-grey, somewhat greasy, coarse and mixed with sand; c. 1100 AD.

Sample 330-340 was from manure, etc., on a stable floor: soil black-brown with soot content and peat-like consistency; 1025-1050 AD.

Sample 340-350 was taken from and just below a stable floor and represents the shift from farming to urban settlement: uppermost a thin layer of black-brown soil mingled with soot, below a dark brown greasy soil with wood, bones and other organic materials; late Viking, before 1025 AD.

Sample 350-365 derived from a homogeneous plough soil: light brown, greasy to sandy, and almost without organic materials; late Viking.

The seeds from the plough soil were most likely produced on the site, and those from the stable floor all transported there from different plant habitats. In other samples, part of the seed content may equally well come from the site itself.

The average content of seeds in the six samples (Table 6) was 1085 per litre, the range being 716-1428 per litre, which is a smaller variation than found in most other examined locations.

Table 6 lists 50 species and 26 genera or families for which a more exact identification could not be made.

The most commonly found seeds were *Rumex acetosella* (14.6%), *Juncus* sp. (12.2%), *Urtica urens* (11.5%), *Ranunculus sceleratus* (10.7%), *Chenopodium* cf. *album* (9.8%), *Myrica gale* (9.4%), *Urtica dioica* (4.6%), and *Stellaria media* (4.3%).

The uniformity of the six examined soil samples is underlined by the fact that seeds from 10 out of the 11 most common species were present in all samples.

Table 6. Viborg. Taxa and number of seeds per litre of soil grouped according to assumed origin of the seeds

Origin/taxa	Sample number						Sum	Per cent of total sum	Additional habitat. Abbreviations cf. Table 1
	350- 365	340- 350	330- 340	320- 330	310- 320	295- 310			
<u>Cultivated or collected</u>									
<i>Corylus avellana</i> L. (+ = parts of fruit)		+	+		+	+	+		Fo
<i>Linum usitatissimum</i> L.			2			4	6	0.1	Ru
<i>Myrica gale</i> L.	24	14	154	120	264	38	614	9.4	H, Me
<i>Rubus fruticosus</i> L. group		2					2	-	Fo
<i>Rubus idaeus</i> L.	4	2					6	0.1	Fo
<i>Sambucus nigra</i> L.				2			2	-	Fo, Ru
<i>Spergula arvensis</i> L.	4		14	10	52	6	86	1.3	W
<u>Weeds</u>									
<i>Agrostemma githago</i> L.	2					2	4	0.1	Ru
<i>Anthemis arvensis</i> L.	2	2	2	2	2	6	16	0.2	G, Ru
<i>Bilderdykia convolvulus</i> (L.) Du- mort. (<i>Polygonum convolvulus</i> L.)			2		2		4	0.1	Ru
<i>Chrysanthemum</i> sp.			2				2	-	
<i>Cirsium arvense</i> (L.) Scop.					6		6	0.1	G, Ma, Ru
<i>Polygonum hydropiper</i> L.	122	26	18			2	168	2.6	Fo, Me
<i>Polygonum lapathifolium</i> L.	28	42	48	22	30	4	174	2.7	Ma, Me, Ru
<i>Polygonum persicaria</i> L.	6	14	26	20	32	8	106	1.6	Ru
<i>Ranunculus</i> cf. <i>repens</i> L.			4	6	4		14	0.2	Fo,G,Me,Ru
<i>Ranunculus sardous</i> Crantz			2				2	-	G
<i>Raphanus raphanistrum</i> L. (+ = parts of silique)			2	2	2		6	0.1	
<i>Rumex acetosella</i> L.	38	78	128	162	280	266	952	14.6	Fo, G, Ma

Table 6 (continued)

Origin/taxa	Sample number						Sum	Per cent of total sum	Additional habitat. Abbreviations cf. Table 1
	350- 365	340- 350	330- 340	320- 330	310- 320	295- 310			
<u>Weeds (continued)</u>									
<i>Scleranthus annuus</i> L.		4		4		4	12	0.2	G
<i>Sonchus asper</i> (L.) Hill	4			4	2	4	14	0.2	Ru
<i>Stellaria media</i> (L.) Vill.	36	50	48	20	68	56	278	4.3	Ma, Ru
<i>Thlaspi arvense</i> L.			2				2	-	Ru
<u>Ruderal soils</u>									
<i>Chenopodium cf. album</i> L.	86	68	196	126	92	72	640	9.8	Ma, W
<i>Polygonum aviculare</i> L.	20	44	62	28	8	6	168	2.6	G, Ma, W
<i>Rorippa islandica</i> (Oeder) Borbás (<i>R. palustris</i> (L.) Besser)	6	2					8	0.1	Me
<i>Rumex crispus</i> L.	8	10	22	6		2	48	0.7	G, Ma
<i>Solanum cf. nigrum</i> L.	4	16	10		6		36	0.6	W
<i>Stachys cf. annua</i> (L.) L.		2					2	-	W
<i>Urtica dioica</i> L.	138	50	56	28	14	14	300	4.6	Fo, G, Me
<i>Urtica urens</i> L.	102	180	162	46	46	214	750	11.5	W
<u>Grasslands</u>									
<i>Achillea millefolium</i> L.					2		2	-	Ma, Ru, W
<i>Festuca cf. rubra</i> L.					2		2	-	Ma, Me
<i>Leontodon autumnalis</i> L.			4				4	0.1	Ma, Me
<i>Potentilla argentea</i> L.					4		4	0.1	Ma
<i>Silene cf. vulgaris</i> (Moench) Garcke (<i>S. cucubalus</i> Wibel)				2			2	-	Ma

Table 6 (continued)

Origin/taxa	Sample number						Sum	Per cent of total sum	Additional habitat. Abbreviations cf. Table 1
	350- 365	340- 350	330- 340	320- 330	310- 320	295- 310			
<u>Bogs, svamps, wetlands (incl. meadows)</u>									
Carex echinata Murray				2			2	-	H
Eleocharis palustris (L.) Roemer & Schultes et E. uniglumis (Link) Schultes in Schultes & Schultes fil.	2		2	6	4	2	16	0.2	Ma
Lychnis flos-cuculi L.			2				2	-	
Mentha aquatica L. et M. arvensis L.			2			4	6	0.1	W
Potentilla palustris (L.) Scop. (Comarum palustre L.)					2		2	-	H, Ma
Prunella vulgaris L.						6	6	0.1	G
Ranunculus flammula L.			2	2			4	0.1	P
Ranunculus sceleratus L.	244	338	102	8	2	4	698	10.7	Ma, W
<u>Maritime areas</u>									
Scirpus lacustris L. subsp. tabernaemontani (C.C. Gmelin) Syme in Sowerby (S. tabernaemontani C.C. Gmelin)		2					2	-	P
<u>Forests and hedges</u>									
Lapsana communis L.		2					2	-	Ru, W
Ulmus cf. glabra Hudson (+ = leaf buds)					+		+		

Table 6 (continued)

Origin/taxa	Sample number						Sum	Per cent of total sum	Additional habitat. Abbreviations cf. Table 1
	350- 365	340- 350	330- 340	320- 330	310- 320	295- 310			
<u>Heaths</u>									
Calluna vulgaris (L.) Hull (+ = leaves)			+	+	+		+		Me
Empetrum nigrum L.					6		6	0.1	Me
Erica tetralix L. (+ = leaves)						+	+		Me
<u>Miscellaneous</u>									
Aphanes sp.			6	8	6	6	26	0.4	
Atriplex sp.			2				2	-	
Brassica sp.					2		2	-	
Carex sect. Distigmaticae	12	8	16	20	18	8	82	1.3	
Carex sect. Tristigmaticae	4	4	2	6	10	4	30	0.5	
Caryophyllaceae				2			2	-	
Centaurea sp.			2				2	-	
Chenopodium sp.			4				4	0.1	
Cirsium sp.					2		2	-	
Compositae					4		4	0.1	
Crepis sp.					2		2	-	
Cyperaceae	2		18		16	2	38	0.6	
Galeopsis sp.		2	14	4	4	2	26	0.4	
Hypericum sp.	2			2			4	0.1	
Juncus sp.	200	412	10	8	16	150	796	12.2	
Labiatae			2				2	-	
Lamium sp.	6		4			4	14	0.2	
Polygonum sp.	30	30	44	10	18	4	136	2.1	

Table 6 (continued)

Origin/taxa	Sample number						Sum	Per cent of total sum	Additional habitat. Abbreviations cf. Table 1
	350- 365	340- 350	330- 340	320- 330	310- 320	295- 310			
<u>Miscellaneous</u> (continued)									
Potentilla sp.	4		4	12	12	20	52	0.8	
Ranunculus sp.	2	2					4	0.1	
Rubus sp.				2			2	-	
Rumex sp.	2	6			2	2	12	0.2	
Scirpus sp.					2		2	-	
Sonchus sp.						8	8	0.1	
Viola sp.			2			4	6	0.1	
Not determined		16	12	14	14	8	64	1.0	
Cenococcum geophilum Fr. (+ = sclerotia)		+	+	+	+	+	+		
Sum	1144	1428	1218	716	1060	946	6512		

Chrysanthemum sp., *Lamium* sp., *Ranunculus sardous*, and *Stachys* cf. *annua*, found in samples dated to the late Viking Age, and *Carex echinata* and *Festuca* cf. *rubra*, found in samples from the early Middle Ages, are the oldest known records from Denmark.

The shift from agricultural activity to different building phases has only to a limited extent influenced the seed composition of the samples, the reason most likely being that after the buildings had been established, grass, hay, and other plant materials were transported to the buildings from arable soil, grassland and heaths.

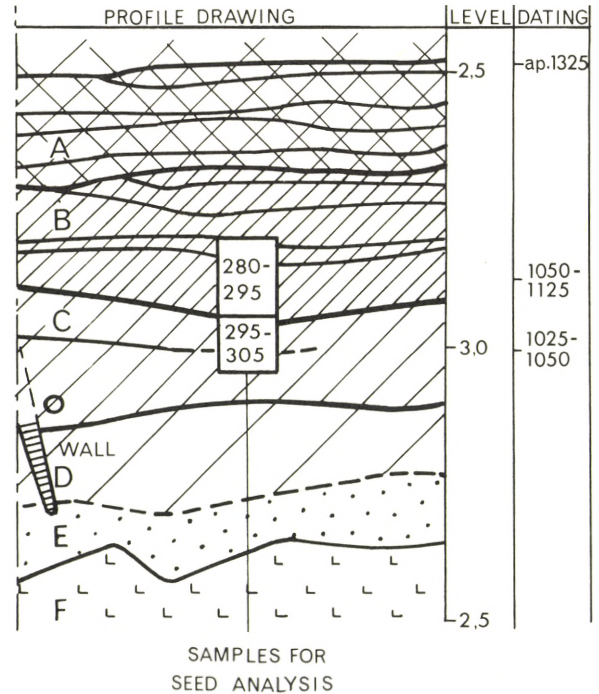
When ploughing ceased at the farm site, *Agrostemma githago* disappeared from the area for many years. This is not surprising, as the weed can survive in Denmark only if the seeds are harvested

with the crop and resown with the subsequent one (Kjær 1946: 432). The *Agrostemma* seed found in the uppermost sample was most likely transported there.

The finds of leaves of the heath plants *Calluna vulgaris* and *Erica tetralix*, seeds from *Empetrum nigrum*, and nut shells from *Corylus avellana* suggest that these plants were utilized in Viborg during the early Middle Ages. The use of heath plants is confirmed by Brøndegård (1978-1980), who reports that *Calluna*, *Empetrum*, and *Erica* were of great importance to the farmers in the heath areas, being used for fodder, fuel, thatching, brooms, etc. *Empetrum* berries were collected for food or dyeing.

Weeds were common in the samples (cf. Table 6), but also ruderal, grassland, bog, swamp, wet-

Fig. 9. Profile drawing from excavations in St. Sct. Pedersstræde, Viborg, from which two samples were examined. A, B: yard; C: storage building, culture filling; D: layer turned by a mould-board plough; E: plough soil; F: subsoil. Surveyed by E. Levin Nielsen & Per Noe.



land, and heath species were present. *Scirpus lacustris* subsp. *tabernaemontani* is here, as for the find from Ribe (Table 1), listed under maritime areas. Several species in Table 6 are marked "Ma", as an additional habitat, but due to the remoteness of Viborg from maritime plant communities, this origin can be ruled out. *Scirpus lacustris* subsp. *tabernaemontani* occurs in reed swamps around lakes, and this is the most likely origin of the seed from Viborg.

The second series from Viborg is shown in Fig. 9.

Sample 280-295 was taken from a culture fill layer. The upper part was the surface of a farmyard, and consisted of thin layers of soot and washed sand. Below was dark brown soil, rich in decomposed organic materials. The layer is dated to 1050-1125 AD.

Sample 295-305 was taken from a waste layer above the floor in the storehouse and comprised dark brown coarse soil with charcoal, wood, bones, other organic remains, and some potsherds. It is dated to 1025-1050 AD.

Some of the seeds identified from sample 280-295 may be of local origin; the remaining part from this

sample, and all those from sample 295-305, must have been transported to the site from surrounding areas.

The two samples contained 704 and 694 seeds per litre, respectively (Table 7), which is somewhat less than in the samples reported in Table 6, but sample 295-305 contained some charcoal and 280-295 some sand.

Altogether, 24 species and 13 genera were identified. Of the total seed content, 37.2% comprised *Chenopodium* cf. *album*, 24.9% *Rumex acetosella*, 6.7% *Urtica urens*, and 4.6% *Aphanes* sp. These species were represented in both samples.

The grain of *Hordeum vulgare* was carbonized, and a more exact identification into two- or six-row barley could not be obtained.

Most of the identified species are weeds, but the samples contained, as indicated in Table 7, species from the surrounding areas.

Based on the results from both series of samples from Viborg, it is concluded that plants from many communities were utilized by the farmers living at St. Sct. Pedersstræde during the early Middle Ages.

Table 7. Viborg. Taxa and number of seeds per litre of soil grouped according to assumed origin of the seed.

Origin/taxa	Sample number		Sum	Per cent of total sum	Additional habitat. Abbreviations cf. Table 1
	295- 305	280- 295			
<u>Cultivated or collected</u>					
<i>Corylus avellana</i> L. (+ = parts of fruit)	+		+		Fo
<i>Hordeum vulgare</i> L.		2	2	0.1	
<i>Hyoscyamus niger</i> L.	2		2	0.1	Ma, Ru
<i>Myrica gale</i> L.	24		24	1.7	H, Me
<i>Sambucus nigra</i> L.	2	2	4	0.3	Fo, Ru
<i>Spergula arvensis</i> L.	4		4	0.3	W
<u>Weeds</u>					
<i>Bilderdykia convolvulus</i> (L.) Dumort. (<i>Polygonum convolvulus</i> L.)		2	2	0.1	Ru
<i>Polygonum hydropiper</i> L.		2	2	0.1	Fo, Me
<i>Polygonum lapathifolium</i> L.	6	6	12	0.9	Ma, Me, Ru
<i>Polygonum persicaria</i> L.	4	4	8	0.6	Ru
<i>Ranunculus</i> cf. <i>repens</i> L.	4	2	6	0.4	Fo, G, Me, Ru
<i>Raphanus raphanistrum</i> L. (+ = parts of silique)	4		4	0.3	
<i>Rumex acetosella</i> L.	186	162	348	24.9	Fo, G, Ma
<i>Sonchus asper</i> (L.) Hill	2	4	6	0.4	Ru
<i>Stellaria media</i> (L.) Vill.	2		2	0.1	Ma, Ru
<i>Thlaspi arvense</i> L.	8		8	0.6	Ru
<u>Ruderal soils</u>					
<i>Chenopodium</i> cf. <i>album</i> L.	230	290	520	37.2	Ma, W
<i>Polygonum aviculare</i> L.	16	20	36	2.6	G, Ma, W
<i>Rumex crispus</i> L.	4	4	8	0.6	G, Ma

Table 7 (continued)

Origin/taxa	Sample number		Sum	Per cent of total sum	Additional habitat. Abbreviations cf. Table 1
	295- 305	280- 295			
<u>Ruderal soils (continued)</u>					
<i>Solanum</i> cf. <i>nigrum</i> L.	6	2	8	0.6	W
<i>Urtica dioica</i> L.	6	28	34	2.4	Fo, G, Me
<i>Urtica urens</i> L.	54	40	94	6.7	W
<u>Bogs, svamps, wetlands (incl. meadows)</u>					
<i>Lychnis flos-cuculi</i> L.	2		2	0.1	
<i>Ranunculus sceleratus</i> L.	6	18	24	1.7	Ma, W
<u>Miscellaneous</u>					
<i>Aphanes</i> sp.	50	14	64	4.6	
<i>Atriplex</i> sp.		10	10	0.7	
<i>Carex</i> sect. <i>Distigmaticae</i>	16	22	38	2.7	
<i>Carex</i> sect. <i>Tristigmaticae</i>	22	14	36	2.6	
Cyperaceae	8	4	12	0.9	
<i>Galeopsis</i> sp.	6		6	0.4	
<i>Juncus</i> sp.		4	4	0.3	
<i>Lamium</i> sp.	2	2	4	0.3	
<i>Polygonum</i> sp.		4	4	0.3	
<i>Potentilla</i> sp.	12	18	30	2.1	
<i>Rumex</i> sp.		6	6	0.4	
<i>Solanum</i> sp.		6	6	0.4	
<i>Viola</i> sp.	2		2	0.1	
Not determined	4	12	16	1.1	
Sum	694	704	1398		

Kolding, Borchs Gaard

(Fig. 10 and Table 8)

Two soil samples were taken from excavations of Borchs Gaard, situated in the old part of Kolding. Sample G was taken from a layer rich in organic remains (Fig. 10). This contained one Erik of Pomerania copper sterling, a coin issued in 1422 AD. The specimen found was only briefly in circulation, and the deposit is therefore most likely from the period 1422-1500. Sample M was taken from a manure layer with many plant residues. This is dated archaeologically to the 13th or beginning of the 14th century (V.Jensen 1976, 1977a, 1977b).

It is assumed that all seeds from the manure layer, and the main part from layer G, were transported to the site. The manure most likely contained remains of fodder brought to the town from fields and meadows outside Kolding.

Sample M contained a total of 1396 seeds per litre and sample G 780 seeds per litre of soil. Altogether, 46 species (including one fungus) were identified. Further, seeds from 17 genera or families could not be identified to the species level.

Most frequent were the *Carex* species which constituted 20.8% of the total seed content, followed by *Urtica dioica* with 17.3%, *Chenopodium album* (5.7%), *Hypericum* sp. (5.5%), *Polygonum lapathifolium* (4.8%), and *Scirpus sylvaticus* (4.8%).

