More than beans and barley

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Published in:
Embracing the salt marsh

Publication date:
2022

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foraging, farming and food preparation in the Dutch-German coastal area up to AD 1600
Studies in honour of Annet Nieuwhof

Editors Johan Nicolay & Mans Schepers

Annet among the tall horse beans growing in her garden (July 2017), sprouted from beans harvested from the salt marsh the year before, as part of an archaeological experimental project concerning crop cultivation in the terp region. Photo R. Immink, De Punt.

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VERENIGING VOOR TERPENONDERZOEK & BARKHUIS PUBLISHING
GRONINGEN
2022

university of groningen / groningen institute of archaeology

JAARVERSLAGEN VAN DE VERENIGING VOOR TERPENONDERZOEK 102

GRONINGEN ARCHAEOLOGICAL STUDIES 42

PUBLISHERS	Vereniging voor Terpenonderzoek p/a Groningen Institute of Archaeology Poststraat 6, 9712 ER, Groningen, the Netherlands www.terpenonderzoek.nl terpenvereniging@gmail.com	Barkhuis Publishing Kooiweg 38, 9716 GL Eelde, the Netherlands www.barkhuis.nl info@barkhuis.nl
EDITORS	J.A.W. Nicolay & M. Schepers (University of Groningen)	
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SUBSCRIPTIONS	Via association membership (www.terpenonderzoek.nl)	
FRONT COVER	Impression of an exposed terp section at Firdgum (province of Friesland, the Netherlands). Above natural salt-marsh sediments, a brownish-grey sequence of cultivated horizons can be seen (left and right). On top of this sequence a low bank was constructed from salt-marsh sods (left), to protect a drinking pond for cattle (centre) from salt water during storm floods. Beyond the section, the village cemetery is located on the intact part of this partially quarried mound, around the church tower (© Groningen Institute of Archaeology, University of Groningen).	
BACK COVER	Drawing of the main part of Section A2, documented during excavations in the terp of Westeraccum (Landkreis Aurich, Germany). Each layer is numbered and coloured according to its type of deposit and inclusions. Drawing W. Schwarze, Ostfriesische Landschaft.	

ISSN 0920-2587 (Jaarverslagen van de Vereniging voor Terpenonderzoek (JVT))
ISSN 1572-1760 (Groningen Archaeological Studies (GAS))
ISBN 978-94-931944-9-6

Refer to this book as: Nicolay, J.A.W. & M. Schepers (eds), 2022: *Embracing the salt marsh: foraging, farming and food preparation in the Dutch-German coastal area up to AD 1600. Studies in honour of Annet Nieuwhof* (= Jaarverslagen van de Vereniging voor Terpenonderzoek 102/Groningen Archaeological Studies 42). Groningen.

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Preface

Like other disciplines, the study of terps in the coastal area of the northern Netherlands has seen fluctuations in research intensity and changes in focus. First, from the 17th century on, researchers wondered whether terps as elevations in the landscape were man-made or natural phenomena. Later, during the period when many terps were quarried for their fertile soil (mid-19th to mid-20th century), research interest shifted to the layering and formation of these (indeed) man-made sites, and the rich collection of archaeological objects that were unearthed by the labourers. Moreover, the specific character of the salt-marsh landscape became a research subject in itself, with a special focus on the relation between sedimentation and sea-level rise. Also noteworthy is the very early attention for biological remains encapsulated in the terp mounds. Nowadays, terps, their finds and their natural setting still are the centre of interest, but with a gradual shift to include so-called off-site activities – including the exploitation of the salt marshes not only as pasture, but also for growing various crops. Parallel to this is the realization that since its first colonization in the 6th century BC a fully 'natural' salt marsh did not exist: large sections of this landscape were cultivated or otherwise used as part of a 'cultural landscape'.

There are a wide variety of terms associated with human/environment relations, and many of these have been applied to parts of the northern clay district. These include terms as 'man-made marshes', 'anthropogenic landscapes', and the traditional divide between 'natural landscapes' and 'cultural landscapes' as mentioned above. Most of this terminology does not do justice to the fact that the landscape surrounding the terps was in fact the product of a complex interplay between physical-geographical, biological and cultural processes. Acknowledging this, the researcher to whom this book is dedicated co-introduced the phrase 'synanthropic salt marsh', a term that explicitly emphasizes the dynamic relationship between people and the environment they inhabit.

The current research themes, which come together in the content of this book, are closely related to the personal interests of our dear colleague Annet Nieuwhof, who last year celebrated her 65th birthday. Some of these interests in a symbolic way coincide in a small, copper-alloy object that was found during excavations at the terp site of Englum, in the province of Groningen. This 5th-century object, measuring c. 11 cm, is an intact slide that once was fastened to the front of a sword-scabbard. The slide secured the sword-scabbard which was suspended from a shoulder-strap or baldric. Its front shows a floral decoration in chip-carving, as curling tendrils with small dots to represent leaves. These tendrils, which now adorn each page heading, refer to Annet's keen interest not only in the natural elements within a landscape, but also in the human/nature balance (rather than a struggle!) that was of crucial importance in people's striving to successfully inhabit and exploit a dynamic environment such as the salt marsh.