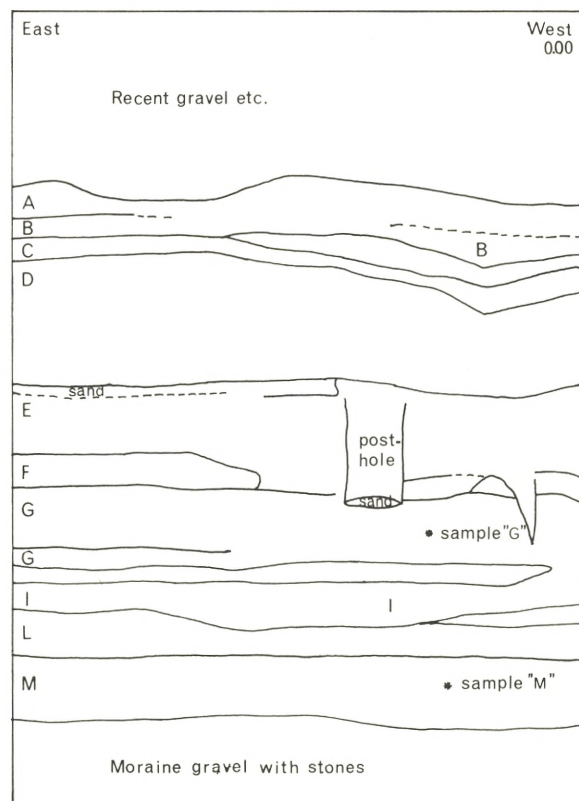
The number of species found was considerably greater in sample M than in sample G.

Of specific interest is the finding of *Eleocharis quinqueflora* and *Lactuca sativa*, being the oldest reported finds for Denmark.

The following cultivated/collected species were identified: *Anethum graveolens*, *Brassica rapa*, *Fragaria vesca*, *Humulus lupulus*, *Lactuca sativa*, *Linum usitatissimum*, *Myrica gale*, *Papaver somniferum*, *Sambucus nigra*, and *Spergula arvensis*.

Especially sample M, taken in a manure layer, contained a large number of weeds as well as several species associated with ruderal soils, grasslands, meadows, ponds, forests and hedges, and heaths.

The identified species from Borchs Gaard indicate that many different plants were either growing in the town or transported there, mainly as fodder for the animals kept in Kolding. Even if not clearly indicated, a limited amount of the seeds may have originated abroad, since some of the pottery found indicates trade connections with France (V.Jensen 1977b).



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Fig. 10. Profile drawing from Borchs Gaard, Kolding (Land. Reg. No. 292, Bygrundene). A,B: 17th-18th centuries fill; C: earth floor of house, most likely from the beginning of the 16th century; D: compressed clay; E: layer with many organic remains and pottery from the 15th century, with a little from the 16th; F: sand, 15th century; G: organic remains and pottery from the 15th century; I: sand layer with pottery from 14th and 15th? century; M: manure layer, rich in plant remains. Surveyed by Vivi Jensen.

Table 8. Kolding, Borchs Gård. Taxa and number of seeds per litre of soil grouped according to assumed origin of the seed.

Origin/taxa	Sample marked		Sum	Per cent of total sum	Additional habitat. Abbreviations cf. Table 1
	M	G			
<u>Cultivated or collected</u>					
<i>Anethum graveolens</i> L.	4		4	0.2	Ru
<i>Brassica rapa</i> L. (<i>B. campestris</i> L.)	4		4	0.2	W
<i>Fragaria vesca</i> L.	16		16	0.7	Fo, G
<i>Humulus lupulus</i> L.	8	8	16	0.7	Fo
<i>Lactuca sativa</i> L.	4		4	0.2	
<i>Linum usitatissimum</i> L.	12		12	0.6	Ru
<i>Myrica gale</i> L.	8		8	0.4	H, Me
<i>Papaver somniferum</i> L.		16	16	0.7	Ru
<i>Sambucus nigra</i> L.		16	16	0.7	Fo, Ru
<i>Spergula arvensis</i> L.	16	4	20	0.9	W
<u>Weeds</u>					
<i>Agrostemma githago</i> L.	16		16	0.7	Ru
<i>Bilderdykia convolvulus</i> (L.) Dumort. (<i>Polygonum convolvulus</i> L.)	8		8	0.4	Ru
<i>Euphorbia helioscopia</i> L.	4		4	0.2	Ru
<i>Polygonum hydropiper</i> L.	8		8	0.4	Fo, Me
<i>Polygonum lapathifolium</i> L.	104		104	4.8	Ma, Me, Ru
<i>Polygonum persicaria</i> L.	32		32	1.5	Ru
<i>Ranunculus repens</i> L.	52		52	2.4	Fo, G, Me, Ru
<i>Raphanus raphanistrum</i> L. (+ = parts of silique)	+	+	+		
<i>Rumex acetosella</i> L.	28	16	44	2.0	Fo, G, Ma
<i>Stellaria media</i> (L.) Vill.		12	12	0.6	Ma, Ru
<i>Thlaspi arvense</i> L.	8		8	0.4	Ru

Tabel 8. (continued)

Origin/taxa	Sample marked		Sum	Per cent of total sum	Additional habitat. Abbreviations cf. Table 1
	M	G			
<u>Ruderal soils</u>					
<i>Chenopodium album</i> L.	36	88	124	5.7	Ma, W
<i>Polygonum aviculare</i> L.	16		16	0.7	G, Ma, W
<i>Rumex</i> cf. <i>longifolius</i> DC. in Lam. & DC.	4		4	0.2	
<i>Solanum nigrum</i> L.		24	24	1.1	W
<i>Urtica dioica</i> L.	8	368	376	17.3	Fo, G, Me
<i>Urtica urens</i> L.	28	28	56	2.6	W
<u>Grasslands</u>					
<i>Linum catharticum</i> L.	8		8	0.4	Me
<i>Plantago lanceolata</i> L.	4		4	0.2	Ru
<i>Potentilla argentea</i> L.	4		4	0.2	Ma
<i>Silene vulgaris</i> (Moench) Garcke (<i>S. cucubalus</i> Wibel)	4		4	0.2	Ma
<i>Stellaria graminea</i> L.	16		16	0.7	Ma
<u>Bogs, swamps, wetlands (incl. meadows)</u>					
<i>Eleocharis palustris</i> (L.) Roemer & Schultes et <i>E. uniglumis</i> (Link) Schultes in Schultes & Schultes fil.	12		12	0.6	Ma
<i>Eleocharis quinqueflora</i> (F.X. Hartmann) O. Schwarz (<i>Scirpus</i> <i>quinqueflorus</i> F.X. Hartmann)	8		8	0.4	Ma
<i>Filipendula ulmaria</i> (L.) Maxim.	64		64	2.9	Fo
<i>Lychnis flos-cuculi</i> L.	8	4	12	0.6	
<i>Lycopus europaeus</i> L.	4		4	0.2	
<i>Prunella vulgaris</i> L.	28		28	1.3	G

Tabel 8. (continued)

Origin/taxa	Sample marked		Sum	Per cent of total sum	Additional habitat. Abbreviations cf. Table 1
	M	G			
<u>Bogs, swamps, wetlands</u> (incl. meadows) (continued)					
Ranunculus acris L.	4		4	0.2	G, Ru
Ranunculus flammula L.	64		64	2.9	P
Ranunculus sceleratus L.		8	8	0.4	Ma, W
Scirpus sylvaticus L.	76	28	104	4.8	
<u>Ponds and lakes</u>					
Menyanthes trifoliata L.	8		8	0.4	Me
<u>Forests and hedges</u>					
Betula pendula Roth	4		4	0.2	
<u>Heaths</u>					
Potentilla erecta (L.) Rauschel	48		48	2.2	Fo, Me
<u>Miscellaneous</u>					
Brassica sp.		4	4	0.2	
Carex sect. Distigmaticae	236	48	284	13.1	
Carex sect. Tristigmaticae	132	36	168	7.7	
Chenopodium sp.	12		12	0.6	
Compositae	4		4	0.2	
Galeopsis sp.	36		36	1.7	

Table 8. (continued)

Origin/taxa	Sample marked		Sum	Per cent of total sum	Additional habitat. Abbreviations cf. Table 1
	M	G			
<u>Miscellaneous</u> (continued)					
Galium sp.	12		12	0.6	
Gramineae	12		12	0.6	
Hypericum sp.	92	28	120	5.5	
Lamium sp.	4	24	28	1.3	
Myosotis sp.	4		4	0.2	
Polygonum sp.	4		4	0.2	
Potentilla sp.	16		16	0.7	
Rubus sp.		4	4	0.2	
Scirpus sp.	4		4	0.2	
Sonchus sp.		4	4	0.2	
Viola sp.	16		16	0.7	
Not determined	24	12	36	1.7	
Cenococcum geophilum Fr. (+ = sclerotia)	+	+	+		
Sum	1396	780	2176		

Odense, Black Friars' Monastery

(Fig. 11 and Table 9)

In 1974, during excavation of the ruins of a Black Friars' Monastery, eight samples were taken from a trench established in an area north of the monastery kitchen (Fig. 11). The monastery functioned from 1239 AD to 1536 AD.

Sample 1 is dated to the 15th-16th centuries, samples 4, 7, and 10 to 1250-1350 AD, samples 13, 16, and 19 to the beginning of the 13th century, i.e. contemporary with the building of the monastery, and sample 22 to before the Middle Ages.

The site was a dump area, on which building remains and refuse from the monastery have been placed. The seed flora consists, accordingly, of remains from the local ruderal flora and seeds dispersed to the site as refuse, etc.

The eight samples contained an average of 1057 seeds per litre, ranging from 8 seeds in sample 1 to 4276 seeds per litre in sample 7. 51 species and a further 28 genera or families were identified.

Most frequent was *Chenopodium* sp. with 21.6%, followed by *Urtica dioica* with 18.5%, *Juncus* sp. with 14.3%, *Stellaria media* with 11.6%, and *Ranunculus sceleratus* with 5.3% of the total seed content.

Chenopodium sp. and *Urtica dioica* were found in seven, and *Stellaria media* in six of the eight samples. Several of the other identified species were present only in samples 4, 7, 10, and 13.

Of specific interest are the finds of *Euphorbia lathyris* and *Verbascum* sp., both dated to the beginning of the 13th century, and of *Papaver argemone* and *Ranunculus* cf. *bulbosus* from 1250-1350, which are all the oldest recorded finds from Denmark.

The following cultivated or collected species were identified from the monastery area: *Anethum graveolens*, *Euphorbia lathyris*, *Fragaria vesca*, *Linum usitatissimum*, *Myrica gale*, *Papaver somniferum*, *Sambucus nigra*, and *Spergula arvensis*.

At this site, many weeds and ruderal plants as well as several species associated with grassland, meadows, and forests and hedges were present. It is not in general possible to distinguish between locally produced seeds and seeds transported to the examined area.

Myrica gale, however, was most likely transported to the site from some distant area, since it was probably rare around Odense (cf. H.A.Jensen 1979a: 71-74).

Fig. 11. Profile drawing from the Black Friars' Monastery, Odense, from which eight samples were taken. Layer 1 and 2: mainly homogeneous grey organic material mixed with sand and some pieces of tile, pre-Medieval dating; 3: mainly gravel, sand, stones, pieces of tile and mortar remains, dated to the beginning of the 13th century; 4: peat-like materials with straw, twigs, bones and other refuse from the monastery, with some pottery dated to 1250-1350 AD; 5: mainly clay, charcoal and pottery from the 15th-16th centuries; 6: debris from the demolition of the monastery in the 17th century. Surveyed by Jørgen Nielsen.

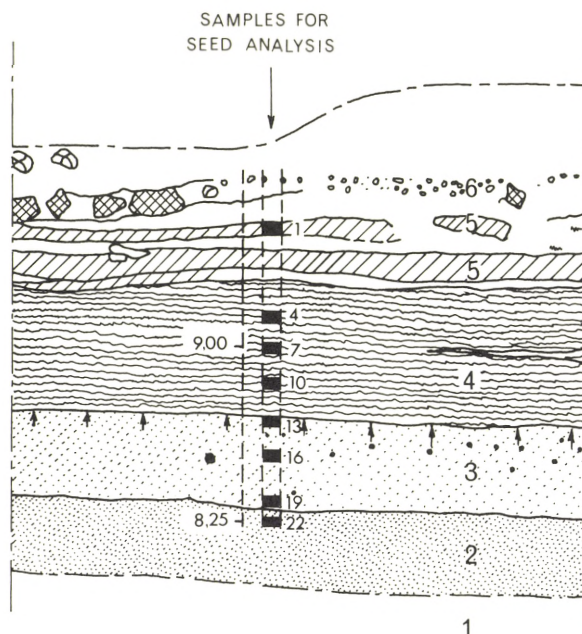


Table 9. Odense, Black Friars' Monastery. Excavation 1974. Taxa and number of seeds per litre of soil grouped according to assumed origin of the seed.

Origin/taxa	Sample number								Sum	Per cent of total sum	Additional habitat. Abbreviations cf. Table 1
	22	19	16	13	10	7	4	1			
<u>Cultivated or collected</u>											
<i>Anethum graveolens</i> L.						4			4	-	Ru
<i>Euphorbia lathyris</i> L.				8					8	0.1	Ru
<i>Fragaria vesca</i> L.						24	4		28	0.3	Fo, G
<i>Linum usitatissimum</i> L.						12			12	0.1	Ru
<i>Myrica gale</i> L.						4			4	-	H, Me
<i>Papaver somniferum</i> L.					4				4	-	Ru
<i>Sambucus nigra</i> L.	20	4	8	12	8	4			56	0.7	Fo, Ru
<i>Spergula arvensis</i> L.				4	8				12	0.1	W
<u>Weeds</u>											
<i>Agrostemma githago</i> L.					4	4			8	0.1	Ru
<i>Anagallis arvensis</i> L.						4			4	-	Ru
<i>Anthemis arvensis</i> L.						4			4	-	G, Ru
<i>Bilderdykia convolvulus</i> (L.) Dumort. (<i>Polygonum convolvulus</i> L.)				4	12	4			20	0.2	Ru
<i>Capsella bursa-pastoris</i> (L.) Medicus						4			4	-	Ru
<i>Centaurea</i> cf. <i>cyanus</i> L.					4				4	-	G, Ru
<i>Cirsium arvense</i> (L.) Scop.						24			24	0.3	G, Ma, Ru
<i>Euphorbia helioscopia</i> L.				8					8	0.1	Ru
<i>Neslia paniculata</i> (L.) Desv. (+ = parts of silique)						4	+		4	-	
<i>Papaver argemone</i> L.					4	16	24		44	0.5	G, Ru
<i>Polygonum hydropiper</i> L.					168				168	2.0	Fo, Me
<i>Polygonum lapathifolium</i> L.					16	4			20	0.2	Ma, Me, Ru

Table 9 (continued)

Origin/taxa	Sample number								Sum	Per cent of total sum	Additional habitat. Abbreviations cf. Table 1	
	22	19	16	13	10	7	4	1				
<u>Weeds (continued)</u>												
<i>Polygonum persicaria</i> L.				4	8	12				24	0.3	Ru
<i>Ranunculus repens</i> L.		8		4	16	28	8			64	0.8	Fo, G, Me, Ru
<i>Ranunculus sardous</i> Crantz					4					4	-	G
<i>Raphanus raphanistrum</i> L. (+ = parts of silique)						+	+	+		+		
<i>Rumex acetosella</i> L.				4	56	44	28			132	1.6	Fo, G, Ma
<i>Stellaria media</i> (L.) Vill.	32	24	16	812	92	4				980	11.6	Ma, Ru
<i>Thlaspi arvense</i> L.				12	12	8	16			48	0.6	Ru
<u>Ruderal soils</u>												
<i>Aethusa cynapium</i> L.		4								4	-	W
<i>Chenopodium</i> cf. <i>album</i> L.	44	32	8	76	236		80			476	5.6	Ma, W
<i>Polygonum aviculare</i> L.				4		32				36	0.4	G, Ma, W
<i>Rumex crispus</i> L.		4		36	104					144	1.7	G, Ma
<i>Solanum nigrum</i> L.				4	8	44	4			60	0.7	W
<i>Urtica dioica</i> L.	88	64	104	160	88	1032	28			1564	18.5	Fo, G, Me
<i>Urtica urens</i> L.				36	64	16				116	1.4	W
<u>Grasslands</u>												
<i>Anthriscus sylvestris</i> (L.) Hoffm.					20					20	0.2	Me
<i>Cerastium fontanum</i> Baumg. subsp. <i>triviale</i> (Link) Jalas							4			4	-	Ma, W
<i>Leontodon autumnalis</i> L.					4	4				8	0.1	Ma, Me
<i>Linum catharticum</i> L.					4	12				16	0.2	Me
<i>Ranunculus</i> cf. <i>bulbosus</i> L.							8			8	0.1	
<i>Trifolium repens</i> L.							4			4	-	Ma, Me

Table 9 (continued)

Origin/taxa	Sample number								Sum	Per cent of total sum	Additional habitat. Abbreviations cf. Table 1
	22	19	16	13	10	7	4	1			
<u>Bogs, swamps, wetlands (incl. meadows)</u>											
Eleocharis palustris (L.) Roemer & Schultes et E. uniglumis (Link) Schultes in Schultes & Schultes fil.				4	28	32	20		84	1.0	Ma
Juncus bufonius L.						320	16		336	4.0	Ma, W
Lychnis flos-cuculi L.					4	4			8	0.1	
Mentha aquatica L. et M. arvensis L.							4		4	-	W
Prunella vulgaris L.					8	24	4		36	0.4	G
Ranunculus flammula L.						24			24	0.3	P
Ranunculus sceleratus L.			16	424			12		452	5.3	Ma, W
Rumex maritimus L. et R. palustris Sm.							4		4	-	Ma, Ru
<u>Forests and hedges</u>											
Betula pubescens Ehrh.								4	4	-	
Lapsana communis L.							4		4	-	Ru, W
<u>Miscellaneous</u>											
Aphanes sp.							24		24	0.3	
Brassica sp.					4				4	-	
Carex sect. Distigmaticae					108	52	52		212	2.5	
Carex sect. Tristigmaticae				4	28	28	32		92	1.1	
Chenopodium sp.						1232	124		1356	16.0	
Cirsium sp.						4			4	-	

Table 9 (continued)

Origin/taxa	Sample number								Sum	Per cent of total sum	Additional habitat. Abbreviations cf. Table 1
	22	19	16	13	10	7	4	1			
<u>Miscellaneous</u> (continued)											
Crataegus sp.				4					4	-	
Cruciferae							4		4	-	
Cyperaceae				4	16				20	0.2	
Galeopsis sp.				4	8	8	4		24	0.3	
Hypericum sp.				8	4		8		20	0.2	
Juncus sp.					96	1096	16		1208	14.3	
Labiatae			4						4	-	
Lamium sp.	40	12	52	4					108	1.3	
Matricaria sp.							4		4	-	
Myosotis sp.				4					4	-	
Papaver sp.					8		8		16	0.2	
Polygonum sp.						12	8		20	0.2	
Potentilla sp.					4	48	24		76	0.9	
Ranunculus sp.					16		4		20	0.2	
Rosa sp.							4		4	-	
Rumex sp.				12	12	4	4		32	0.4	
Solanum sp.							4		4	-	
Stachys sp.						4			4	-	
Umbelliferae						4			4	-	
Verbascum sp.		4							4	-	
Viola sp.							4		4	-	
Not determined	4			12	28	12	12		68	0.8	
Cenococcum geophilum Fr. (+ = sclerotia)	+	+	+	+	+	+			+		
Equisetum sp. (+ = leaves)						+			+		
Sum	192	180	152	1312	1744	4276	592	8	8456		

General Discussion

The present chapter aims to evaluate the finds presented in this publication, Table 1-9, and in previously published material from Svendborg (H.A.Jensen 1979a), by 1) comparing the records from the investigated sites and 2) referring the finds of species/genera to the time of deposit, and to discuss to what extent the finds further our knowledge of the contemporaneous Danish flora. The samples included were analysed by identical methods (cf. p. 8).

Comparison of seed record from the sites studied

The material presented, Table 1-9, and the previously published Svendborg material, represent a rather homogeneous group compared to the ancient material described in a large number of papers (cf. H.A.Jensen 1985). All the sites were: affected by human settlement, located in Jutland and Funen, and dated to the 8th-16th centuries AD. Despite this similarity, the history, composition of the examined layers, dating, and number of samples examined all varied from site to site. In order to facilitate comparison between sites, these circumstances, as well as the total number of species/genera identified, the average and maximum number of seeds per litre, and the assumed origin of the seed, have been summarized in Table 10.

The samples from three of the sites in Ribe (Table 1-3) were taken from a dump area or market place at which a rather thick layer of manure was found. The plant remains were well preserved, and a large number of seeds from several taxa were recorded: the three samples from Tvedgade (Table 3), for example, contained seeds of 41 species and 21 genera for which a more precise identification was not possible, owing to the damaged state of the seeds.

The samples from Viborg (Table 6-7) represent the shift from farmland to urban settlement. They consisted of brown, sandy soil, rich in organic remains. A total of 50 species and 26 genera were listed from one of the examined sites (cf. Table 6).

The samples from Sønderportsgade, Ribe (Table 4), Borchs Gaard, Kolding (Table 5), and Foldagers Gaard and Korsgade 4, Svendborg (H.A. Jensen 1979a, Table 1-2) represent urban settlements and towns. The layer examined included soil rich in organic remains, manure, and sandy culture layers. From Foldagers Gaard, Svendborg, 71 species and 30 genera were identified. Several samples contained more than 4000 seeds per litre.

Three sites were associated with monasteries (Table 5, 9 and H.A.Jensen 1979a, Table 4).

The sample from Øm Monastery consisted mainly of building remains, and only 2 species at a concentration of 26 seeds per litre were recovered.

The samples from the Black Friars' Monastery, Odense, were taken from a dump area close to the monastery kitchen. They consisted of sand mixed with organic remains and peat-like materials with refuse. Both number of species and number of seeds per litre were rather high.

The samples from the site of the Franciscan Monastery were dated to the Early Middle Ages. The site on which the monastery was built was close to the sea, and 3 species associated with maritime areas were identified.

The samples from Krøyers Have, Svendborg, (H.A.Jensen 1979a, Table 3) were taken from a moat that was a part of the town's defence system. The examined layer consisted of clay, sand, and gytja. A total of 54 species and 20 genera were identified. The moat must have held water, since the following taxa associated with ponds and lakes were identified: *Alisma plantago-aquatica*, *Ceratophyl-*

(Continued on p. 74)

Table 10
Comparison of seed record from the sites examined

Site	Ribe Kunstmuseet	Ribe Dommerhaven	Ribe Tvedgade	Ribe Sønderports- gade	Øm Monastery
Source	Present paper				
Table number	1	2	3	4	5
Site history	Dump area, market- place	Dump area, market- place	Dump area, market- place	Town, dump area, garth	Pit under cloister wall
Layer/sample description	Manure with wood, wattle, & artefacts	Manure with artefacts	Manure with straw, wood & artefacts	Building remains, charcoal, humic culture layer	Building remains, some organic matter
Dating (AD)	8th century	8th century	8th century	c. 1100– c. 1580	1412–1450
Number of samples	5	1	3	14	1
Number of species/genera recorded	32 + 22	20 + 8	41 + 21	41 + 16	2 + 0
Number of seeds/litre					
Average	384	1180	4715	1131	26
Maximum	488	1180	6235	4536	26

Viborg St. Sct. Pedersstræde	Viborg St. Sct. Pedersstræde	Kolding Borchs Gaard	Odense Black Friars' Monastery	Svendborg Foldagers Gaard	Svendborg Korsgade 4	Svendborg Krøyers Have	Svendborg Franciscan Monastery
H. A. Jensen 1979 a							
6	7	8	9	1	2	3	4
Farmland, urban settlement	Farmyard, storehouse	Town, culture fill layer/dung	Dump area near monastery	Urban settlement/ town	Urban settlement/ town	Moat	Building site. Moist ruderal soil affected by the sea
Sandy, light-, medium-, black-brown soil with organic remains	Culture fill with sand, soot, & brown soil rich in organic remains	Soil rich in organic remains, manure	Sand with organic & building remains; peat-like materials with refuse	Humic culture layer	Sandy culture layers with charcoal & leather waste between clay floors	Fill, gyttja, clay with sand & gyttja	Peat with wood & artefacts; wood chip layer
Late Viking – c. 1200	1025–1125	13th century – c. 1500	Before Middle Ages – 16th century	1100–1600	1150– c. 1400	c. 1200– c. 1550	Early Middle Ages
6	2	2	8	8	5	8	5
50 + 26	24 + 13	46 + 17	51 + 28	71 + 30	51 + 21	54 + 20	47 + 16
1085 1428	699 704	1088 1396	1057 4276	1002 1630	1925 4695	1574 3685	1383 3804

Table 10 (Continued)
Comparison of seed record from the sites examined

Site	Ribe Kunstmuseet	Ribe Dommerhaven	Ribe Tvedgade	Ribe Sønderports- gade	Øm Monastery
Recorded species/genera grouped according to assumed origin of the seeds					
Cultivated or collected					
Anethum graveolens L.					
Brassica rapa L. (B. campestris L.)					
Cerealìa					
Chelidonium majus L.					+
Corylus avellana L.	+		+		
Daucus carota L.					
Euphorbia lathyris L.					
Fragaria vesca L.		+	+		
Hordeum cf. distichon L. (two-rowed hulled barley)					
Hordeum vulgare L. (six-rowed hulled barley)					
Hordeum vulgare L.	+			+	
Humulus lupulus L.			+		
Hyoscyamus niger L.			+	+	
Lactuca sativa L.					
Linum usitatissimum L.				+	
Malus sylvestris Miller				+	
Myrica gale L.	+		+	+	
Papaver somniferum L.					
Prunus cf. domestica L. subsp. insititia (L.) C. K. Schneider (P. insititia L.)					
Rubus fruticosus L. group					
Rubus cf. fruticosus L. group	+				

Viborg St. Sct. Pedersstræde	Viborg St. Sct. Pedersstræde	Kolding Borchs Gaard	Odense Black Friars' Monastery	Svendborg Foldagers Gaard	Svendborg Korsgade 4	Svendborg Krøyers Have	Svendborg Franciscan Monastery
		+	+	+			
		+		+			
				+			
						+	
+	+			+	+		+
				+			
			+				
		+	+	+	+	+	+
				+			
				+			
	+			+	+		
		+		+	+	+	+
	+			+	+	+	
		+					
+		+	+	+	+	+	+
+	+	+	+	+			+
		+	+	+			
						+	
+				+	+	+	+

Table 10 (Continued)
Comparison of seed record from the sites examined

Site	Ribe Kunstmuseet	Ribe Dommerhaven	Ribe Tvedgade	Ribe Sønderports- gade	Øm Monastery
Recorded species/genera grouped according to assumed origin of the seeds					
Cultivated or collected (continued)					
<i>Rubus idaeus</i> L.				+	
<i>Sambucus nigra</i> L.				+	+
<i>Spergula arvensis</i> L.	+		+	+	
Weeds					
<i>Agrostemma githago</i> L.				+	
<i>Anagallis arvensis</i> L.					
<i>Anthemis arvensis</i> L.	+		+	+	
<i>Aphanes arvensis</i> L.				+	
<i>Arenaria serpyllifolia</i> L.					
<i>Bilderdykia convolvulus</i> (L.) Dumor. (<i>Polygonum convolvulus</i> L.)	+			+	
<i>Bromus</i> cf. <i>secalinus</i> L.	+				
<i>Capsella bursa-pastoris</i> (L.) Medicus					
<i>Centaurea cyanus</i> L.				+	
<i>Centaurea</i> cf. <i>cyanus</i> L.					
<i>Chrysanthemum</i> sp.					
<i>Cirsium arvense</i> (L.) Scop.					
<i>Cirsium</i> cf. <i>arvense</i> (L.) Scop.				+	
<i>Euphorbia helioscopia</i> L.					
<i>Neslia paniculata</i> (L.) Desv.					

Viborg St. Sct. Pedersstræde	Viborg St. Sct. Pedersstræde	Kolding Borchs Gaard	Odense Black Friars' Monastery	Svendborg Foldagers Gaard	Svendborg Korsgade 4	Svendborg Krøyers Have	Svendborg Franciscan Monastery
+				+			
+	+	+	+	+	+	+	+
+	+	+	+	+	+	+	+
+		+	+	+	+		
			+	+	+		+
+			+		+		
						+	
+	+	+	+	+	+		
				+			
			+				
				+	+		+
+							
+			+	+	+	+	+
		+	+	+	+		
			+	+	+		

Table 10 (Continued)
Comparison of seed record from the sites examined

Site	Ribe Kunstmuseet	Ribe Dommerhaven	Ribe Tvedgade	Ribe Sønderports- gade	Øm Monastery
Recorded species/genera grouped according to assumed origin of the seeds					
Weeds (continued)					
<i>Odontites verna</i> (Bellardt) Dumort.				+	
<i>Papaver argemone</i> L.					
<i>Poa annua</i> L.					
<i>Polygonum hydropiper</i> L.	+		+	+	
<i>Polygonum lapathifolium</i> L.	+	+	+		
<i>Polygonum lapathifolium</i> L. et <i>P. persicaria</i> L.				+	
<i>Polygonum persicaria</i> L.	+	+	+		
<i>Ranunculus repens</i> L.					
<i>Ranunculus</i> cf. <i>repens</i> L.					
<i>Ranunculus sardous</i> Crantz.					
<i>Raphanus raphanistrum</i> L.		+	+	+	
<i>Rumex acetosella</i> L.	+	+	+	+	
<i>Scleranthus annuus</i> L.					
<i>Sinapis arvensis</i> L.					
<i>Sonchus arvensis</i> L.	+		+		
<i>Sonchus asper</i> (L.) Hill				+	
<i>Sonchus oleraceus</i> L.				+	
<i>Stellaria media</i> (L.) Vill.	+	+	+	+	
<i>Thlaspi arvense</i> L.				+	

Table 10 (Continued)
Comparison of seed record from the sites examined

Site	Ribe Kunstmuseet	Ribe Dommerhaven	Ribe Tvedgade	Ribe Sønderports- gade	Øm Monastery
Recorded species/genera grouped according to assumed origin of the seeds					
Ruderal soils					
<i>Aethusa cynapium</i> L.			+		
<i>Anthemis cotula</i> L.				+	
<i>Bupleurum rotundifolium</i> L.				+	
<i>Chenopodium album</i> L.			+		
<i>Chenopodium</i> cf. <i>album</i> L.	+	+		+	
<i>Echinochloa crus-galli</i> (L.) Beauv.				+	
<i>Polygonum aviculare</i> L.	+	+	+	+	
<i>Rorippa islandica</i> (Oeder) Borbás (<i>R. palustris</i> (L.) Besser)	+		+		
<i>Rumex crispus</i> L.	+		+		
<i>Rumex</i> cf. <i>longifolius</i> DC. in Lam. & DC.					
<i>Rumex obtusifolius</i> L.					
<i>Rumex</i> cf. <i>obtusifolius</i> L.			+		
<i>Solanum dulcamara</i> L. et <i>S. nigrum</i> L.					
<i>Solanum nigrum</i> L.		+	+		
<i>Solanum</i> cf. <i>nigrum</i> L.	+				
<i>Stachys</i> cf. <i>annua</i> (L.) L.					
<i>Urtica dioica</i> L.	+		+	+	
<i>Urtica urens</i> L.	+	+	+	+	
<i>Verbena officinalis</i> L.					

Table 10 (Continued)
Comparison of seed record from the sites examined

Site	Ribe Kunstmuseet	Ribe Dommerhaven	Ribe Tvedgade	Ribe Sønderports- gade	Øm Monastery
Recorded species/genera grouped according to assumed origin of the seeds					
Grasslands					
<i>Achillea millefolium</i> L.					
<i>Anchusa officinalis</i> L.					
<i>Anthriscus sylvestris</i> (L.) Hoffm.					
<i>Carduus crispus</i> L.			+		
<i>Cerastium fontanum</i> Baumg. subsp. <i>triviale</i> (Link) Jalas			+		
<i>Cichorium intybus</i> L.					
<i>Dactylis glomerata</i> L.			+		
<i>Dianthus deltoides</i> L.					
<i>Festuca</i> cf. <i>rubra</i> L.					
<i>Leontodon autumnalis</i> L.				+	
<i>Linum catharticum</i> L.					
<i>Origanum vulgare</i> L.					
<i>Plantago lanceolata</i> L.					
<i>Potentilla anserina</i> L.				+	
<i>Potentilla argentea</i> L.				+	
<i>Potentilla</i> cf. <i>argentea</i> L.					
<i>Potentilla reptans</i> L.	+				
<i>Ranunculus</i> cf. <i>bulbosus</i> L.					
<i>Rumex</i> cf. <i>acetosa</i> L.	+				
<i>Silene vulgaris</i> (Moench) Garcke (<i>S. cucubalus</i> Wibel)					
<i>Silene</i> cf. <i>vulgaris</i> (Moench) Garcke					

Viborg St. Sct. Pedersstræde	Viborg St. Sct. Pedersstræde	Kolding Borchs Gaard	Odense Black Friars' Monastery	Svendborg Foldagers Gaard	Svendborg Korsgade 4	Svendborg Krøyers Have	Svendborg Franciscan Monastery
+							
					+		+
			+			+	
			+				
						+	
				+			
+							
+			+				
		+	+				
							+
		+		+			
+		+				+	+
					+		
				+			
			+				
		+					
+					+		

Table 10 (Continued)
Comparison of seed record from the sites examined

Site	Ribe Kunstmuseet	Ribe Dommerhaven	Ribe Tvedgade	Ribe Sønderports- gade	Øm Monastery
Recorded species/genera grouped according to assumed origin of the seeds					
Grasslands (continued)					
Stellaria graminea L.					
Taraxacum officinale group				+	
Torilis japonica (Houtt.) DC.					
Trifolium cf. campestre Schreber in Sturm					
Trifolium repens L.			+		
Bogs, swamps, and wetlands (incl. meadows)					
Alopecurus geniculatus L.	+				
Berula cf. erecta (Hudson) Coville (Sium erectum Hudson)					
Carex echinata Murray					
Cicuta virosa L.					
Eleocharis palustris (L.) Roemer & Schultes et E. uniglumis (Link.) Schultes in Schultes & Schultes fil.	+	+	+	+	
Eleocharis quinqueflora (F.X. Hartmann) O. Schwarz (Scirpus quinqueflorus F.X. Hartmann)					
Filipendula ulmaria (L.) Maxim.					
Juncus bufonius L.			+	+	
Lychnis flos-cuculi L.	+		+		
Lycopus europaeus L.				+	
Mentha aquatica L. et M. arvensis L.					

Viborg St. Sct. Pedersstræde	Viborg St. Sct. Pedersstræde	Kolding Borchs Gaard	Odense Black Friars' Monastery	Svendborg Foldagers Gaard	Svendborg Korsgade 4	Svendborg Krøyers Have	Svendborg Franciscan Monastery
		+		+	+	+	
						+	
					+		
			+	+	+	+	
						+	
+						+	
						+	
+		+	+	+	+	+	+
		+					
		+					
			+	+	+		+
+	+	+	+	+	+	+	
		+		+		+	+
+			+	+	+	+	+

Table 10 (Continued)
Comparison of seed record from the sites examined

Site	Ribe Kunstmuseet	Ribe Dommerhaven	Ribe Tvedgade	Ribe Sønderports- gade	Øm Monastery
Recorded species/genera grouped according to assumed origin of the seeds					
Bogs, swamps, and wetlands (continued)					
Montia fontana L. subsp. chondrosperma (Fenzl) Walters					
Pedicularis palustris L.			+		
Poa trivialis L.		+			
Polygonum cf. minus Hudson					
Potentilla palustris (L.) Scop. (Comarum palustre L.)			+		
cf. Potentilla palustris (L.) Scop.					
Prunella vulgaris L.					
Ranunculus acris L.					
Ranunculus cf. acris L.					
Ranunculus flammula L.	+	+	+		
Ranunculus sceleratus L.	+	+	+	+	
Rumex maritimus L. et R. palustris Sm.					
Scirpus cespitosus L.			+		
Scirpus lacustris L.					
Scirpus setaceus L.			+		
Scirpus sylvaticus L.					
Stachys cf. palustris L.			+		

Viborg St. Sct. Pedersstræde	Viborg St. Sct. Pedersstræde	Kolding Borchs Gaard	Odense Black Friars' Monastery	Svendborg Foldagers Gaard	Svendborg Korsgade 4	Svendborg Krøyers Have	Svendborg Franciscan Monastery
				+		+	
				+			
				+			
+							+
					+		
+		+	+	+	+		+
		+					
				+			
+		+	+	+	+		+
+	+	+	+	+	+	+	+
			+				
				+			
				+			
		+				+	
				+			

Table 10 (Continued)
Comparison of seed record from the sites examined

Site	Ribe Kunstmuseet	Ribe Dommerhaven	Ribe Tvedgade	Ribe Sønderports- gade	Øm Monastery
Recorded species/genera grouped according to assumed origin of the seeds					
Ponds and lakes					
<i>Alisma plantago-aquatica</i> L.		+			
<i>Ceratophyllum demersum</i> L.					
<i>Lemna</i> sp.					
<i>Menyanthes trifoliata</i> L.			+		
<i>Nymphaea alba</i> L.					
<i>Ranunculus</i> subgen. <i>Batrachium</i> (DC.) A. Gray					
<i>Zannichellia palustris</i> L.					
Maritime areas					
<i>Aster tripolium</i> L.					
<i>Samolus valerandi</i> L.					
<i>Scirpus lacustris</i> L. subsp. <i>tabernaemontani</i> (C.C. Gmelin) Syme in Sowerby (<i>S. tabernaemontani</i> C.C. Gmelin)	+				
<i>Scirpus maritimus</i> L.		+			
<i>Zostera noltii</i> Hornem. (<i>Z. nana</i> Roth pro parte)		+			

Table 10 (Continued)
Comparison of seed record from the sites examined

Site	Ribe Kunstmuseet	Ribe Dommerhaven	Ribe Tvedgade	Ribe Sønderports- gade	Øm Monastery
Recorded species/genera grouped according to assumed origin of the seeds					
Forests and hedges					
<i>Betula pendula</i> Roth			+	+	
<i>Betula pubescens</i> Ehrh.					
<i>Betula</i> cf. <i>pubescens</i> Ehrh.					
<i>Lapsana communis</i> L.				+	
<i>Mochringia trinervia</i> (L.) Clairv. (<i>Arenaria trinervia</i> L.)					
cf. <i>Prunus avium</i> L. (<i>Cerasus avium</i> (L.) Moench)					
<i>Rubus caesius</i> L.					
<i>Rubus corylifolius</i> Sm.					
<i>Solanum dulcamara</i> L.					
<i>Solanum</i> cf. <i>dulcamara</i> L.					
<i>Ulmus</i> cf. <i>glabra</i> Hudson					
Heaths					
<i>Andromeda polifolia</i> L.	+				
<i>Calluna vulgaris</i> (L.) Hull		+			
<i>Empetrum nigrum</i> L.				+	
<i>Erica tetralix</i> L.					
<i>Potentilla erecta</i> (L.) Räuschel		+	+		
<i>Solidago virgaurea</i> L.					