To mark Annet's 65th birthday, a group of colleagues and friends each wrote a chapter about this human/nature relationship, approaching the subject from different angles. This *Liber amicorum*, however, starts off with a contribution by Egge Knol, who elaborates on why Annet is so deserving of this token of appreciation from her colleagues.

Subsequently, four contributions highlight various ways in which humans made use of the landscape. Annette Siegmüller does so on a conceptual level, introducing a model to assess the use of resources during the Roman Iron Age, based on the characteristics of the salt-marsh environment. In doing so, she makes explicit the need and capacity of terp dwellers to adapt to their special habitat. Gilles de Langen and Hans Mol focus on physical land division in the Middle Ages, using a retrogressive model that starts out from early-modern historical sources, and potentially allows us to look further back in time. Johan Nicolay and Hans Huisman delve into the salt-marsh soil on a macro- and micromorphological level, presenting an overview of cultivated horizons encountered in terp excavations, and discussing their implications for understanding the evolution of ploughing technology. This overview follows

The sword-scabbard slide from Englum, as a symbol of Annet Nieuwhof's strong interest in the human/nature balance in a salt-marsh context. Scale 1:1. Photos J. Schokker, Noordelijk Archeologisch Depot.

the steep rise in cultivation horizons recognized in one modern form of terp research, by cleaning the escarpments of partially quarried terps. Ernst Taayke and colleagues train their sights on a different form of supposed human landscape modification, critically evaluating the radiocarbon dating and distribution of vegetation horizons across the Groningen landscape. On solid grounds they question earlier ideas about the degree to which humans were indeed responsible for their formation.

Two chapters present reviews of bio-archaeological find groups in the Dutch-German terp region. Mans Schepers and Karl-Ernst Behre highlight a group of botanical remains known to be rare in the area: edible fruits and nuts. They also discuss the likelihood that a number of wild plants known to have been abundant in the region were foraged by terp dwellers. Wietske Prummel and Hans Christian Küchelmann discuss the use of animal-related products, taking into account both domestic and wild animals. Their overview shows clear and interesting trends, both in time and space.

Two chapters bring us even closer to the food itself. Tania Oudemans and Amy Kuiper highlight the potential of combining traditional typo-chronological pottery analyses with chemical residue analysis, pointing out some successful applications already realized in the area. In addition, they come up with a number of explicit suggestions for future endeavours along these lines. Steven Matthews' contribution takes us to northeast Africa, discussing flatbread production and its connection with ceramic griddle plates, which are also known from the Dutch-German terp sites. His contribution makes us realize that clues for interpreting the archaeological record need not necessarily come from nearby.

The importance of this international perspective explicitly speaks from the contributions in this volume, those by Dutch, German, and English authors as well as from two co-authored 'Dutch-German' papers and an African perspective that fascinatingly also is relevant to the archaeology of the terp region. As editors, we were gratified to see this volume develop, and to identify numerous potential connections between the various chapters, as well as a substantial number of explicit research ideas. A final contribution, by Jan Kegler, urges all researchers involved in terp archaeology to seek collaborations and to continue exchanging ideas across borders and (sub-)disciplines. A call that we wholeheartedly support.

We want to thank the contributors to this compilation for agreeing to write a chapter at quite short notice, and for keeping the subject of their contributions close to the theme of the book. Also we are grateful to Xandra Bardet (Groningen) for editing the English texts, and to Siebe Boersma (Groningen Institute of Archeology, University of Groningen) for designing the layout and transforming the texts and illustrations into beautiful chapters.

We wish Annet many more years in good health, as a good friend, as an enthusiastic terp researcher and now also as a proud grandmother.

Johan Nicolay & Mans Schepers

6 More than beans and barley: juicy fruits, nuts and collected wild plants from the terp region

Mans Schepers & Karl-Ernst Behre

Abstract

While it is well-established and commonly agreed upon that fruits and nuts such as apples, plums and hazelnuts were of little importance for human subsistence in the Dutch-German salt-marsh region, as yet no systematic review and critical evaluation of finds has been compiled. This contribution fills this void, and thus allows future claims with respect to this topic to be supported by clear figures. In addition to the edible juicy fruits and nuts, we discuss the potential of edible dry plant seeds and fruits, as well as vegetative plant parts. The little information available from samples dated between AD 1200 and 1600 points to major changes in that phase, and appears to indicate the onset of a segregation between rural, urban, and monastic sites. We argue that this phase deserves special attention in future research and that this calls for more intensive cooperation between archaeologists and historians.

Keywords

Archaeobotany, nuts, juicy fruits, wild plants, trees and shrubs.

6.1 Introduction

Human subsistence has been an important aspect of archaeological research from the beginning of the discipline. The study of human-food relations is complex and multi-faceted, and often covers interrelated topics such as foraging, trade, arable farming, animal husbandry, storage, and cooking. A broad understanding of the history of people and their food demands close cooperation between various archaeological subdisciplines. These include numerous specialisms, ranging from the broadest possible view of connections between regions, via detailed studies of landscape ecology and 'landscape affordances', to the microscopic study of soils, animal, or plant remains and even aDNA and isotopes.

The present volume contains various chapters dealing with 'people and food', ranging from potential landscape management, to the analysis of food remains on and in pots.[1] The overwhelming majority of the things we eat are either plants or animal products. A logical and commonly applied subdivision is the distinction between wild and domesticated species.[2] Archaeozoological research demonstrates that domesticated animals were the major source of animal food in the present study area, but various wild animals were consumed as well.[3]

A final division to be made with respect to (food) resources, is the degree to which food could be grown or collected more or less locally, or whether it had to be to acquired from remote places. In the latter case, this can either be done by active foraging expeditions, or through exchange networks. In the coastal salt-marsh area in particular, there is a long tradition in suggesting that at least part of the food must have been obtained from the inland peatbog margins or the higher Pleistocene soils.[4]

Archaeobotanists and archaeologists have discussed the matter most intensively when it came to the likelihood of crops being grown locally in the salt marshes. Emmer wheat (*Triticum dicoccum*) and rye (*Secale cereale*) in particular, are repeatedly mentioned as a crop likely to have been imported from elsewhere.[5] The occurrence of wild plants that were seemingly out of place in the salt marsh, and arable weeds in particular, has prompted speculation as to relations between the clay and the sand districts or even remoter parts.[6]

This contribution discusses the occurrence and possible use of wild plants within the terp area along the Dutch-German North Sea coast. Relatively little has been written about wild-plant consumption, compared to the categories mentioned above. Van Zeist states that 'wild fruits and nuts did not grow in the salt marsh area' and that 'it is usually impossible to determine what use was made of wild plants by prehistoric man'.[7] The scarcity of edible 'fruits and nuts' (see terminology discussed under 'methodology' below) is generally agreed upon and supported by extensive

1 See chapters 6 and 9.
2 We will use the term 'species' throughout this chapter for the sake of readability, whereas 'taxa' would in some cases be more correct. We will discuss taxonomy in more detail wherever relevant.
3 See, for example, chapter 8.
4 E.g. Van Es 1967, p 38.
5 See for Emmer wheat: Bakels 1997; Boersma 2005, 574; Cappers et al. 2005; Pals 1999; Van Zeist 1989. See for Rye: Groenman-van Waateringe 1999; Maurer 2016.
6 Van Zeist 1988b; Schepers in prep. A.
7 Van Zeist 1974, 366-367.

Table 6.1. The phases defined for an overview of juicy fruits and nuts in this contribution.

phase	description	start date	end date
1	Pre-Roman Iron Age	600 BC	100 BC
2	Roman Iron Age	100 BC	AD 500
3	Early Middle Ages	AD 500	AD 1000
4	High Middle Ages	AD 1000	AD 1400
5	Late Middle Ages/Early Modern Period	AD 1400	AD 1600

Table 6.2. The number of site groups in which a species occurs per phase, sorted by frequency of occurrence. Explanation of grouped species: 1: *Malus/Pyrus* group, 2: *Rubus* group, 3: *Prunus* group, 4: species from peatlands, heaths and dry forests.

				1			2				3											4		
phase	total N site groups	*Sambucus nigra*	*Corylus avellana*	*Malus sylvestris*	*Malus/Pyrus*	*Pyrus communis*	*Rubus fruticosus*	*Rubus idaeus*	*Rubus*	*Juglans regia*	*Prunus avium/cerasus*	*Prunus domestica*	*Prunus*	*Ficus carica*	*Vitis vinifera*	*Rosa*	*Ribes rubrum*	*Quercus*	*Rhamnus cathartica*	*Cucumis melo/sativus*	*Morus*	*Vaccinium myrtillus*	*Empetrum nigrum*	*Oxycoccus palustris*
1	5	1	1	1	-	-	-	-	1	-	-	-	1	-	-	-	-	1	1	-	-	-	-	-
1/2	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	18	12	3	2	1	-	7	2	-	-	-	1	2	-	-	3	-	-	1	-	-	-	-	-
3	13	9	3	4	-	1	1	-	-		-	-	-	-	2	-	-	1	-	-	-	1	-	-
3/4	4	2	-	-	-	-	1	-	-	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-
4	21	14	8	6	-	3	3	1	-	4	3	-	1	2	-	-	1	-	-	-	-	2	1	2
4/5	4	4	1	1	-	-	1	1	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-
5	2	1	1	1	1	-	-	-	-	1	2	-	-	2	2	-	1	-	-	1	1	-	-	-
Total	**68**	**44**	**17**	**15**	**2**	**4**	**13**	**4**	**1**	**6**	**6**	**3**	**4**	**5**	**4**	**3**	**2**	**2**	**2**	**1**	**1**	**3**	**1**	**2**

archaeobotanical research.[8] A systematic overview of what *was* available nonetheless, and to what degree this could have been grown or collected locally, is currently lacking.