Table 10 (Continued)
Comparison of seed record from the sites examined

Site	Ribe Kunstmuseet	Ribe Dommerhaven	Ribe Tvedgade	Ribe Sønderports- gade	Øm Monastery
Recorded species/genera grouped according to assumed origin of the seeds					
Miscellaneous					
Agrostis sp.	+		+		
Aphanes sp.	+		+		
Arctium sp.	+			+	
Atriplex sp.		+		+	
Barbarea sp.			+		
Brassica sp.	+		+		
Carduus sp.					
Carex, sect. Distigmaticae	+	+	+		
Carex, sect. Tristigmaticae	+	+	+		
Carex sp.	+				
Caryophyllaceae					
Centaurea sp.					
Cerastium sp.					
Chenopodium sp.		+			
Cirsium sp.	+				
Compositae					
Crataegus sp.					
Crepis sp.					
Cruciferae	+				
Cyperaceae	+	+	+		
Epilobium sp.					

Table 10 (Continued)
Comparison of seed record from the sites examined

Site	Ribe Kunstmuseet	Ribe Dommerhaven	Ribe Tvedgade	Ribe Sønderports- gade	Øm Monastery
Recorded species/genera grouped according to assumed origin of the seeds					
Miscellaneous (continued)					
Euphorbia sp.				+	
Galeopsis sp.	+			+	
Galium sp.					
Gramineae			+		
Hieracium sp.					
Hypericum sp.	+				
Juncus sp.	+	+	+	+	
Labiatae					
Lamium sp.				+	
Leguminosae			+		
Lolium sp.	+				
Matricaria sp.					
Myosotis sp.			+		
Papaver sp.				+	
Polygonum sp.	+	+	+	+	
Potamogeton sp.					
Potentilla sp.	+		+	+	
Ranunculus sp.	+		+	+	
Rosa sp.					
Rubus sp.			+		
Rumex sp.	+	+		+	
Scirpus sp.				+	

Viborg St. Sct. Pedersstræde	Viborg St. Sct. Pedersstræde	Kolding Borchs Gaard	Odense Black Friars' Monastery	Svendborg Foldagers Gaard	Svendborg Korsgade 4	Svendborg Krøyers Have	Svendborg Franciscan Monastery
+	+	+	+	+	+	+	+
		+		+			
		+		+	+		
						+	
+		+	+	+	+		
+	+		+	+	+	+	+
+			+	+		+	
+	+	+	+	+	+		
			+				
		+	+				+
+	+	+	+	+	+	+	+
						+	
+	+	+	+	+	+	+	+
+			+	+	+	+	
			+			+	
+		+			+		
+	+		+	+	+		+
+		+					

Table 10 (Continued)
Comparison of seed record from the sites examined

Site	Ribe Kunstmuseet	Ribe Dommerhaven	Ribe Tvedgade	Ribe Sønderports- gade	Øm Monastery
Recorded species/genera grouped according to assumed origin of the seeds					
Scleranthus sp.	+			+	
Silene sp. (incl. Melandrium sp.)				+	
Solanum sp.			+	+	
Sonchus sp.	+		+		
Spergula sp.				+	
Stachys sp.					
Umbelliferae			+		
Verbascum sp.					
Veronica sp.	+				
Viola sp.	+		+		

Cenococcum geophilum Fr.	+	+	+	Not examined	+
Equisetum sp.			+		

Viborg St. Sct. Pedersstræde	Viborg St. Sct. Pedersstræde	Kolding Borchs Gaard	Odense Black Friars' Monastery	Svendborg Foldagers Gaard	Svendborg Korsgade 4	Svendborg Krøyers Have	Svendborg Franciscan Monastery
	+		+	+		+	
+		+		+	+	+	
			+	+		+	
			+	+			+
			+				
				+			
+	+	+	+	+	+		
+		+	+	+	+	+	+
			+	+			

lum demersum, *Lemna* sp., *Menyanthes trifoliata*, *Nymphaea alba*, and *Zannichellia palustris*.

As indicated above, not only the history of the site but also the substance of the examined layers have naturally influenced both the size and the composition of the seed bank: thus the sample from Øm consisting mainly of building remains, with its 2 species only, in contrast to the 71 species and 30 genera recovered from the 8 samples taken from the humic culture layer at Foldagers Gaard, Svendborg.

It has been remarked that several species contained a large number of seeds per litre, the greatest concentration being found in the samples from Tvedgade, Ribe, with an average of 4715, and a maximum of 6235 seeds per litre. In comparison, modern Danish fields contain an average of 673, with a maximum of 4669 seeds per litre (H.A. Jensen 1969). Here it must be kept in mind that the archaeologically dated samples were taken from ruderal soil, which usually has a rich flora.

The seed finds, and the wild and cultivated Danish flora

The present chapter aims to show how the published finds contribute to our knowledge of the contemporaneous Danish flora.

The taxa identified are in Table 10 grouped according to the assumed origin of the seed.

Under "cultivated or collected" are listed 24 (11%) of the recorded taxa grown or gathered as food, culinary herbs or medicinal plants in Denmark during the 8th-16th centuries. Some of the seeds, for instance of *Chelidonium majus*, *Humulus lupulus*, and *Hyoscyamus niger*, may not have been collected but derive from wild plants either growing at the excavated site or brought there in different ways.

The information on finds from different sites in Jutland and Funen gives some indication of the occurrence of the species in the 8th-16th centuries. *Spergula arvensis* was present in 11, *Sambucus nigra* in

10, *Myrica gale* in 9, and *Linum usitatissimum* and *Fragaria vesca* in 8 of the 13 sites examined.

34 (16%) of the taxa have been classified as weeds. As previously discussed, several species occur in other habitats as well. The taxa are in this and the following groups listed according to the assumed origin of the seed.

Present at all but one or two sites were *Polygonum hydropiper*, *P. persicaria*, *Raphanus raphanistrum*, *Rumex acetosella*, and *Stellaria media*. These species are still rather important as weeds in Danish fields, having been recorded during examination of the seed content in 57 Danish fields (H.A. Jensen 1969).

Agrostemma githago - now extremely rare as a weed in Denmark - was found in samples from 6 of the 13 excavated sites.

19 (9%) of the taxa were grouped as originating from ruderal soil. Most frequent were *Chenopodium album* and *C. cf. album*, *Polygonum aviculare*, *Urtica dioica*, and *U. urens*.

26 (12%) of the taxa were assigned to grasslands. The main part of these were, as previously discussed, most likely transported to the sites, mainly as hay or in manure. This is supported by the fact that the taxa seem to have been assembled by chance, since none of the species listed was present in the main part of the samples. Most frequent was *Trifolium repens*, known from 5 of the 13 sites.

28 (13%) of the taxa are assigned to bogs, swamps, and wetlands (incl. meadows). Some of the seeds are most likely of local origin (e.g. *Juncus bufonius*), others probably transported to the sites. Most frequent were *Ranunculus sceleratus*, followed by *Eleocharis palustris* et *uniglumis*, *Lychnis flos-cuculi*, and *Ranunculus flammula*.

11 (5%) of the taxa were referred to forests and hedges. Some species (*Betula pendula*, *Solanum dulcamara*) may have grown on or close to the excavated sites. *Rubus fruticosus* - listed as "cultivated or collected" - may derive from open forest or hedgerow. Most frequent was *Lapsana communis*, found at 6 of the sites.

6 (3%) of the taxa were assigned to heaths. *Myrica gale* - recorded as "cultivated or collected"

and originating from wet heaths and bogs - was present at 9 of the sites. Other heath-species were found at 3 sites or less.

7 (3%) of the taxa were assigned to ponds and lakes. 6 of these were found in the moat at Krøyers Have, Svendborg.

5 (2%) of the taxa are assumed to have originated in maritime areas. The *Scirpus lacustris* subsp. *tabernaemontani* found at Viborg is, as discussed, most likely not of maritime origin.

Under "miscellaneous" are listed 55 (26%) of the taxa. Allocation to assumed habitat has not been attempted. Some of the taxa (*Aphanes* sp., *Brassica* sp.), however, are most likely weeds, and the main part of *Carex* sect. *Distigmaticae* and *C.* sect. *Tristigmaticae* most likely originates from bogs, swamps, and wetlands.

Cenococcum geophilum, which is discussed on p. 93, was found in all but one of the sites examined for that fungus.

Excluding the group miscellaneous, most of the taxa recorded were classified as weeds (16%), followed by plants from bogs, swamps, and wetlands (13%), from grasslands (12%), cultivated and collected species (11%), and plants from ruderal soil (9%). Less frequent were plants from forests and hedges (5%), heaths (3%), ponds and lakes (3%), and maritime areas (2%).

The relatively high number of species recorded from Viborg, Kolding, Odense, and Svendborg suggests that the flora in those areas was richer in species than the 8th century flora around Ribe.

The seed finds grouped according to age

Table 11 gives in alphabetical order the species/genera found as seeds or other diaspores, referred to four periods: 700-799 AD (GIA: Germanic Iron Age), 800-1049 (VA: Viking Age), 1050-1299 (EMA: Early Middle Ages), and 1300-1536 (LMA: Late Middle Ages). For each taxon within each period the constancy (percentage occurrence in the samples examined) and the sum of diaspores found

in the samples examined are shown. All figures have been converted into number of seeds per litre of "soil" (see p. 8). The number of samples examined is displayed at the top of the table.

In the interests of evaluation, the number of other reports of corresponding finds in Denmark, referred to periods between 13000 BP and 1536 AD, is given in Table 11. Comparison serves to show for which species/genera the present analyses add significant new knowledge.

Of the 215 taxa listed in Table 11, 36 were present in each of the periods GIA, VA, EMA, and LMA. The following were identified in at least 25% of the samples examined for each period: *Carex* sect. *Distigmaticae*, *Carex* sect. *Tristigmaticae*, *Chenopodium* cf. *album*, *Eleocharis palustris* et *uniglumis*, *Juncus* sp., *Polygonum lapathifolium*, *P. persicaria*, *Polygonum* sp., *Potentilla* sp., *Ranunculus sceleratus*, *Rumex acetosella*, *R. crispus*, *Stellaria media*, *Urtica dioica*, *U. urens*, and the fungus *Cenococcum geophilum*.

This indicates that these plants were rather common at the sites examined during the 8th-16th centuries.

The number of diaspores was, as mentioned in the previous chapter, rather high in several samples. The average number per litre for all species (total number of seeds/number of samples) was: GIA 1904, VA 928, EMA 1419, LMA 993, and for the period as a whole, 1301 per litre.

Several species were present in large quantities. *Urtica urens* provided the highest content (3776 per litre - Table 4), followed by *Juncus bufonius* (2200 per litre - Table 4), *Ranunculus sceleratus* (2165 and 1250 per litre - Table 3), and *Chenopodium* sp. (1232 per litre - Table 9).

The average number of seeds per litre (sum of seeds of the species/number of samples) was calculated for taxa in Table 11 having a large number of seeds:

	GIA	VA	EMA	LMA
<i>Juncus</i> sp.	877	124	90	88
<i>Ranunculus sceleratus</i>	393	138	160	36
<i>Urtica dioica</i>	4	68	58	241
<i>Carex</i> sect. <i>Distigmaticae</i>	209	10	15	25

Table 11

Constancy and number of seeds and other diaspores per litre found in Danish soil samples from 700-1536 AD, the corresponding number of other reports on finds from Denmark, referred to periods between 13000 BP and 1536 AD, and brief remarks on own finds compared to those of others (cf. Jensen 1985).

Abbreviations:		I-IX: Pollen assemblage zones		EMA : Early Middle Ages (1050-1299 AD)	Remarks	
		PRIA: Pre-Roman Iron Age (500-1 BC)		LMA : Late Middle Ages (1300-1536 AD)		
		RIA : Roman Iron Age (1-399 AD)		u : period uncertain		
		GIA : Germanic Iron Age (400-799 AD)		ORFD: Oldest recorded find from Denmark		
		VA : Viking Age (800-1049 AD)		DI : Dating improved		
Species/genera	Summary of finds reported in the present paper and in Jensen (1979a). For each species/genus are calculated: CONSTANCY, i.e. the percentage occurrence in the samples examined within the period, and the SUM of seeds and other diaspores found in samples referred to the period.				Number of reports from Denmark covering the quoted periods and published by other authors (cf. Jensen 1985)	Remarks
	Period AD					
	700- 799	800- 1049	1050- 1299	1300- 1536		
	GIA	VA	EMA	LMA		
Number of samples:	9	5	30	23		
<i>Achillea millefolium</i> L.			3% 2		VIII:1 PRIA:1 LMA:1	
<i>Aethusa cynapium</i> L.	11% 5	20% 4	10% 11		VA:1 LMA:1u	ORFD
<i>Agrostemma githago</i> L.		20% 2	27% 87	13% 24	RIA:1 GIA:1 VA:3 EMA:1+1u LMA:3+1u	
<i>Agrostis</i> sp.	22% 12				VIII:1	
<i>Alisma plantago-aquatica</i> L.	11% 10			22% 90	IV:1 V:1 VIII:1 VA:1 EMA:1u LMA:1u	
<i>Alopecurus geniculatus</i> L.	11% 2					ORFD
<i>Anagallis arvensis</i> L.			10% 37	9% 9		ORFD
<i>Anchusa officinalis</i> L.			7% 9			ORFD
<i>Andromeda polifolia</i> L.	11% 2				IX:1	DI
<i>Anethum graveolens</i> L.			3% 8	9% 8	LMA:1	ORFD
<i>Anthemis arvensis</i> L.	22% 7	60% 6	20% 35	9% 8	EMA:1u LMA:1+1u	ORFD
<i>Anthemis cotula</i> L.			7% 14	4% 5	EMA:1u	DI
<i>Anthriscus sylvestris</i> (L.) Hoffm.			3% 35	4% 20	VIII:1u LMA:1	

Table 11 (continued)

Species/genera	Constancy and sum			LMA	Other reports	Remarks
	GIA	VA	EMA			
<i>Aphanes arvensis</i> L.			3% 4		PRIA:1 EMA:1u LMA:1u	
<i>Aphanes</i> sp.	33% 12	40% 56	50% 699	17% 35		
<i>Arctium</i> sp.	11% 2		7% 6		VI,VII:1 EMA:1u LMA:1u	
<i>Arenaria serpyllifolia</i> L.			3% 5		VIII:1 LMA:1u	
<i>Aster tripolium</i> L.			3% 4		EMA:1	
<i>Atriplex</i> sp.	11% 5	20% 2	40% 380	9% 49	V:1 VI,VII:1 VA:1 EMA:1u	1)
<i>Barbarea</i> sp.	11% 25					ORFD
<i>Berula</i> cf. <i>erecta</i> (Hudson) Coville (<i>Sium erectum</i> Hudson)			3% 5			
<i>Betula pendula</i> Roth	11% 5		17% 16	9% 6	II:2 III:1 IV:1 VI,VII:3+3u VIII:1u IX:1 LMA:1u	
<i>Betula pubescens</i> Ehrh.				4% 4	II:8 III:2+1u IV:3+1u V:2+4u VI,VII:8+7u VIII:4+2u IX:4 RIA:1 EMA:1u	
<i>Betula</i> cf. <i>pubescens</i> Ehrh.				4% 2	V:1u	
<i>Bilderdykia convolvulus</i> (L.) Dumort. (<i>Polygonum convolvulus</i> L.)	11% 4	20% 2	43% 60	22% 28	VIII:5 PRIA:7 RIA:5 GIA:6 VA:3 EMA:5+1u LMA:6+1u	
<i>Brassica rapa</i> L. (<i>B. campestris</i> L.)			3% 4	4% 4	VIII:2 PRIA:2 RIA:3 GIA:1 VA:1 EMA:1u LMA:1+1u	
<i>Brassica</i> sp.	22% 7		7% 4	9% 8	EMA:1u	
<i>Bromus</i> cf. <i>secalinus</i> L.	11% 2		7% 6		VIII:2	2)
<i>Bupleurum rotundifolium</i> L.			7% 24			ORFD
<i>Calluna vulgaris</i> (L.) Hull (leaves)	11% 5	20% 2	7% 6		III:1+3u IV:1 V:1 VI,VII:2 VIII:6 IX:4 RIA:3 GIA:1 VA:1 LMA:2	
<i>Capsella bursa-pastoris</i> (L.) Medicus				4% 4	VIII:1 PRIA:3 RIA:2 GIA:1	
<i>Carduus crispus</i> L.	11% 5				VA:1 EMA:1u LMA:1u	ORFD
<i>Carduus</i> sp.				4% 5		
<i>Carex</i> sect. <i>Distigmaticae</i>	100% 1883	80% 52	57% 447	43% 583	I:1 II:2 III:3 VIII:1 VA:1	
<i>Carex echinata</i> Murray			3% 2		LMA:2	ORFD
<i>Carex</i> sect. <i>Tristigmaticae</i>	100% 177	80% 32	67% 301	48% 401	II:1 III:2 VA:1	