6.2 Methodology

We divide wild plants into three categories. The first group comprises what in most publications is generally referred to as 'fruits and nuts', which includes plums, apples and hazelnuts.[9] From a strictly botanical-morphological point of view, this is a problematic categorization, since even grain kernels are fruits. We adopt the term 'juicy fruits' from Cappers and Bekker for our section dealing with fruits such as plums (*Prunus* spp.) and grapes (*Vitis vinifera*).[10] We speak of 'nuts' when referring to walnuts (*Juglans regia*) and hazelnuts (*Corylus avellana*). We shall stick to the phrase 'fruits and nuts' for readability and recognizability.

For this group of plants, we scanned all botanical reports available to us and systematically scored the number of samples per 'site group' in which a particular species was encountered. A 'site group' refers to all samples from a particular site belonging to a specific phase.[11] In addition to sample frequency, we marked those instances where at least one sample with a concentration of more than ten items was found.[12] In some cases, finds from certain periods were reported without specification of (the number of) samples. In these instances, only the presence of a species was noted. Only samples were included that contained at least one of the species targeted here. Thus, the relative importance of these species in this pool can be assessed on the basis of the data presented here, but not their relative importance in 'all samples' available from the area. In some cases, identifications have been upgraded, for example '*Corylus*' from Workum is considered to be *Corylus avellana*.[13]

For plant remains of this first group we made a division into five phases (table 6.1). This would provide a general overview of chronological developments and trends, should these be present. We had to allow ourselves some freedom when assigning a sample to a particular phase, either because the report was not totally clear or a sample date overlapped with the previous or next phase. In the latter case, we assigned the sample to its 'main phase'. In some instances where more overlap occurred, we defined 'in-between' phases.[14] We restricted ourselves to reports dealing

8 E.g. Nieuwhof 2018, 46;
9 E.g. Nieuwhof 2020, 55.
10 Cappers & Bekker 2021.
11 Prummel & Küchelmann take a similar approach, but simply refer to the data belonging to a particular phase per site as 'phases' (see chapter 8).
12 Items refer to the counted unit for that particular species, e.g. the shells from hazelnuts. For the remainder of this contribution, the term 'concentration' thus refers to 10 items or more in one sample.
13 De Roller 2003a.
14 These are: 1/2 (in between phase 1 and 2), 3/4, and 4/5.

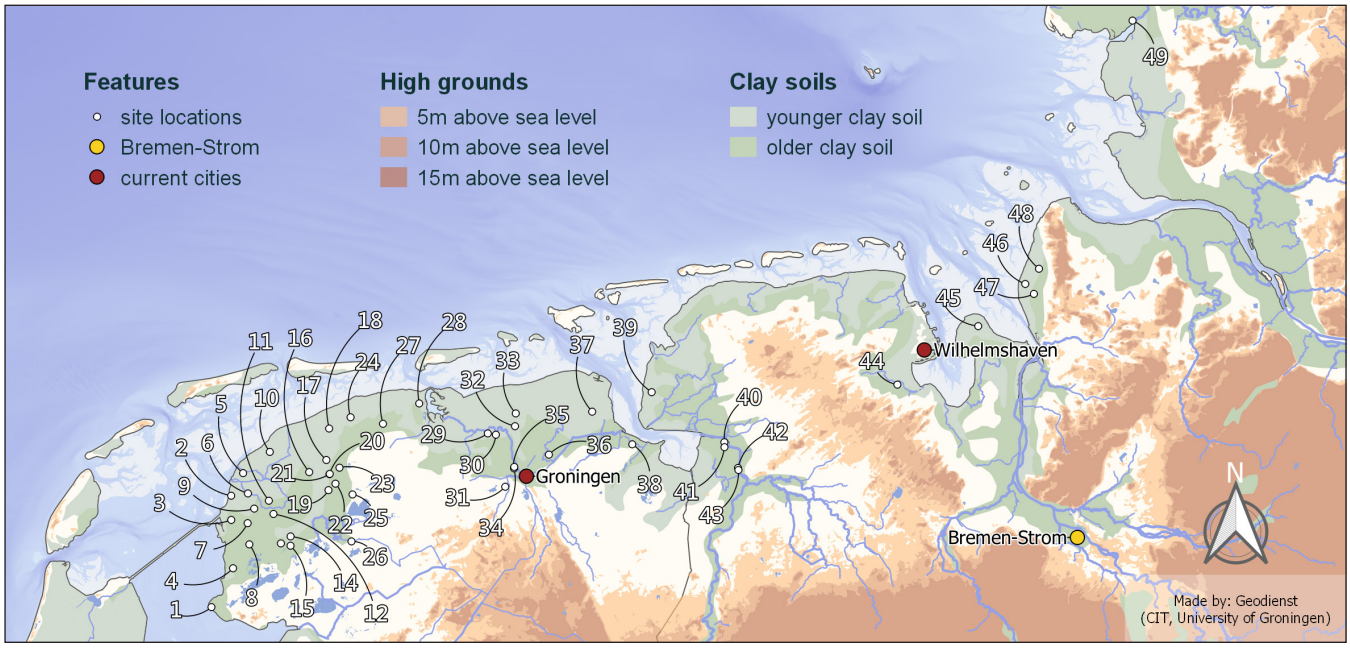

Fig. 6.1 The locations of the 49 sites forming Group 1 (see appendix 6.1) and the location of Bremen-Strom.

with plant macro-remains, but wood and pollen analyses will be referred to in the discussion.