1) *Atriplex littoralis* L. and *A. patula* L. recorded from VI,VII(u)2) *Bromus secalinus* L. recorded from VIII

Table 11 (continued)

Species/genera	Constancy and sum				Other reports	Remarks
	GIA	VA	EMA	LMA		
Carex sp.	33% 14				I:1 II:3+1u III:2+5u IV:1u V:2+1u VI,VII:7 VIII:1 IX:1 PRIA:1 RIA:3 GIA:1+1u EMA:1+1u LMA:2+1u	
Caryophyllaceae			7% 4	4% 2		
Centaurea cyanus L.			27% 34	4% 4	EMA:1u LMA:1+1u	DI
Centaurea cf. cyanus L.				4% 4		
Centaurea sp.		20% 2			EMA:1u LMA:1u	
Cerastium fontanum Baumg. subsp. triviale (Link) Jalas	11% 5			4% 4	PRIA:1 RIA:1 GIA:1 VA:1 LMA:1	
Cerastium sp.			3% 15		LMA:1u	
Ceratophyllum demersum L.			3% 25	4% 5	III:1 IV:1+1u V:2u VI,VII:2+3u VIII:1+1u LMA:1u	
Cerealia			3% 2	4% 4		
Chelidonium majus L.				9% 34		ORFD
Chenopodium album L.	33% 100		47% 5441	43% 1183	VI,VII:2u VIII:11 PRIA:7 RIA:6 GIA:6 VA:3 EMA:1 LMA:3+1u	
Chenopodium cf. album L.	67% 231	100% 624	50% 2104	26% 540	RIA:1	
Chenopodium sp.	11% 15	20% 4	30% 607	26% 1450	VIII:1 IX:1 PRIA:1 RIA:1 GIA:1 EMA:1u LMA:1u	
Chrysanthemum sp.		20% 2				ORFD
Cichorium intybus L.			7% 10		EMA:1u	DI
Cicuta virosa L.			3% 5		IV:1 VI,VII:1+1u VIII:1+2u IX:2 LMA:1u	
Cirsium arvense (L.) Scop.			17% 27	22% 54	VA:1 LMA:3	
Cirsium cf. arvense (L.) Scop.			7% 8			
Cirsium sp.	11% 4		10% 9	4% 4		
Compositae	11% 5		13% 21	13% 16		
Corylus avellana L.	78% 10	60%	37%		V:1+1u VI,VII:5+6u VIII:8+2u IX:2 RIA:1 VA:1 EMA:1u LMA:2+1u	
Crataegus sp.			3% 4		VI,VII:1u, VIII:1	
Crepis sp.			7% 12	4% 20		1)
Cruciferae	11% 2		3% 4	4% 4		

1) Crepis capillaris (L.) Wallr. and C. tectorum L. reported from PRIA

Table 11 (continued)

Species/genera	Constancy and sum				Other reports	Remarks
	GIA	VA	EMA	LMA		
Cyperaceae	89%	60%	50%	17%		
	92	28	218	62		
Dactylis glomerata L.	11%					ORFD
	5					
Daucus carota L.			3%	4%	EMA:1u LMA:1u	DI
			2	4		
Dianthus deltooides L.			3%			ORFD
			2			
Echinochloa crus-galli (L.) Beauv.			3%		PRIA:2 LMA:1	
			4			
Eleocharis palustris (L.) Roemer & Schultes et E. uniglumis (Link.) Schultes in Schultes & Schultes fil.	100%	40%	77%	39%	VA:1	1)
	1363	4	402	138		
Eleocharis quinqueflora (F.X. Hartmann) O. Schwarz (Scirpus quinqueflorus F.X. Hartmann)				4%		ORFD
				8		
Empetrum nigrum L.			10%		I:1 II:3 III:3+4u IV:2u VI,VII:1+2u VIII:1 IX:2 RIA:1	
			22			
Epilobium sp.			10%	9%	VA:1	
			39	60		
Erica tetralix L. (leaves)			3%		EMA:1u LMA:1	DI
Euphorbia helioscopia L.			17%	17%	VA:1 EMA:1u LMA:2+1u	
			10	15		
Euphorbia lathyris L.			3%			ORFD
			8			
Euphorbia sp.			13%	4%		
			80	12		
Festuca cf. rubra L.			3%			ORFD
			2			
Filipendula ulmaria (L.) Maxim.				4%	VIII:2u	
				64		
Fragaria vesca L.	22%		33%	26%	VIII:1 LMA:1	
	60		370	73		
Galeopsis sp.	11%	60%	67%	22%	PRIA:2 VA:1 EMA:1u LMA:1u	2)
	4	22	162	60		
Galium sp.			3%	4%	VA:1 LMA:1u	3)
			2	12		
Gramineae	22%		10%	9%		
	10		18	16		
Hieracium sp.				4%	EMA:1u	4)
				15		
Hordeum cf. distichon L. (two-rowed hulled barley)			3%			ORFD
			20			
Hordeum vulgare L. (six-rowed hulled barley)			3%		VIII:9 PRIA:7 RIA:9 GIA:4 VA:2 EMA:2	
			16			

1) Eleocharis palustris is known from III(u)

2) Galeopsis ladanum L. is known from RIA, G. tetrahit L. from VIII

3) Galium aparine L. is known from VIII, G. palustre L. and G. spurium L. from RIA

4) Hieracium umbellatum L. recorded from RIA

Table 11 (continued)
Species/genera

Species/genera	Constancy and sum				Other reports	Remarks
	GIA	VA	EMA	LMA		
<i>Hordeum vulgare</i> L.	11% 2		27% 151	13% 30		
<i>Humulus lupulus</i> L.	11% 10		20% 93	26% 41	VI,VII:1u EMA:1u LMA:3+1u	
<i>Hyoscyamus niger</i> L.	22% 10	20% 2	30% 369	17% 20	EMA:1u LMA:2+2u	ORFD
<i>Hypericum</i> sp.	11% 2	20% 2	23% 35	26% 162	VIII:1	
<i>Juncus bufonius</i> L.	11% 20		30% 2447	22% 370		ORFD
<i>Juncus</i> sp.	100% 7897	60% 622	83% 2694	52% 2013	VIII:1 RIA:1 LMA:1u	
Labiatae		20% 2	7% 8	4% 5		
<i>Lactuca sativa</i> L.				4% 4		ORFD
<i>Lamium</i> sp.		60% 12	40% 171	22% 46	EMA:1u	ORFD
<i>Lapsana communis</i> L.		20% 2	33% 55	4% 4	PRIA:1 GIA:1 VA:2 EMA:1u LMA:1	
Leguminosae	11% 5					
<i>Lemna</i> sp.			7% 44	26% 2260	EMA:1u LMA:1u	DI
<i>Leontodon autumnalis</i> L.		20% 4	3% 4	9% 8	VIII:1 PRIA:1 RIA:1 EMA:1u LMA:1+1u	
<i>Linum catharticum</i> L.				13% 24	VA:1 EMA:1u LMA:1u	
<i>Linum usitatissimum</i> L.		20% 2	37% 118	13% 29	VIII:1 PRIA:3 RIA:17 GIA:1 EMA:1u LMA:3+1u	
<i>Lolium</i> sp.	11% 2				VIII:1	1)
<i>Lychnis flos-cuculi</i> L.	33% 52	40% 4	7% 7	22% 25	VI,VII:1 RIA:1 VA:1 LMA:1u	
<i>Lycopus europaeus</i> L.			20% 120	17% 44	V:1u VI,VII:1u VIII:1+2u IX:2 RIA:1 GIA:1 VA:1 EMA:1u LMA:1+2u	
<i>Malus sylvestris</i> Miller			3% 4		VIII:4 LMA:1	
<i>Matricaria</i> sp.				4% 4		ORFD
<i>Mentha aquatica</i> L. et <i>M. arvensis</i> L.	11% 2	20% 2	27% 38	26% 46	VA:1	2)
<i>Menyanthes trifoliata</i> L.	11% 25			9% 13	I:1 II:8+2u III:4+6u IV:7+3u V:10+3u VI,VII:11+7u VIII:5+2u IX:4 RIA:1 VA:1 EMA:1u LMA:2+1u	
<i>Moehringia trinervia</i> (L.) Clairv. (<i>Arenaria trinervia</i> L.)				4% 5	VI,VII:1u RIA:1	
<i>Montia fontana</i> L. subsp. <i>chondrosperma</i> (Fenzl) Walters			7% 9			ORFD

1) *Lolium perenne* L. and *L. cf. remotum* Schrank known from PRIA

2) *Mentha aquatica* L. and *M. arvensis* L. recorded from RIA

Table 11 (continued)

Species/genera	Constancy and sum				Other reports	Remarks
	GIA	VA	EMA	LMA		
<i>Myosotis</i> sp.	11% 10		7% 8	4% 4		1)
<i>Myrica gale</i> L.	22% 7	80% 216	50% 1188	17% 28	VIII:1 IX:1 RIA:1 VA:1 EMA:1u LMA:3+1u	
<i>Neslia paniculata</i> (L.) Desv. (mainly parts of silique)			20% 2	17% 4	EMA:1+1u LMA:1u	
<i>Nymphaea alba</i> L.				4% 30	III:1+1u IV:3+1u V:9+3u VI,VII:12+6u VIII:2+2u IX:1 LMA:1+1u	
<i>Odontites verna</i> (Bellardi) Dumort.				4% 4	VA:1	
<i>Origanum vulgare</i> L.			10% 32			ORFD
<i>Papaver argemone</i> L.				13% 44		ORFD
<i>Papaver somniferum</i> L.			3% 2	9% 20	LMA:1	ORFD 2)
<i>Papaver</i> sp.			3% 8	9% 16	EMA:1u LMA:1u	
<i>Pedicularis palustris</i> L.	22% 100				LMA:2	ORFD
<i>Plantago lanceolata</i> L.			3% 2	4% 4	VIII:3 PRIA:3 RIA:1 GIA:1 VA:1	
<i>Poa annua</i> L.			3% 2			ORFD
<i>Poa trivialis</i> L.	11% 5		3% 2			ORFD
<i>Polygonum aviculare</i> L.	78% 102	80% 142	77% 495	22% 63	VI,VII:1 VIII:9 PRIA:2 RIA:4 GIA:3 VA:3 EMA:1u LMA:4+1u	
<i>Polygonum hydropiper</i> L.	33% 129	60% 166	23% 124	22% 200	VIII:1 RIA:1 GIA:1 LMA:1+1u	
<i>Polygonum lapathifolium</i> L.	78% 99	80% 124	47% 644	26% 144	VIII:7 PRIA:8 RIA:8 GIA:6 VA:3 EMA:1u LMA:3+2u	
<i>Polygonum lapathifolium</i> L. et <i>P. persicaria</i> L.			27% 1164	4% 276	GIA:1	
<i>Polygonum</i> cf. <i>minus</i> Hudson			3% 2			ORFD
<i>Polygonum persicaria</i> L.	44% 19	80% 50	47% 189	26% 74	VIII:3 PRIA:2 RIA:3 GIA:1 VA:1 EMA:1u LMA:3+1u	
<i>Polygonum</i> sp.	44% 22	60% 104	67% 339	39% 77	VIII:2 RIA:5 GIA:2	
<i>Potamogeton</i> sp.			7% 95	26% 755	I:4+1u II:9+3u III:2+5u IV:1+3u V:4+4u VI,VII:4+7u VIII:2+1u IX:3 EMA:1u LMA:2u	3)
<i>Potentilla anserina</i> L.			13% 17	4% 8	V:1 IX:1 RIA:2 EMA:1+1u LMA:1u	

1) *Myosotis arvensis* (L.) Hill recorded from PRIA

2) Recently identified at Lodbjerg, Jutland, in layer dated 355-240 BC (Jensen & Liversage, unpublished)

3) *Potamogeton alpinus* Balbis, *P. compressus* L., *P. filiformis* Pers., *P. friesii* Rupr.,
P. gramineus L., *P. natans* L., *P. obtusifolius* Mert. & Koch in Röhlings,
P. pectinatus L., *P. perfoliatus* L., *P. praelongus* Wulfen, *P. pusillus* L.,
P. trichoides Cham. & Schlecht., *P. vaginatus* Turcz., *P. x zizii* Koch ex Roth
recorded from I, II or III

Table 11 (continued)

Species/genera	Constancy and sum			LMA	Other reports	Remarks
	GIA	VA	EMA			
<i>Potentilla argentea</i> L.			10% 92	4% 4	PRIA:1 VA:1	
<i>Potentilla</i> cf. <i>argentea</i> L.			3% 40			
<i>Potentilla erecta</i> (L.) Räuschel	22% 10			4% 48	III:1u VIII:4 IX:1 PRIA:1 RIA:2 GIA:1 VA:3 EMA:1 LMA:1	
<i>Potentilla palustris</i> (L.) Scop. (<i>Comarum palustre</i> L.)	11% 5		7% 14		I:2 II:2 III:2+3u IV:3+1u V:1+1u VI,VII:1+3u VIII:1+2u IX:3 RIA:1 VA:1 EMA:1u LMA:2+1u	
cf. <i>Potentilla palustris</i> (L.) Scop.			3% 5			
<i>Potentilla reptans</i> L.	11% 8			4% 2		ORFD
<i>Potentilla</i> sp.	44% 15	60% 20	60% 211	26% 96	II:1 III:2u VIII:2 VA:1 EMA:1u LMA:1u	
<i>Prunella vulgaris</i> L.			33% 275	17% 64	V:1 VIII:2 PRIA:1 RIA:1 GIA:1 EMA:1u LMA:3+1u	
cf. <i>Prunus avium</i> L. (<i>Cerasus avium</i> (L.) Moench)				4% 2		1)
<i>Prunus</i> cf. <i>domestica</i> L. subsp. <i>in-</i> <i>sititia</i> (L.) C.K. Schneider (<i>P. in-</i> <i>sititia</i> L.)			3% 5			2)
<i>Ranunculus acris</i> L.				4% 4	VIII:1 PRIA:1 RIA:2 EMA:1u LMA:1+1u	
<i>Ranunculus</i> cf. <i>acris</i> L.			7% 4			
<i>Ranunculus</i> subgen. <i>Batrachium</i> (DC.) A. Gray				4% 4	II:6+1u III:1+2u IV:1+1u V:2+1u VI,VII:3+1u VA:1 EMA:1u LMA:1+1u	
<i>Ranunculus</i> cf. <i>bulbosus</i> L.				4% 8		ORFD
<i>Ranunculus flammula</i> L.	89% 122	20% 2	40% 225	17% 97	IV:1 VI,VII:1 VIII:1 RIA:1 VA:1 EMA:1u LMA:1u	
<i>Ranunculus repens</i> L.			33% 106	26% 112	IV:1 V:1 VI,VII:1 VIII:2+2u IX:1 PRIA:1 RIA:1 GIA:2 VA:1 EMA:1+1u LMA:5+1u	
<i>Ranunculus</i> cf. <i>repens</i> L.		40% 8	10% 12			
<i>Ranunculus sardous</i> Crantz		20% 2	3% 5	4% 4		ORFD
<i>Ranunculus sceleratus</i> L.	89% 3539	80% 690	83% 4814	57% 827	VI,VII:1 VIII:1 VA:1 EMA:1u LMA:1u	
<i>Ranunculus</i> sp.	67% 31	40% 4	20% 38	17% 61	III:1u VA:1	
<i>Raphanus raphanistrum</i> L.	22% 6	40% 6	50% 16	39% 5	VIII:3+1u GIA:1 VA:2 EMA:2+1u LMA:3+1u	
<i>Rorippa islandica</i> (Oeder) Borbás (<i>R. palustris</i> (L.) Besser)	44% 32	40% 8				ORFD
<i>Rosa</i> sp.			3% 10	13% 79	EMA:1u LMA:1+1u	DI

1) *Prunus avium* L. recorded from VA in Schleswig and LMA in Denmark2) *Prunus domestica* L. subsp. *insititia* (L.) C.K. Schneider recorded from VA

Table 11 (continued)
Species/genera

Species/genera	Constancy and sum			LMA	Other reports	Remarks
	GIA	VA	EMA			
<i>Rubus caesius</i> L.				4% 4	LMA:1	
<i>Rubus corylifolius</i> Sm.			3% 4			ORFD
<i>Rubus fruticosus</i> L. group		20% 2	30% 91	22% 29	VIII:1 GIA:1u VA:2 EMA:2+1u LMA:3+1u	
<i>Rubus cf. fruticosus</i> L. group	11% 2					
<i>Rubus idaeus</i> L.		40% 6	17% 44	4% 4	III:1u V:1u VI,VII:3+2u VIII:5+2u IX:2 RIA:1 VA:2 EMA:1+1u LMA:3+1u	
<i>Rubus</i> sp.	11% 5		7% 7	4% 4		
<i>Rumex cf. acetosa</i> L.	11% 2				PRIA:1	1)
<i>Rumex acetosella</i> L.	100% 433	80% 430	87% 2447	48% 339	II:1 III:1 VIII:6 PRIA:4 RIA:3 GIA:1 VA:1 EMA:1u LMA:4+1u	
<i>Rumex crispus</i> L.	56% 13	80% 44	53% 643	35% 343	VI,VII:1u PRIA:2 GIA:1 VA:1 EMA:1u LMA:2	
<i>Rumex cf. longifolius</i> DC. in Lam. & DC.				4% 4	GIA:1	2)
<i>Rumex maritimus</i> L. et <i>R. palustris</i> Sm.				4% 4		3)
<i>Rumex obtusifolius</i> L.				4% 5	VA:1 LMA:1	
<i>Rumex cf. obtusifolius</i> L.	22% 55					ORFD
<i>Rumex</i> sp.	33% 9	40% 8	53% 370	17% 22	VI,VII:1+1u EMA:1u LMA:1u	
<i>Sambucus nigra</i> L.		40% 22	60% 629	57% 1158	VA:1 EMA:1+1u LMA:2+2u	
<i>Samolus valerandi</i> L.			3% 4			ORFD
<i>Scirpus cespitosus</i> L.	11% 5				IX:2	DI
<i>Scirpus lacustris</i> L.			3% 2	9% 38	III:1+1u IV:1+1u V:6+2u VI,VII:6+3u VIII:3 IX:3 EMA:1u LMA:1+1u	
<i>Scirpus lacustris</i> L. subsp. <i>tabernaemontani</i> (C.C. Gmelin) Syme in Sowerby (<i>S. tabernaemontani</i> C.C. Gmelin)	22% 10	20% 2	3% 20		V:1+1u VI,VII:1u VIII:1 GIA:1 VA:1	
<i>Scirpus maritimus</i> L.	11% 5				EMA:1u LMA:1u	ORFD
<i>Scirpus setaceus</i> L.	11% 20		7% 4	4% 2	VA:1	ORFD
<i>Scirpus sylvaticus</i> L.	11% 5			13% 119	I:2 VI,VII:1u	
<i>Scirpus</i> sp.			30% 214	9% 12	VI,VII:2 VIII:1u EMA:1u	