The second and third groups of plants consist of wild plants that can easily be identified, but for which actual human consumption is open to some debate. These include plants from which the dry seeds are potential candidates for consumption (group 2), and plants from which vegetative parts such as leaves and roots are known to be edible (group 3).[15] For these plants, we discuss some finds which by their context or concentration give extra reason to consider their actual consumption. Additionally, we shall highlight some species that are extremely common in the area, to the extent that they are likely to have been eaten as well.

After presenting the plant remains that belong to these three groups, we shall discuss the likelihood of the species' actually having been consumed, as well as their local availability. Special attention is given to trends over time and the potential role of wild-plant food in the diet of the terp dwellers. In the conclusion, the results will be summarized and some recommendations will be made with respect to future research.

6.3 Results

6.3.1 Group 1: juicy fruits and nuts

A total of 68 site groups from 49 different sites was established from the reports examined for this review (see full results in Appendix 6.1 and fig. 6.1). For comparison: a review of crop plants, based upon the same collection of reports, resulted in approximately 160 site groups from over 90 sites.[16] Moreover, the total number of samples containing crop species is considerably higher as well. The data are not evenly distributed over all phases. Only five site groups containing fruits and nuts were identified for the earliest phase, and only two site groups represent the last phase. The diversity in fruits and nuts clearly increases over time, with an apparent jump between the Early Middle Ages (phase 3) and the High Middle Ages (phase 4). Ten and eight species, respectively, are recorded for the Roman Iron Age (phase 2) and the Early Middle Ages, which increases to 14 different species in the High Middle Ages.[17] It should be noted however, that a limited number of sites, and Leeuwarden-Gouverneursplein and Leeuwarden-Speelmanstraat in particular, largely account for this effect.[18] The order in which the species will be discussed reflects the number of site groups in which they occur. Some species are lumped together for taxonomic or ecological reasons (table 6.2). Only the most frequently occurring species or species groups are discussed individually (>5 site groups, see table 6.2 and fig. 6.2).

Elder *(Sambucus nigra)*

Elder is by far the most commonly encountered juicy fruit type in archaeobotanical research in the former salt-marsh region, occurring in 44 site groups. A rather spectacular find is a small concentration of 35 stones in a pot at Feddersen Wierde.[19] Not only is this clear evidence of its

15 For a wider overview of these 'dry fruits' in prehistoric and early historical context, see Behre 2008.
16 Schepers & Behre in prep.
17 These numbers are reliable as an indication, but it should be noted that some species may be counted twice here, since the total number of taxa is counted. This will sometimes include the same species, for example when apple or pear seeds were not distinguished at a site (then appearing as Malus/Pyrus), while the distinction has been made at another site.
18 Van Zeist et al. 1987.
19 Elderberry 'seeds' are not technically seeds from a plant morphology perspective.

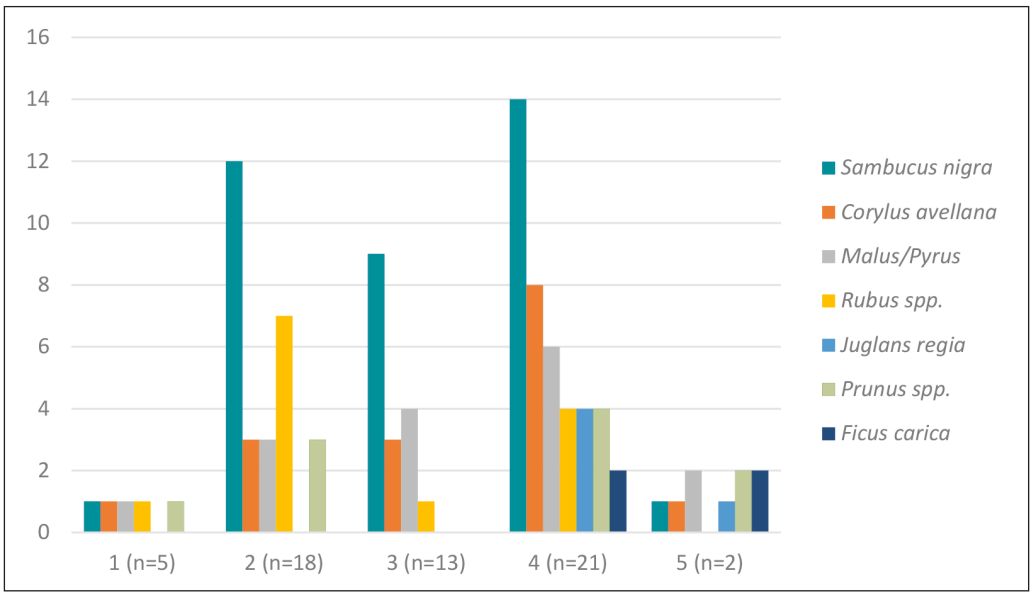

Fig. 6.2 Site-group frequency for the most frequently occurring juicy fruits and nuts. Note that the total number of site groups representing phases 1 and 5 is low.