1) *Rumex acetosa* L. recorded from VIII

2) *Rumex longifolius* DC. in Lam. & DC. recorded from VA

3) *Rumex maritimus* L. recorded from VI,VII(u)

Table 11 (continued)
Species/genera

Species/genera	Constancy and sum				Other reports	Remarks
	GIA	VA	EMA	LMA		
<i>Scleranthus annuus</i> L.		20% 4	17% 25		VIII:2 PRIA:2 RIA:1 LMA:1	
<i>Scleranthus</i> sp.	11% 2		3% 4		PRIA:1 RIA:1	
<i>Silene vulgaris</i> (Moench) Garcke (<i>S. cucubalus</i> Wibel)				4% 4	LMA:1u	DI
<i>Silene</i> cf. <i>vulgaris</i> (Moench) Garcke			7% 7			
<i>Silene</i> sp. (incl. <i>Melandrium</i> sp.)			3% 4		GIA:1	
<i>Sinapis arvensis</i> L.				4% 5	VIII:1 RIA:2 GIA:1 VA:1 EMA:1u LMA:1+1u	
<i>Solanum dulcamara</i> L.			3% 2		IV:1 VI,VII:2+2u VIII:1+1u RIA:1 EMA:1u LMA:1+2u	
<i>Solanum</i> cf. <i>dulcamara</i> L.			10% 22	4% 50		
<i>Solanum dulcamara</i> L. et <i>S. nigrum</i> L.			3% 5			
<i>Solanum nigrum</i> L.	33% 45		27% 124	39% 703	VIII:1 PRIA:2 RIA:1 VA:1 EMA:1u LMA:1u	
<i>Solanum</i> cf. <i>nigrum</i> L.	11% 4	80% 36	7% 8			
<i>Solanum</i> sp.	11% 5		47% 228	22% 58	LMA:1	
<i>Solidago virgaurea</i> L.			3% 5			ORFD
<i>Sonchus arvensis</i> L.	22% 7		7% 6	4% 5	EMA:1u LMA:1+1u	ORFD
<i>Sonchus asper</i> (L.) Hill		40% 6	53% 106	22% 70	PRIA:1 EMA:1u	
<i>Sonchus oleraceus</i> L.			17% 31	17% 75	VIII:1 RIA:1 EMA:1u LMA:1+1u	
<i>Sonchus</i> sp.	22% 7		10% 20	9% 9		
<i>Spergula arvensis</i> L.	44% 11	60% 22	70% 250	22% 47	VIII:1 PRIA:7 RIA:7 GIA:3 VA:2 EMA:1u LMA:1u	
<i>Spergula</i> sp.			7% 8			
<i>Stachys</i> cf. <i>annua</i> (L.) L.		20% 2				ORFD
<i>Stachys</i> cf. <i>palustris</i> L.			3% 2			1)
<i>Stachys</i> sp.			10% 21	4% 4		
<i>Stellaria graminea</i> L.			27% 100	9% 18	II:1 VIII:1 PRIA:1 VA:1 EMA:1u LMA:1+1u	
<i>Stellaria media</i> (L.) Vill.	56% 21	100% 168	77% 1485	43% 169	VIII:2 PRIA:4 RIA:4 GIA:2 VA:2 EMA:1u LMA:3+1u	
<i>Taraxacum officinale</i> group				4% 4	LMA:1+2u	

1) *Stachys palustris* L. recorded from VI,VII(u)

Table 11 (continued)

Species/genera	Constancy and sum				Other reports	Remarks
	GIA	VA	EMA	LMA		
<i>Thlaspi arvense</i> L.		40%	37%	26%	VIII:1 PRIA:2 RIA:1 VA:1 EMA:1u LMA:3+1u	
<i>Torilis japonica</i> (Houtt.) DC.		10	86	52	EMA:1u LMA:1	DI
<i>Trifolium</i> cf. <i>campestre</i> Schreber in Sturm			3%			1)
<i>Trifolium repens</i> L.	11%		3%	13%	GIA:1 LMA:2	
<i>Ulmus</i> cf. <i>glabra</i> Hudson	5		5	15		2)
Umbelliferae	11%		3%	9%		
<i>Urtica dioica</i> L.	33%	100%	77%	65%	II:2 V:1 VI,VII:1 VIII:1u PRIA:1 VA:1 EMA:1+1u LMA:2+1u	
<i>Urtica urens</i> L.	38	338	1746	5552		
<i>Verbascum</i> sp.	56%	80%	73%	30%	PRIA:1 VA:1 EMA:1u LMA:1u	
<i>Verbena officinalis</i> L.	35	498	5179	155		ORFD
<i>Veronica</i> sp.			3%			ORFD
<i>Viola</i> sp.			4			3)
<i>Zannichellia palustris</i> L.	11%		3%			4)
<i>Zosteria noltii</i> Hornem. (<i>Z. nana</i> Roth pro parte)	2		2			
—	33%	40%	23%	13%	IX:1 EMA:1u LMA:1+1u	
<i>Cenococcum geophilum</i> Fr.	12	4	32	30		
<i>Equisetum</i> sp.			7%	13%	III:1 VI,VII:3u GIA:1 EMA:1u LMA:1u	
			8	220		ORFD
	11%		3%			
	5		4			
	89%	60%	73%	43%		
	11%		10%	4%		

1) *Trifolium campestre* Schreber in Sturm recorded from PRIA

2) *Ulmus glabra* Hudson recorded from V

3) *Veronica chamaedrys* L. recorded from GIA, *V. polita* Fries from PRIA, and *V. serpyllifolia* L. from PRIA

4) *Viola arvensis* Murray recorded from PRIA, *V. canina* L. from VIII, *V. palustris* L. from III(u), and *V. tricolor* from VIII

These taxa have contributed considerably to the number of seeds found in each period. For GIA the number of seeds of species preferring moist ground was rather high. The reason is most likely that all samples referred to the period were taken at Ribe, where both the localities examined and the surrounding areas are rather moist.

Brief remarks on the summarized finds are made in Table 11 for several species. Forty-five finds marked "ORFD" (Oldest Recorded Find from Denmark) are treated separately in the following

chapter. "DI" (Dating Improved) has been added for such species (11) for which the present results are based on a more certain dating than the previously published ones.

Remarks on the oldest recorded finds from Denmark

The finds that so far are the oldest recorded in Denmark are described below. The description includes: name of site, dating of sample, concentra-

tion of seeds, and the number of samples if the seed was present in more than one sample. Also given is information on relevant finds from neighbouring countries and, for some species, on their mention in old Danish herbals.

This information is intended as a supplement to the Danish finds. A thorough discussion of the distribution of the plants listed for Northern Europe during different periods is considered outside the scope of the present publication.

Aethusa cynapium L.

Identified from: Tvedgade, Ribe, 8th century (Table 3); the Black Friars' Monastery, Odense, dated to before the Middle Ages (Table 9); Foldagers Gaard, Svendborg, 1100-1228 AD; the Franciscan Monastery, Svendborg, EMA; and Krøyers Have, Svendborg, LMA (H.A.Jensen 1979a).

The species was recorded with one seed only from each site, the samples examined varying between 0.2 and 0.5 litre in volume and the find concentration varying accordingly from 5 to 2 per litre (cf. p. 8).

Aethusa cynapium has been recorded from Oberaden, BRD, 12-8 BC (Kučan 1981). Godwin (1975) has summarized finds from the British Isles from period VI onwards. Recent finds are from a Roman well at Rudston (Greig 1980) and in horse dung from Lancaster, late 2nd century AD (Wilson 1979).

Alopecurus geniculatus L.

Kunstmuseet, Ribe (Table 1), 8th century, most likely 720-750 AD. Concentration 2 seeds/litre.

Alopecurus geniculatus is listed from: Feddersen Wierde, BRD, 1st to 2nd century AD (Körber-Grohne 1967); Tofting, Schleswig, RIA (Behre 1976); Roman castle, Welzheim, BRD, c. 200 AD (Körber-Grohne 1979); Roman Lancaster, England, late 2nd century AD (Wilson 1979); Elisenhof, Schleswig, 8th-10th centuries (Behre 1976); and Haithabu, Schleswig, 9th-10th centuries (Behre 1983).

Anagallis arvensis L.

Foldagers Gaard, Svendborg, 1159-1228 AD; the Franciscan Monastery, Svendborg, EMA; two samples, Korsgade, Svendborg, 1200-1250 and 1300-1400 (H.A.Jensen 1979a); and the Black Friars' Monastery, Odense, 1250-1350 AD (Table 9). The sample from Odense yielded 28 seeds/litre, other samples 4 or 5 seeds/litre.

Seeds of *Anagallis arvensis* are reported from: Grevenbroich-Gustorf, BRD, c. 200 BC (Knörzer 1979a); Oberaden, BRD, 12-8 BC (Kučan 1981); Neuss/RH, BRD, 1st century AD (Knörzer 1967b); Hertzdorf, BRD, 1st century AD (E.Lange 1973); Friesheim, BRD, 3rd century AD (E.Lange 1973); Feddersen-Wierde, BRD, 1st-2nd centuries AD (Körber-Grohne 1967); RIA deposits at Tofting (Behre 1976); a 9th-10th century layer at Haithabu (Behre 1983); and Little Waltham, England, 300 AD (Wilson 1978). Godwin (1975) reports six British finds dated Bronze Age-LMA.

Anchusa officinalis L.

Korsgade, Svendborg, 1150-1200 AD; and the Franciscan Monastery, Svendborg, EMA (H.A.Jensen 1979a). The samples contained 5 and 4 seeds/litre, respectively.

Recorded from: Neuss, BRD, in deposits from 1st century AD (Knörzer 1970). The plant is recommended against cardiac pain in Harpestreng's herbal from c. 1300 AD (Kristensen 1908-1920), and is mentioned in a herbal published by Christiern Pedersen in 1533 (Brøndegaard 1980).

Anethum graveolens L.

Foldagers Gaard, Svendborg, dated between 1100±50 and 1160±50 AD (H.A.Jensen 1979a); the Black Friars' Monastery, Odense, 1250-1350 AD (Table 9); and Kolding, dated 13th or beginning of the 14th century (Table 8). The sample from Foldagers Gaard contained 8 seeds/litre, the others 4 seeds/litre.

Jørgensen (1980) reports *Anethum graveolens* in latrine from Svendborg, dated to 1350-1400 AD.

Anethum graveolens has been found at Oberaden, BRD, 12-8 BC (Kučan 1981); in Neuss/RH, 1st century AD (Knörzer 1967b, 1970); and from a Roman well at Welzheim, c. 200 AD (Körber-Grohne 1979).

It is an ancient cultivated plant, mentioned in the Bible (H.A.Jensen 1974) and in "Capitulare de Villis" issued in the year 795 (Fischer-Benzon 1894), included in a garden plan for a monastery in St. Gallen from about 820 (H.A.Jensen 1979a), and mentioned in Harpestreng's herbal from c. 1300 AD (Kristensen 1908-1920). As the Danish name 'dild' ('dyllæ' and 'dil') is not derived from the Latin *Anethum*, Lind (1918) suggested that the plant was well known in Denmark before the 13th century.

Anthemis arvensis L.

Kunstmuseet, Ribe, 8th century, most likely 720-750 AD (Table 1); Tvedgade, Ribe, 8th century (Table 3); two samples, Sønderportsgade, Ribe, 1100-1225; one from the same site, 1250-1350 (Table 4); six samples from Viborg, late VA-1200 (Table 6); the Black Friars' Monastery, Odense, 1250-1350 (Table 9); and Korsgade, Svendborg, 1150-1200 (H.A.Jensen 1979a). One sample from Ribe contained 16 seeds/litre, the other samples 2-6 seeds/litre.

Anthemis arvensis is recorded in Roman context at Aachen, BRD, and Neuss/RH, BRD, both dated 1st century AD (Knörzer 1967a, 1967b, 1970); in a sample from Tornow, DDR, 7th-9th centuries (E.Lange 1976b); and from a well at Braunschweig, BRD, dated 10th century AD (Willerding 1973).

Barbarea sp.

Tvedgade, Ribe, 8th century, most likely 720-750 AD. The seed concentration was 25/litre (Table 3).

Barbarea vulgaris L. has been found at a Roman site at Godmanchester (Godwin 1975) and at Gabryeliszki, USSR, in deposits dated to the 8th century AD (Swederski 1925).

Bupleurum rotundifolium L.

Two samples, Sønderportsgade, Ribe (Table 4). One sample, dated 1100-1225, contained 20 seeds/litre, the other, dated 1250-1350, 4 seeds/litre.

Recorded in Roman context at Oberaden, BRD, 12-8 BC (Kučan 1981) and at Tornow, DDR, 7th-9th centuries (E.Lange 1976b).

Carduus crispus L.

Tvedgade, Ribe, 8th century (Table 3). Concentration 5 seeds/litre.

Carduus crispus has been reported from three sites in the Netherlands (Zeist 1974): Tritsum (500 BC-200 AD), Ezinge (300-100 BC) and Paddepoel-Groningen (200 BC-250 AD); from BRD: Neuss, 1st century AD (Knörzer 1970) and Haithabu, 9th-10th centuries (Behre 1983).

Carex echinata Murr.

Viborg (Table 6), c. 1100 AD. Concentration 2 seeds/litre.

Reported from: the British Isles in layers from Late Weichselian and from period V onwards (Godwin 1975); Trondheim, Norway, in deposits dated 910-1120 AD (Tallantire 1979); Lund, Scania, VA (Hjelmqvist 1963); and Lübeck, early 13th century (Lynch & Paap 1982).

Chelidonium majus L.

Øm Monastery, 1412-1450 (Table 5); and Krøyers Have, Svendborg, 1350-1550 AD (H.A.Jensen 1979a). The seed concentration was 24 and 10 seeds/litre, respectively.

Chelidonium majus was recorded from 'Stülper Huk', Travemünde, in a peat bog dated 1st century AD (Averdieck et al. 1982); from Lübeck, 819-1138 AD (Averdieck 1981); and from a Roman context at Caerwent (Godwin 1975). The plant is mentioned in Harpestreng's herbal c. 1300 AD and in herbal AM 187 from c. 1400 AD. Both recommend juice from the plant against eye afflictions, jaundice and toothache.

In my paper on finds from Medieval Svendborg I

wrote (H.A.Jensen 1979a: 78): "since seeds of *Chelidonium majus* apparently were not found in Denmark in the Early Middle Ages or earlier, it is likely that the monks brought the species with them to Denmark, but it cannot be completely precluded that 'Surgunnæ' and 'Brænyrt' are old Danish names, used before the monks came here." The later published finds from Travemünde and Lübeck suggest that the plant is older in Denmark than hitherto believed.

Chrysanthemum sp.

Viborg, 1025-1050 (Table 6). Concentration 2 seeds/litre.

Chrysanthemum segetum L. is listed from Tornow, DDR, in layers from 7th-9th and 6th-10th centuries AD (E.Lange 1976b, 1979); and from two Roman and three Medieval finds in Britain (Godwin 1975). *Leucanthemum vulgare* Lam. (syn. *Chrysanthemum leucanthemum* L.) was found in Roman context at Neuss/RH, BRD, 1st century AD (Knörzer 1967b, 1970); in a Roman well dated c. 200 AD at Welzheim, BRD (Körber-Grohne 1979); and in a Roman context at Dormagen, BRD, early 2nd century AD (Knörzer 1979b). Godwin (1975) reports four British finds from PRIA-RIA.

Dactylis glomerata L.

Tvedgade, Ribe (Table 3), 8th century. Concentration 5 seeds/litre.

Reported from a Roman well at Welzheim, dated c. 200 AD (Körber-Grohne 1979) and in samples from Gabryeliszki, USSR, dated to the 8th century (Matlakówna 1929).

Dianthus deltooides L.

Foldagers Gaard, Svendborg, 1228 AD (H.A.Jensen 1979a). Concentration 2 seeds/litre.

Dianthus deltooides is recorded from an 11th century context at Oslo, Norway (Griffin 1975).

Eleocharis quinqueflora (F.X.Hartmann) O.Schwartz
Borchs Gaard, Kolding, 13th or beginning of the 14th century (Table 8). Concentration 8 seeds/litre.

Known from period VIIa in the British Isles (Godwin 1975); and Trondheim, Norway, c. 1050 AD (Tallantire 1979).

Euphorbia lathyris L.

The Black Friars' Monastery, Odense, beginning of the 13th century (Table 9). Concentration 8 seeds/litre.

Euphorbia lathyris is an old medicinal plant, mentioned in "Capitulare de Villis" issued in 795 (Fischer-Benzon 1894). Its seeds with hot water and honey are recommended in herbal AM 187 as a constipation remedy. The Danish name 'purgatoriekorn' indicates that the plant was used for that purpose (J.Lange 1959-1961).

Festuca cf. *rubra* L.

Viborg, c. 1150 AD (Table 6). Concentration 2 seeds/litre.

Festuca cf. *rubra* was identified in Band Ceramic context at Bedburg-Garsdorf, BRD (Knörzer 1974a); in an Iron Age context at Frixheim-Anstel, Hallstattstufe D (Knörzer 1974b); and from Rommerskirchen, Hallstatt (Knörzer 1971). *Festuca rubra* was found in RIA deposits at Archsum, Sylt (Kroll 1975) and Tofting (Behre 1976); and in VA deposits at Elisenhof (Behre 1976) and Haithabu (Behre 1983).

Hordeum cf. *distichon* L.

Grains showing features characteristic of two-rowed hulled barley were found at Foldagers Gaard, Svendborg, 1228 AD (H.A.Jensen 1979a: 59ff.). They were, however, mixed with six-rowed barley, and the final proof of the introduction of two-rowed barley into Denmark in the Middle Ages is still lacking.

Hordeum distichon is reported from Kablow, DDR, in samples from the 3rd-4th centuries AD (Schiemann 1957); in Hünenburg Castle, BRD, 10th to the beginning of the 11th century AD (Wittmack & Buchwald 1902); and from Larkfield, England, in MA context (Grove 1963).

Hyoscyamus niger L.

Two samples from Tvedgade, Ribe, 8th century (Table 3); Sønderportsgade, Ribe, 1100-1225 AD (Table 4); Viborg, 1025-1050 (Table 7); five samples from Foldagers Gaard, three samples from Korsgade, and four samples from Krøyers Have, all Svendborg, 1100 to the end of the Middle Ages (H.A.Jensen 1979a).

The samples from Korsgade, Svendborg, yielded 40, 80 and 210 seeds/litre, respectively. Other samples yielded 12 or less seeds/litre.