cultural relevance, but it is also a quite rare example - for terp research in particular - of a convincing relation between a pot and its botanical contents.[20]

Most finds are single finds, but some concentrations do occur, for example in Roman Iron Age samples from Englum and Saksenoord, and High Medieval samples from Wommels.[21] An intriguing discovery was made a long time ago, but not actually recognized as such. Six tubes containing flax remains from Egypt, Switzerland and two different terp settlements are in a display case at the archaeobotanical laboratory of the Groningen Institute of Archaeology (fig. 6.3). Tube 6 calls for our special attention; according to the description, it contains flax seeds from the terp Eenumerhoogte. Yet upon closer inspection, these 'seeds' recently turned out not to be flax seeds at all, but actually remains of elder. According to E. Knol, these are likely to be specimens collected by Van Giffen himself in the 1910s.[22] Eenumerhoogte is a high terp in the province of Groningen, and these are the only botanical remains known from that location.[23] Without radiocarbon dating, there is no way of telling how old they are. In general, elderberry remains are found from the very beginning of terp habitation, and spread over the entire region.

Hazel (*Corylus avellana*)

Hazelnuts were already reported by Beijerinck in the late 1920s, from the terp sites of Ezinge, Ferwerd and Rasquert, but the exact provenance of the nuts from these sites is unclear.[24] For Ezinge, notes in the finds register record some additional hazelnut finds, which Nieuwhof was able to assign to the Middle Pre-Roman Iron Age.[25] The only significant concentrations known from terp research are from Feddersen Wierde, where occasionally small concentrations of one or two handfuls of hazelnuts from the Roman Iron Age were found in the vicinity of houses, sometimes even preserved in a net-like bag.[26] A rare report for the coastal region of hazel petals is reported from the Roman Iron Age site of Jemgumkloster.[27] Exceptional in terms of sample frequency is the early medieval site of Elisenhof, where hazelnut fragments appear in a total of eighteen samples although concentrations as mentioned for Feddersen Wierde are lacking.[28] Remarkable are the fifteen hazelnuts in a sample from early medieval Niens, which, interestingly enough, were all '*von Mäusen angebissen*' (gnawed by mice).'[29] The relatively large numbers of nuts are probably due to the large number of investigated samples from these sites.

Hazelnut finds became more common in the High Middle Ages. At Dokkum, where elder was found as well, two out of three samples contained a concentration of hazelnut fragments. Samples containing hazelnuts were reported from various other sites in this phase, such as Achlum (fig. 6.4), Leeuwarden-Gouverneursplein and Stavoren.[30] Thus the general picture of hazelnuts in the area is an increase in occurrence over time. Concentrations or higher sample frequencies dated *before* the high-medieval period seem to be restricted to sites relatively close to the sand districts.

20 See Schepers & De Vries 2018.
21 NIeuwhof & Woldring 2008 (Englum); Schepers & Assië 2018 (Saksenoord); Schepers & Maurer 2018 (Wommels).
22 The authors thank Egge Knol for his input on this matter.
23 Beijerinck (1929) did include some samples from the adjacent terp of Eenum.
24 Beijerinck 1929; see also Nieuwhof 2020, 47.
25 Nieuwhof 2020, 54.
26 Körber-Grohne 1967, 189.
27 Behre 1972, sample 1107.
28 Behre 1976, 22 & 88.
29 Behre 1991, 151 (translated by authors).
30 Schepers 2015b (Achlum); Van Zeist et al. 1987 (Leeuwarden-Gouverneursplein); Maurer 2016 (Stavoren).

Fig. 6.3 A collection of 'flax remains' held at the Groningen Institute of Archaeology turned out to contain a concentration of elder (*Sambucus nigra*) remains in tube 6 (labelled as seeds, but actually stones or drupes). The dating is unknown. Photos D. Fennema.

Fig. 6.4 Hazelnut (*Corylus avellana*) shell fragments from Achlum, dated AD1100-1400. Photo M. Hondelink.

Apples and pears (*Malus/Pyrus* group)

Apples and pears are relatively rare in the coastal region. Seeds from either one of the species have been found in 17 out of 68 site groups. Without going into a discussion regarding the criteria to separate the two, it should be mentioned here that they were not always identified to the species level, depending on both the experience of the analyst and the preservation of the material under study. It is also good to be aware that apples are sometimes identified as *Malus sylvestris*, which is the wild apple, and sometimes as *M. domestica*, the domesticated apple. It is not actually possible to distinguish these by the seeds. Hence this distinction is not so much a research result as a research artefact.[31] That being said, apples are more common than pears. Identifications of both species at one site are reported from Oldeboorn (phase 4), Leeuwarden-Gouverneursplein (phase 4), Leeuwarden-Speelmanstraat (phase 4) and Anjum (phase 3).[32]

Certain identifications of pear occur later than apple. A single find of an apple seed is present in a pre-Roman Iron Age sample from Jelsum.[33] Apple seeds from the Roman Iron Age occur in both Jelsum and Hallum. The find conditions at Hallum were exceptional, as reported upon elsewhere. Here, an apple seed and a fragment of a hazelnut shell were found in direct association with a 'scrap copper' deposit, which definitely concerns imported material.[34]

Early Medieval finds are known from four locations only. A single, uncertain identification dated to the 7th or 8th century is reported from Wijnaldum; a 9th-century apple seed was identified at Anjum; and three samples dated to the 9th or 10th century originate from Leeuwarden-Gouverneursplein and Leeuwarden- Speelmanstraat.[35] The

31 This need not even be a different research tradition per laboratory or analyst: Van Zeist identifies medieval apple seeds from Leeuwarden (Van Zeist et al. 1987) as M. sylvestris, but apple seeds from the same period from Oldeboorn (1988) as M. domestica.
32 Van Zeist et al. 1987 (Leeuwarden-Gouverneursplein & Leeuwarden-Speelmanstraat); Van Zeist 1988a (Oldeboorn); Schepers in prep. A (Anjum). The identifications for Anjum were carried out by Arnoud Maurer for his Bachelor thesis, but were not included in that report for thematic reasons (Maurer 2010).
33 Schepers in prep. A.
34 Schepers 2016, 148-149; See Caspers 2010 for more information about the metallurgical details.
35 Pals 1999 (Wijnaldum); Schepers in prep. A (Anjum); Van Zeist et al. 1987 (L. Gouverneursplein & L. Speelmanstraat).

Fig. 6.5 Seed of a pear (*Pyrus communis*) from Anjum, dated in the 10th century. Photo A. Maurer.

only early-medieval pear find from the region is a 10th-century seed from Anjum (fig. 6.5).[36]

Concentrations of neither apple nor pear remains occur; and somewhat higher sample frequencies are known only from the two Leeuwarden sites mentioned above. Thus, there is no spatial distribution to reflect upon.

Blackberries, raspberries and dewberries (*Rubus* group)

Blackberry (*Rubus fruticosus*) stands out from most other plants in this group in terms of chronological distribution. While occurring in just one sample from Tritsum in the pre-Roman Iron Age, it attains a notable peak in the Roman Iron Age.[37] Finds from phase 2 have been reported from various sites, including Jemgumkloster, Leeuwarden-Bullepolder, Sneek-Harinxmaland, and Jelsum (fig. 6.6).[38] Jemgumkloster is the only site from the Roman Iron Age where raspberry (*Rubus idaeus*) was found as well. The only convincing, albeit small concentration of *R. fruticosus* is from Heveskesklooster, dating from the Roman Iron Age.[39] Poorly dated, but probably contemporary with the find from Heveskesklooster, is a small concentration of a mixture of blackberry and dewberry (*Rubus caesius*) reported from Marssum.[40] The dewberry, somewhat less familiar to the general public, is a blackberry-like species, that can easily be recognized in its fruiting stage by the pale, greyish appearance of the fruits.

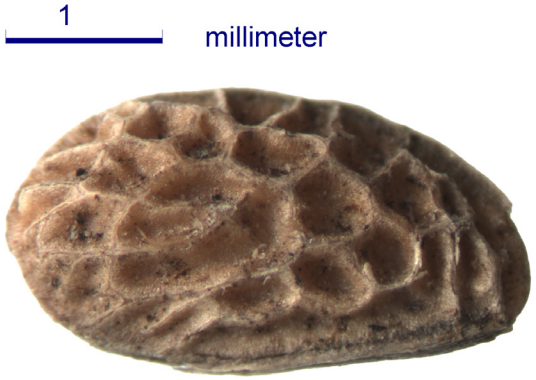

Fig. 6.6 A blackberry (*Rubus fruticosus*) stone from the terp Jelsum, dated AD 100-250. Photo M. Hondelink.

Rubus species are virtually absent in the Early Middle Ages, only reported from an 8th- or 9th-century sample from Hatzum-Burg.[41] High-medieval finds are somewhat more common, but less so than one would probably expect. Whilst this contribution focuses on presence rather than absence, the fact that *Rubus* remains are lacking from Leeuwarden-Speelmanstraat and Leeuwarden-Gouverneursplein is remarkable. Concentrations occur in samples from late-medieval, partly raised farmsteads in the De Onlanden area, and in a sample dated between AD 1300 and AD 1600 from Heveskesklooster.[42]

Spatially, the *Rubus* species are clustered on terp sites in the clay-on-peat area (De Onlanden, Leeuwarden-Bullepolder and Sneek-Harinxmaland) and the river Ems estuary (Hatzum-Burg, Heveskesklooster and Jemgumkloster).[43] Since these sites represent various phases, an ecological explanation is likely here (see numbers 14, 23, 31, 38, 40 on fig. 6.1).