Hyoscyamus niger has been recorded from: Endersbach, BRD, in remains from the 'Rössener' culture, c. 2500 BC (Piening 1979); Oberaden, BRD, 12-8 BC (Kučan 1981); Feddersen Wierde, BRD, 1st-2nd centuries AD (Körber-Grohne 1967); Roman context at Neuss/RH, BRD, 1st century AD (Knörzer 1967b); a Roman well at Welzheim, c. 200 AD (Körber-Grohne 1979); Archsum, Sylt, PRIA-RIA (Kroll 1975); and Tofting in deposits from RIA (Behre 1976). This species is known from several sites in England, e.g. from Fisherwick 2130±100 BP (Greig 1979); and from deposits in York dated to RIA (Greig 1976).

Juncus bufonius L.

Tvedgade, Ribe, 8th century (Table 3); Sønderportsgade, Ribe, 1100-1225 (Table 4); and two samples from the Black Friars' Monastery, Odense, 1250-1350 AD (Table 9). Furthermore identified in six samples from Foldagers Gaard, four samples from Korsgade, and one sample from the Franciscan Monastery, all Svendborg and dated to EMALMA (H.A.Jensen 1979a).

The sample from Sønderportsgade, Ribe, yielded 2200 seeds/litre, one sample from Odense 320 seeds/litre, one from Korsgade, Svendborg, 130 seeds/litre, and other samples 44 or less seeds/litre. Examination of the seed content in 57 modern Danish fields has disclosed a similar high content of *Juncus bufonius*: the average corresponded to 239 seeds/litre (47,839 seeds per sq.m. in 20 cm depth), while the maximum was 2184/litre (H.A.Jensen 1969).

Juncus bufonius is reported from: Late Weichselian and period IV and VIIb in the British Isles (Godwin 1975); Archsum, Sylt, PRIA-RIA (Kroll 1975); Tofting, RIA (Behre 1976); a Roman well at Welzheim, c. 200 AD (Körber-Grohne 1979); and Roman context at Oberaden, BRD, 12-8 BC (Kučan 1981).

Lactuca sativa L.

Borchs Gaard, Kolding, 13th or beginning of the 14th century AD (Table 8). Concentration 4 seeds/litre.

As far as I know, *Lactuca sativa* has not previously been recorded in North European macrofossil analysis, but the plant is mentioned in Harpestreng's herbal of c. 1300 AD and in herbal AM 187 (c. 1400).

The plant is included in "Capitulare de Villis" issued in 795 (Fischer-Benzon 1894) and mentioned in a monastery plan for St. Gallen made about 820 AD (H.A.Jensen 1979a).

Lamium sp.

Five samples, Viborg, dated late VA, 1025-1050 AD and c. 1200 (Tables 6 and 7); two samples, Sønderportsgade, Ribe, 1100-1225 (Table 4); two samples, Kolding, 13th or beginning of the 14th century and 1422-1500 (Table 8); and three samples, Odense, dated to the 13th century and to 1250-1350 (Table 9). The genus was also found in six samples from Foldagers Gaard, Svendborg, 1100 AD and later, and in one sample from Korsgade, Svendborg, 1150-1200 (H.A.Jensen 1979a). Two samples from Odense contained 52 and 40 seeds/litre, one from Ribe 24 seeds/litre, and other samples 12 seeds or less per litre.

Lamium sp. is listed from Late Bronze Age deposits at Barsebäck, Scania (Hjelmqvist 1955) and from RIA-GIA deposits at Archsum, Sylt (Kroll 1975).

Lamium album L. was found in RIA context at Tofting (Scheer 1955); and in a sample dated 819-1138 AD from Lübeck (Averdieck 1981). *Lamium amplexicaule* L. is reported from Neuss, BRD, in 1st

century layers (Knörzer 1970); and from 7th-9th century AD context at Tornow, DDR (E.Lange 1976b). *Lamium purpureum* L. has been identified at Feddersen Wierde, BRD, 1st-2nd centuries AD (Körber-Grohne 1967); at Neuss/RH in 1st century AD context (Knörzer 1967b); at Aachen in deposits from the 1st century AD (Knörzer 1967a); and from Roman sites in the British Isles (Godwin 1975).

Montia fontana L. subsp. *chondrosperma* (Fenzl) Walters

Foldagers Gaard, Svendborg, 1100-1228; and Krøyers Have, Svendborg, 1210±50 AD (H.A.Jensen 1979a). The concentration was 4 and 5 seeds/litre, respectively.

Montia fontana subsp. *chondrosperma* was found in an Iron Age house at Little Waltham, England, destroyed by fire in 3rd century BC (Wilson 1978); and at Godmanchester in Roman context (Godwin 1975). *Montia fontana* is reported from Fisherwick, England, dated 2130±100 BP (Greig 1979); and from Jæren, Norway, 400-550 AD (Griffin 1981).

Origanum vulgare L.

Three samples from the Franciscan Monastery, Svendborg, EMA (H.A.Jensen 1979a). Concentration 16, 12 and 4 seeds/litre.

Reported from period VII at Bowness Common and from period VIII at Ehenside Tarn, Cumberland (Godwin 1975); and from Neuss, BRD, 1st century AD (Knörzer 1970).

The plant is mentioned in Harpestreng's herbal from c. 1300 and in herbal AM 187 from c. 1400.

Papaver argemone L.

Three samples, Black Friars' Monastery, Odense, 1250-1350 (Table 9). Concentration 24, 16 and 4 seeds/litre.

Identified from: Roman context at Aachen and Neuss, 1st century AD (Knörzer 1967a, 1970); Friesheim, BRD, 3rd century AD (E.Lange 1973); a Roman well in Yorkshire (Greig 1980); and Trondheim, Norway, in a context dated 910-1050 AD (Tallantire 1979).

Papaver somniferum L.

Foldagers Gaard, Svendborg, 1100-1228 AD (H.A.Jensen 1979a); the Black Friars' Monastery, Odense, 1250-1350 (Table 9); and Kolding, 1422-1500 (Table 8). The sample from Svendborg contained 16 seeds/litre, the other samples 4 and 2 seeds/litre, respectively.

Recently (1983), *Papaver somniferum* was identified in one sample from Lodbjerg, Jutland, in a layer dated 355-240 BC (H.A.Jensen & Liversage, unpublished).

Papaver somniferum is furthermore recorded from: Neolithic and later in Poland (Gluza & Wasylikowa 1977); Neuss, BRD, 1st century AD (Knörzer 1970); a Roman well at Welzheim, c. 200 AD (Körber-Grohne 1979); Bearsden, Scotland, c. 140 AD (Dickson et al. 1979); and a Roman well in Yorkshire (Greig 1980).

The plant is mentioned in Harpestreng's herbal and in the herbal AM 187, where it is recommended against insomnia.

Pedicularis palustris L.

Two samples, Tvedgade, Ribe, 8th century, revealed a content corresponding to 65 and 35 seeds/litre, respectively (Table 3).

Recorded from: Coney Street, York, 1st-2nd centuries AD (Kenward & Williams 1979); three Roman sites at Newstead (Godwin 1975); Lübeck in context 819-1138 AD (Averdieck 1981); Elisenhof 8th-10th centuries AD (Behre 1976); and Haithabu in deposits from 9th-10th centuries (Behre 1983).

Poa annua L.

Foldagers Gaard, Svendborg, 1100-1228 AD (H.A.Jensen 1979a). Concentration 2 seeds/litre.

Poa annua is listed from: Archsum, Sylt, PRIA-RIA (Kroll 1975); Tofting, RIA (Behre 1976); Oberaden, BRD, Roman context 12-8 BC (Kučan 1981); Feddersen Wierde, BRD, 1st-2nd centuries AD (Körber-Grohne 1967); Neuss/RH, 1st century AD (Knörzer 1967b); a Roman well at Welzheim, c. 200 AD (Körber-Grohne 1979); and in horse dung from Lancaster, late 2nd century AD (Wilson

1979). From VA, *Poa annua* is found at Elisenhof (Behre 1976) and Haithabu (Behre 1983).

Poa trivialis L.

Foldagers Gaard, Svendborg, 1100-1228 AD (H.A.Jensen 1979a). Concentration 2 seeds/litre.

I am not aware of any previous finds of this species in neighbouring countries.

Polygonum cf. minus Hudson

Foldagers Gaard, Svendborg, 1100-1228 AD (H.A.Jensen 1979a). Concentration 2 seeds/litre.

Polygonum minus is recorded from period VIIb at Helton Tarn and from period VIII at Ballingarry Downs (Godwin 1975).

Potentilla reptans L.

Kunstmuseet, Ribe, dated 8th century, most likely 720-750. Concentration 8 seeds/litre (Table 1).

Knörzer (1970) reports *Potentilla reptans* from 1st century context at Neuss/RH; while Wilson (1968) identified the species in samples from a Roman well at Bunny, Nottinghamshire, 100-300 AD.

Ranunculus cf. bulbosus L.

The Black Friars' Monastery, Odense, 1250-1350 (Table 9). Concentration 8 seeds/litre.

Ranunculus bulbosus is recorded from Cottenham, Mersea Island, and Newstead, all Roman sites (Godwin 1975).

Ranunculus sardous Crantz

Viborg, 1025-1050 (Table 6); the Black Friars' Monastery, Odense, 1250-1350 (Table 9); Korsgade, Svendborg, 1150-1200 (H.A.Jensen 1979a). Concentration 2, 4 and 5 seeds/litre, respectively.

Identified in samples from: Tofting, RIA (Behre 1976); Feddersen Wierde, BRD, 1st-2nd century AD (Körber-Grohne 1967); Oberaden, BRD, in Roman context 12-8 BC (Kučan 1981); Aachen in deposits from the 1st century AD (Knörzer 1967a); and from the Roman sewer system at York, 4th-5th centuries AD (Greig 1976).

Rorippa islandica (Oeder) Borbás

Kunstmuseet, Ribe (Table 1), dated 8th century, most likely 720-750; three samples, Tvedgade, Ribe, 8th century (Table 3); two samples, Viborg, Late Viking Age (Table 6).

Rorippa islandica was found at Archsum, Sylt, in RIA context (Kroll 1975); at Aachen in deposits from the 1st century AD (Knörzer 1967a); in a Roman well at Welzheim, c. 200 AD (Körber-Grohne 1979); and Trondheim, Norway, in context dated 910-1050 AD (Tallantire 1979).

Rubus corylifolius Sm.

The Franciscan Monastery, Svendborg, EMA (H.A.Jensen 1979a). Concentration 4 seeds/litre.

I am not aware of any previous finds of this species in neighbouring countries.

Rumex cf. obtusifolius L.

Two samples from Tvedgade, Svendborg, 8th century (Table 3). Concentration 20 and 35 seeds/litre.

Godwin (1975) reports five Roman, one Norman and two Medieval finds of *Rumex obtusifolius*.

Samolus valerandi L.

The Franciscan Monastery, Svendborg, EMA (H.A.Jensen 1979a). Concentration 4 seeds/litre.

Samolus valerandi was found at Haithabu, 9th-10th centuries (Behre 1983); and in the Graveney Boat, Kent, 10th century (Wilson 1975).

Scirpus maritimus L.

Dommerhaven, Ribe, 8th century, most likely 720-750. Concentration 5 seeds/litre (Table 2).

Known from RIA at Archsum, Sylt (Kroll 1975) and Tofting (Behre 1976); and from Feddersen Wierde, BRD, 1st-2nd centuries AD (Körber-Grohne 1967).

Scirpus setaceus L.

Tvedgade, Ribe, 8th century (Table 3); and two samples drawn at Foldagers Gaard, Svendborg, dated 1100-1228 and 1228 (H.A.Jensen 1979a).

Concentration 20, 2 and 2 seeds/litre, respectively.

Scirpus setaceus has previously been found at Århus Søndervold, Jutland, in deposits from the late VA (Fredskild 1971); in a Roman well at Bunny, Nottinghamshire, 100-300 AD (Wilson 1968), and in four British finds referred to periods VIIb-VIII (Godwin 1975).

Solidago virgaurea L.

Krøyers Have, Svendborg, 1210±50 (H.A. Jensen 1979a). Concentration 5 seeds/litre.

I am not aware of any previous finds of this species in neighbouring countries.

Sonchus arvensis L.

Kunstmuseets Have, Ribe, 8th century, most likely 720-750 (Table 1); Tvedgade, Ribe, 8th century (Table 3); two samples, Foldagers Gaard, Svendborg, 1100±50 and 1100-1228; and Krøyers Have, Svendborg, 1350-1550 (H.A. Jensen 1979a). Concentration 5 seeds/litre or less.

Listed from: Tofting in RIA deposits (Behre 1976); Oberaden, BRD, in Roman context 12-8 BC (Kučan 1981); Büraburg, Nordhessen, in 700-800 AD context (Willerding 1974); and Roman contexts at Silchester and Finsbury Circus, England (Godwin 1975).

Stachys cf. *annua* (L.) L.

Viborg, late VA (Table 6). Concentration 2 seeds/litre.

I am not aware of any previous finds of this species in neighbouring countries.

Verbascum sp.

The Black Friars' Monastery, Odense, beginning of the 13th century (Table 9). Concentration 4 seeds/litre.

Verbascum thapsus L. has been identified in samples from Asmild, Jutland, c. 1300 AD (Ødum 1965). *Verbascum* sp. was found in a Roman well at Welzheim, c. 200 AD (Körber-Grohne 1979); and *Verbascum* cf. *thapsus* was identified from 'Stülper Hük', Travemünde, in samples dated to the 1st

century AD (Averdieck et al. 1982). *Verbascum nigrum* was found in deposits at Oslo, 1150-1200 (Griffin 1979).

Verbascum is mentioned in copies of Harpestreng's herbal as a remedy for pain, wounds, etc. The old Danish name for *Verbascum* indicates that some species (*V. thapsus* and *V. thapsiforme*) were used as torches (J.Lange 1959-61).

Verbena officinalis L.

Five samples from Krøyers Have, Svendborg (H.A. Jensen 1979a). Two samples were dated 1210±50, three samples 1200-1550. The concentration was 40, 15, 5, 5 and 5 seeds/litre, respectively.

Verbena officinalis has been identified in 1st century AD Roman context at Aachen (Knörzer 1967a) and Neuss/RH (Knörzer 1967b, 1970); in West Berlin in 1st century deposits (E.Lange 1975); in Roman deposits at Caerwent (Godwin 1975); in 7th-9th century context at Tornow, DDR (E.Lange 1976b) and in 9th-12th century layers in Cracow (Wasylikowa 1978).

The plant is recommended for the treatment of wounds, poison, etc., in copies of Harpestreng's herbal of c. 1300 AD, and in the herbal AM 187, it is recommended for headache.

Zostera noltii Hornem.

Dommerhaven, Ribe, 8th century, most likely 720-750 (Table 2); and the Franciscan Monastery, Svendborg, EMA (H.A. Jensen 1979a). Concentration 5 seeds/litre.

I am not aware of any previous finds of this species in neighbouring countries.

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The analyses for content of seeds and other macrofossils have revealed a large number of taxa from well-preserved Danish deposits. 45 taxa, dated to the 8th-16th centuries AD, were the oldest recorded finds from Denmark. Finds from the British Isles, The Netherlands, Germany, Poland, Sweden, and Norway (see H.A. Jensen 1985) indicate, however,

that, of these, the taxa listed below may actually have been present in Denmark earlier.

Recorded in neighbouring countries from Roman Iron Age: *Aethusa cynapium*, *Alopecurus geniculatus*, *Anchusa officinalis*, *Anthemis arvensis*, *Barbarea* sp., *Bupleurum rotundifolium*, *Chelidonium majus*, *Chrysanthemum* sp., *Dactylis glomerata*, *Hordeum* cf. *distichon*, *Papaver argemone*, *Pedicularis palustris*, *Potentilla reptans*, *Ranunculus* cf. *bulbosus*, *Rorippa islandica*, *Rumex* cf. *obtusifolius*, *Scirpus maritimus*, *Verbascum* sp., *Verberna officinalis*.

From Pre-Roman Iron Age: *Anagallis arvensis*, *Anethum graveolens*, *Carduus crispus*, *Montia fontana* subsp. *chondrosperma*, *Poa annua*, *Ranunculus sardous*, *Sonchus arvensis*.

From Pollen Assemblage Zone VIII: *Eleocharis quinqueflora*, *Festuca* cf. *rubra*, *Hyoscyamus niger*, *Lamium* sp., *Origanum vulgare*, *Papaver somniferum*, *Polygonum* cf. *minus*, *Scirpus setaceus*.

From Late Weichselian: *Carex echinata*, *Juncus bufonius*.

I am not aware of any information in foreign finds dated earlier than the 8th century of: *Euphorbia lathyris*, *Dianthus deltoides*, *Lactuca sativa*, *Poa trivialis*, *Rubus corylifolius*, *Samolus valerandi*, *Solidago virgaurea*, *Stachys* cf. *annua*, *Zostera noltii*.

It is assumed that *Euphorbia lathyris* and *Lactuca sativa* were introduced into Denmark during the Middle Ages, and it is likely that some of the remaining species were present here before the 8th century.

The material assembled indicates that further analysis of soil samples dated to periods older than the 8th century AD would most likely result in an

earlier dating for a number of species, especially for those belonging to natural plant communities.

Fungi

All samples but those listed in Table 4 were examined for the presence of sclerotia of the imperfect fungus *Cenococcum geophilum* Fr. Sclerotia were identified in 11 out of 12 sites (cf. Table 10) and in 22 out of 28 samples examined, representing the periods GIA, VA, EMA, and LMA (Table 11). Large numbers were present in most samples, but no attempt has been made to estimate the number per litre.

Analysis of soil samples from 37 modern fields for content of *Cenococcum geophilum* has revealed an average content equivalent to 22,100 sclerotia/litre; maximum was 250,450 sclerotia/litre (H.A. Jensen 1975). The fungus was present in every field examined.

Most of the sclerotia found measured between 0.2 and 2 mm and were almost entirely round. Due to the durable structure and the great number present in soil of the 'mor' type (Ferdinandson & Winge 1925) or in cultivated soil (H.A. Jensen 1975), the sclerotia are frequently reported from archaeological excavations. In Denmark they have been reported from samples dated to the Allerød and Younger Dryas Ages (Hartz & Milters 1901; Jessen 1920), as well as in later finds (e.g. Jessen 1927; Jonassen 1950; Mikkelsen 1954). Occurrence of *Cenococcum geophilum* in similar samples is reported from Germany (Willerdig 1974) and Norway (Griffin 1977, 1979, 1981).

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Abbreviations

Dating

I-IX	Pollen assemblage zones (Jessen 1935)
Period	
IV-VIII	Godwin's (1975) pollen assemblage zones. Periods VIIa, VIIb, and VIII correspond to Jessen's zones VII, VIII, and IX, respectively.
AD	Anno Domini
BC	Before Christ
BP	Before present (1950 AD)
EMA	Early Middle Ages (1050-1299 AD)
GIA	Germanic Iron Age (400-799 AD)
LMA	Late Middle Ages (1300-1536 AD)
PRIA	Pre-Roman Iron Age (500-1 BC)
RIA	Roman Iron Age (1-399 AD)
VA	Viking Age (800-1049 AD)

Origin of seeds

C	Cultivated or collected
Fo	Forests and hedges
G	Grasslands
H	Heaths
Ma	Maritime areas
Me	Bogs, swamps, wetlands (incl. meadows)
P	Ponds and lakes
Ru	Ruderal soils
W	Weeds

Miscellaneous

BRD	Bundesrepublik Deutschland
c	Circa
cf	Confer. In connection with plant names: identification uncertain
DDR	Deutsche Demokratische Republik
DI	Dating improved
ORFD	Oldest recorded find from Denmark
RH	Rhine
sp	Species
subsp	Sub-species
u	Uncertain dating

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Plates I-V

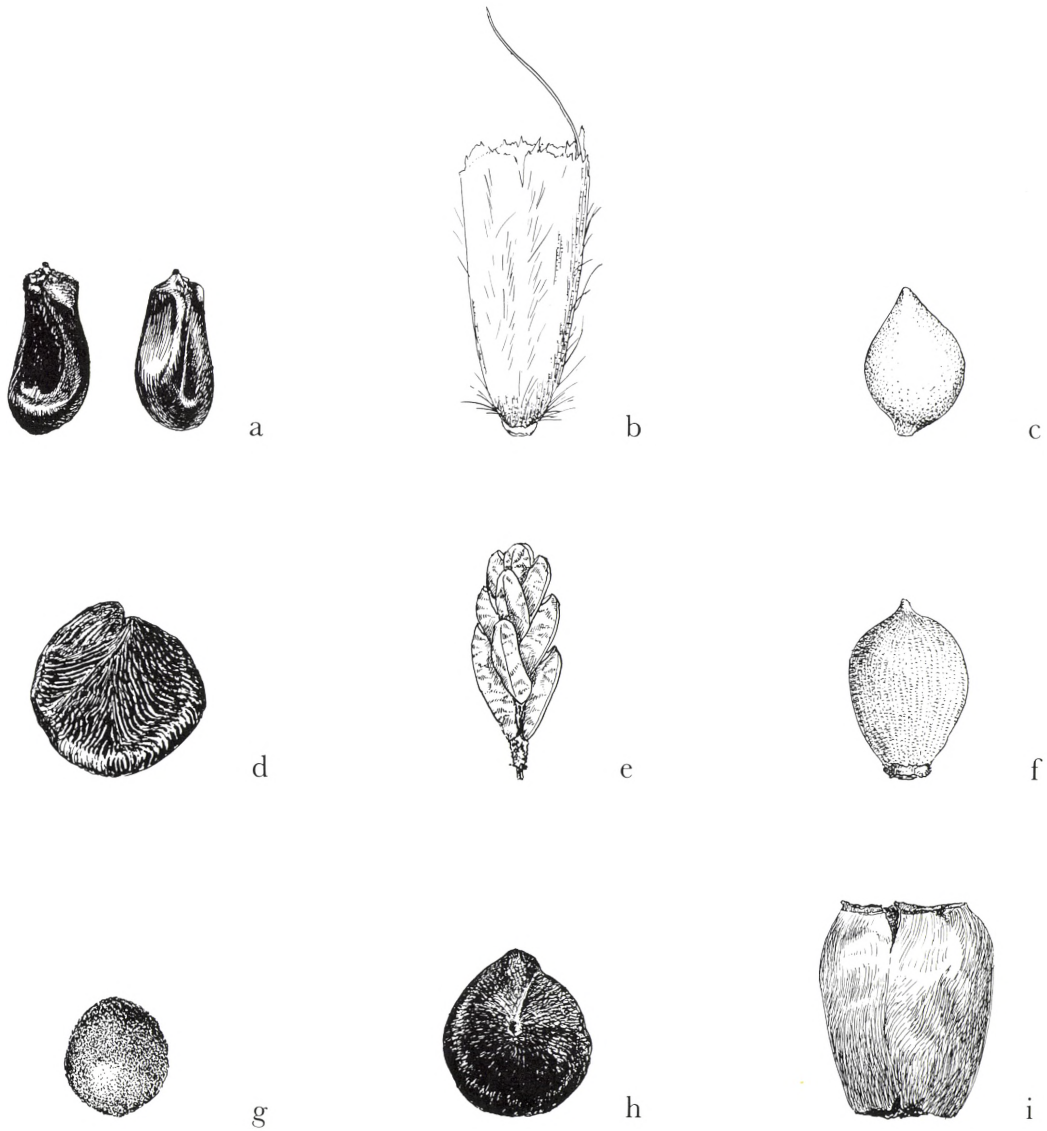


PLATE I. a: *Alisma plantago-aquatica*. Ribe, Dommerhaven (1.4 mm × 0.6 mm).
 b: *Alopecurus geniculatus*. Ribe, Kunstmuseet (2.5 mm × 1.2 mm).
 c: *Aphanes* sp. Ribe, Tvedgade (1.0 × 0.7 mm).
 d: *Atriplex* sp. Ribe, Dommerhaven (1.4 mm × 1.3 mm)
 e: *Calluna vulgaris*. Ribe, Dommerhaven (3.0 mm × 1.1 mm)
 f: *Carex* sect. *Distigmatica*. Ribe, Tvedgade (1.8 mm × 1.2 mm)
 g: *Cenococcum geophilum*. Ribe, Kunstmuseet (0.4 mm × 0.4 mm)
 h: *Chenopodium* cf. *album*. Ribe, Kunstmuseet (1.5 mm × 1.4 mm)
 i: *Cirsium* sp. Ribe, Kunstmuseet (2.5 mm × 2.1 mm)

Drawings: Elisabeth Papp

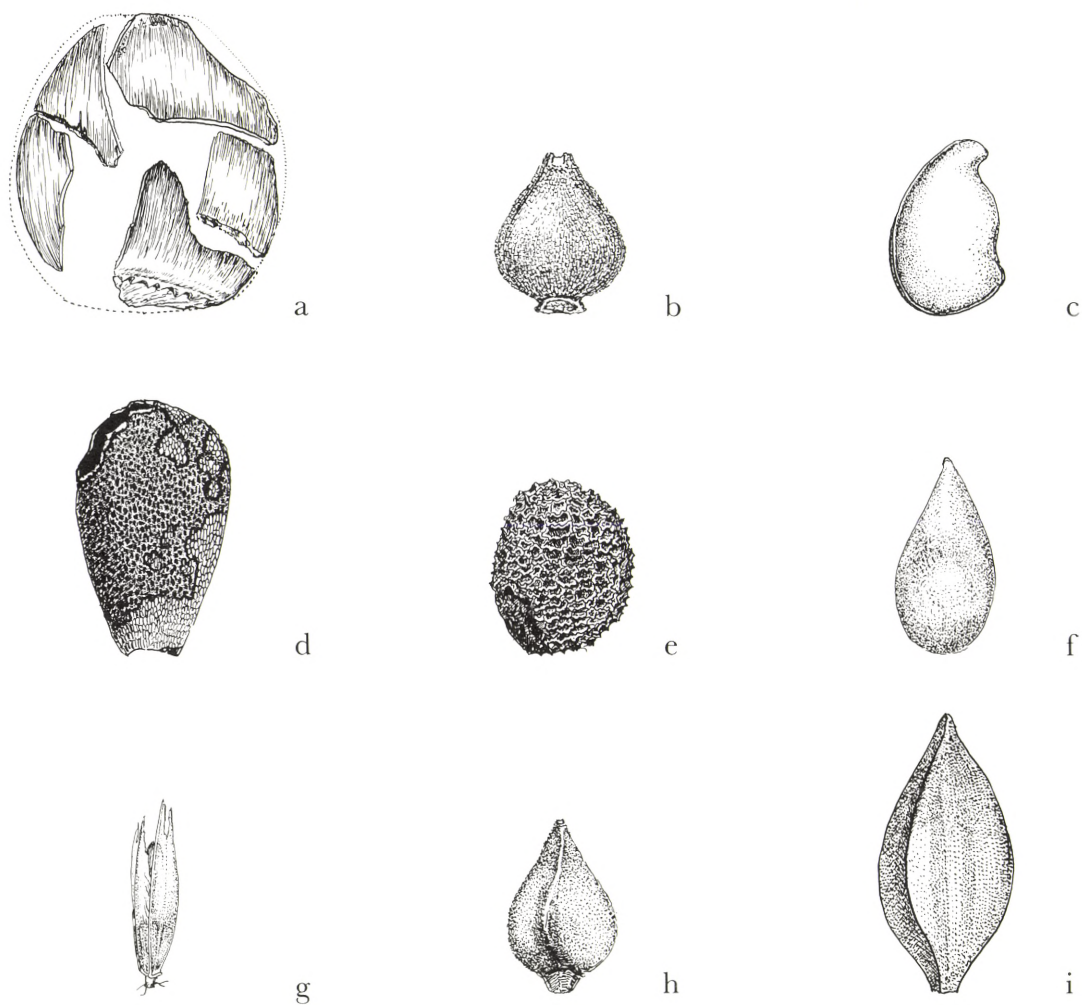


PLATE II. a: *Corylus avellana*. Ribe, Kunstmuseet (17 mm × 12 mm)
 b: *Eleocharis palustris et uniglumis*. Ribe, Dommerhaven (1.6 mm × 1.2 mm)
 c: *Fragaria vesca*. Ribe, Dommerhaven (1.4 mm × 1.1 mm)
 d: *Galeopsis* sp. Ribe, Kunstmuseet (3.2 mm × 2.0 mm)
 e: *Hyoscyamus niger*. Ribe, Tvedgade (1.4 mm × 1.1 mm)
 f: *Myrica gale*. Ribe, Kunstmuseet (1.9 mm × 1.0 mm)
 g: *Poa trivialis*. Ribe, Dommerhaven (2.7 × 0.7 mm)
 h: *Polygonum aviculare*. Ribe, Kunstmuseet (2.0 × 1.2 mm)
 i: *Polygonum hydropiper*. Ribe, Kunstmuseet (3.5 × 2.0 mm)

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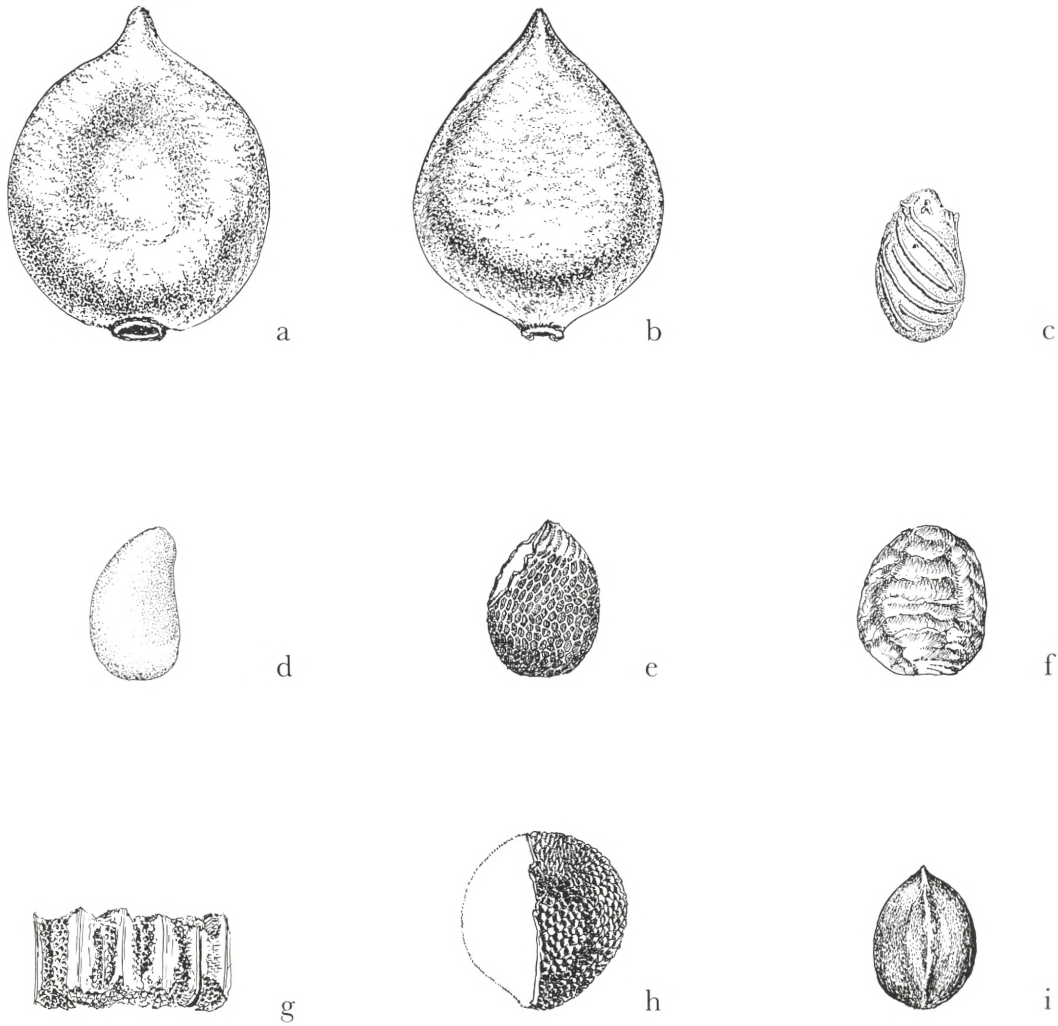


PLATE III. a: *Polygonum lapathifolium*. Ribe, Dommerhaven (3.0 mm × 2.3 mm)
 b: *Polygonum persicaria*. Ribe, Dommerhaven (2.5 mm × 1.9 mm)
 c: *Potentilla erecta*. Ribe, Dommerhaven (1.1 mm × 0.9 mm)
 d: *Potentilla reptans*. Ribe, Kunstmuseet (1.7 mm × 0.9 mm)
 e: *Ranunculus flammula*. Ribe, Dommerhaven (1.5 mm × 0.9 mm)
 f: *Ranunculus sceleratus*. Ribe, Dommerhaven (1.0 mm × 0.6 mm)
 g: *Raphanus raphanistrum*. Ribe, Dommerhaven (2.0 mm × 1.3 mm)
 h: *Rorippa islandica*. Ribe, Kunstmuseet (0.7 mm × ?)
 i: *Rumex acetosella*. Ribe, Kunstmuseet (1.0 mm × 0.8 mm)

Drawings: Elisabeth Papp

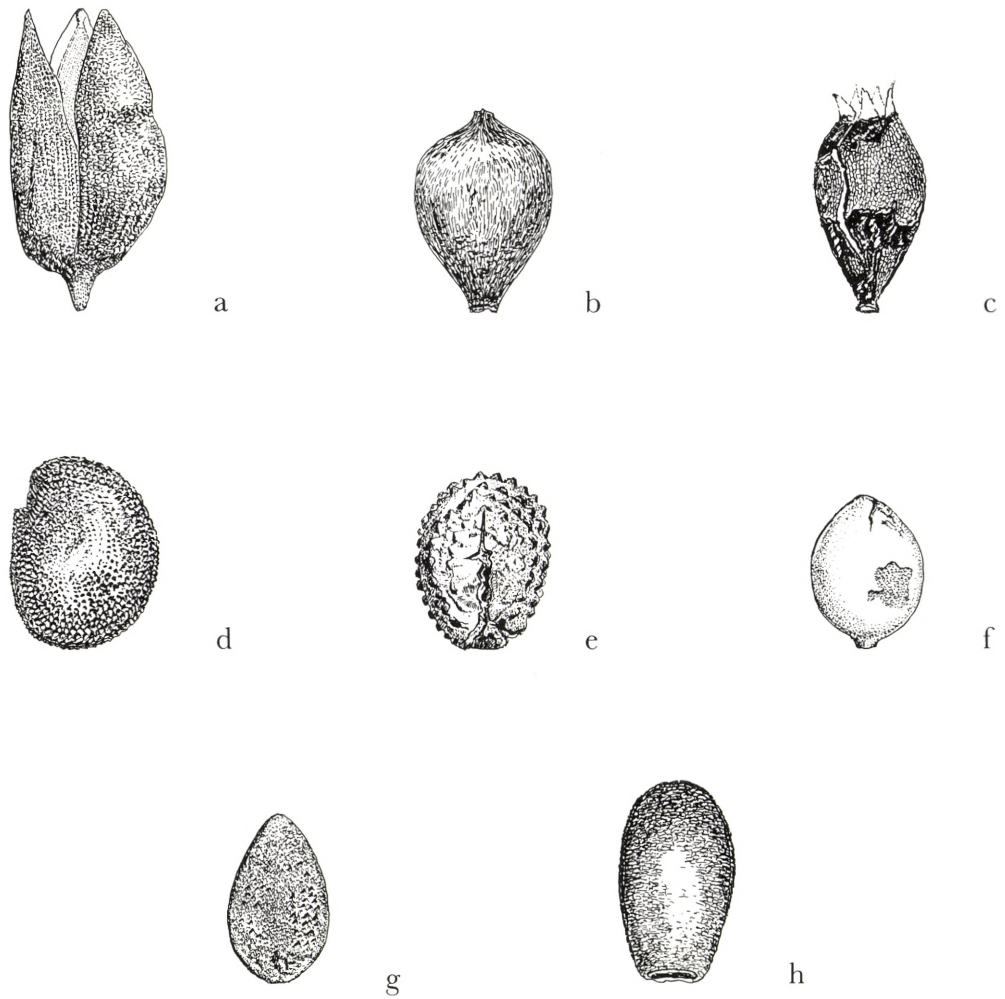


PLATE IV. a: *Scirpus maritimus*. Ribe, Dommerhaven (3.2 mm × 2.4 mm)
 b: *Scirpus lacustris* subsp. *tabernaemontani*. Ribe, Kunstmuseet (2.2 mm × 1.5 mm)
 c: *Scleranthus* sp. Ribe, Kunstmuseet (2.0 mm × 1.2 mm)
 d: *Solanum nigrum*. Ribe, Dommerhaven (2.0 mm × 1.5 mm)
 e: *Stellaria media*. Ribe, Kunstmuseet (1.5 mm × 1.3 mm)
 f: *Urtica dioica*. Ribe, Kunstmuseet (1.2 mm × 0.9 mm)
 g: *Urtica urens*. Ribe, Kunstmuseet (1.7 mm × 1.1 mm)
 h: *Zostera noltii*. Ribe, Dommerhaven (1.3 mm × 0.8 mm)

Drawings: Elisabeth Papp



PLATE V. Photo of profile from Dommerhaven, Ribe. The arrow indicates where the sample for seed analysis was taken. The dark layer in the central part of the photo is a 8th century humus (manure) layer found at the excavated sites Kunstmuseet, Dommerhaven and Tvedgade (cf. Fig. 3, 4, 5).

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