Walnut (*Juglans regia*)

No convincing walnut finds occur in the coastal region before the High Middle Ages. The oldest example comes from Oldeboorn, dated between AD 1000 and AD 1200.[44] Concentrations are lacking, as are high sample frequencies within any single site group.

Plums and cherries (*Prunus* group)

The *Prunus* group includes a number of different economically interesting species, including the cherries (*Prunus avium/cerasus*), the cherry plum (*P. cerasifera*), the plum (*P. domestica*), and the sloe (*P. spinosa*).[45] Their stones can generally be used to distinguish between these species, as well as between varieties within some of these species,

36 Schepers in prep. A.
37 Van Zeist 1974 (Tritsum).
38 Behre 1972 (Jemgumkloster); Schepers 2020 (Leeuwarden-Bullepolder); Schepers 2018a (Sneek-Harinxmaland), Schepers in prep. A (Jelsum).
39 Cappers 1995.
40 Schepers 2015a.
41 Behre 1986, 103-104 & 111-112.
42 Cappers 1995; Schepers 2018.
43 Schepers 2018b (De Onlanden); Schepers 2020 (Leeuwarden-Bullepolder); Schepers 2018a (Sneek-Harinxmaland), Behre 1986 (Hatzum-Burg); Cappers 1995 (Heveskesklooster); Behre 1972 (Jemgumkloster).
44 Van Zeist 1988a.
45 This is not a complete list of economically relevant *Prunus* species, but includes those relevant for this contribution.

Fig. 6.7 A cherry-plum stone (*Prunus cerasifera*) in a drift-litter deposit at Delfzijl (July 2021). Photo M. Schepers.

but this generally requires detailed measurements of large numbers of stones.[46]

A single pre-Roman Iron Age stone has been reported from Ezinge.[47] This stone was not identified to the species level, but another poorly dated stone from Ezinge, reported by Beijerinck, could be identified as *P. spinosa*.[48] Roman-period *Prunus* stones identified to the genus level are known from Heveskesklooster and Leeuwarden-Bullepolder.[49] A plum stone found at the Friesestraatweg terp (near the city of Groningen) could be identified as *P. domestica*.[50]

Undisputed early-medieval finds are lacking. Both a plum (*P. domestica*) and a cherry (*P. avium/cerasus*) stone are found in a sample from Stavoren, dated to the 10th-12th century.[51] A date after AD 1000 seems likely in the light of the present review. Various *Prunus* finds are reported from the High Middle Ages, including (possible) sloe at Sneek Stinswier, cherries at Leeuwarden-Gouverneursplein and Leeuwarden-Speelmanstraat, and plum at Heveskesklooster.[52] The overall rarity of *Prunus* remains is striking, all the more since concentrations are completely absent. Evidently, at least at the genus level, their remains are not easily overlooked or misidentified. Indeed, the possibility that some of the early finds actually represent drift material from inland areas cannot be excluded (fig. 6.7).[53]

Fig (*Ficus carica*)

Fig only occurs in samples from the High Middle Ages, and predominantly in terp sites that are known to have evolved from predominantly rural to urban in that period. These sites are Leeuwarden-Gouverneursplein, Leeuwarden-Speelmanstraat, Sneek Martiniplein and Winsum-Boogplein.[54] The only exception is Heveskesklooster, as the only site where a more substantial concentration of 164 fruits occurs (Phase 4/5, AD 1300-1600).[55]

Other juicy fruits and nuts

Two early-medieval grape finds are known from the coastal area: from Wijnaldum and Oosterbeintum.[56] These were included in a general overview of economic plants found in Dutch terp research, which also mentioned an at that time 'new' find at the terp site of Schettens-Sotterum.[57] The

46 See e.g. Körber-Grohne 1996; Woldring 2012.
47 Nieuwhof 2020, 42-43.
48 Beijerinck 1929.
49 Cappers 1995 (Heveskesklooster); Schepers 2020 (Leeuwarden-Bullepolder)
50 Cappers et al. 2005.
51 Maurer 2016.
52 Hänninen & Van Waijen 2005 (Sneek Stinswier); Van Zeist et al. 1987 (L.-Gouverneursplein & L.-Speelmanstraat); Cappers 1995 (Heveskesklooster).
53 See also Cappers 1995 who discusses this option for various plant remains found in the coastal region.
54 Van Zeist et al. 1987 (L.-Gouverneursplein & L.-Speelmanstraat); Cappers & Bottema 2008 (Sneek-Martiniplein); Schepers 2014 (Winsum-Boogplein).
55 Cappers 1995. 'Fruits' should not be mistaken for whole figs here (which are technically 'false fruits') but instead refers to the individual dry fruits, which to non-specialists would be known as seeds.
56 Pals 1999 (Wijnaldum); Schepers in prep. A (Oosterbeintum).
57 Schepers 2016, 149.

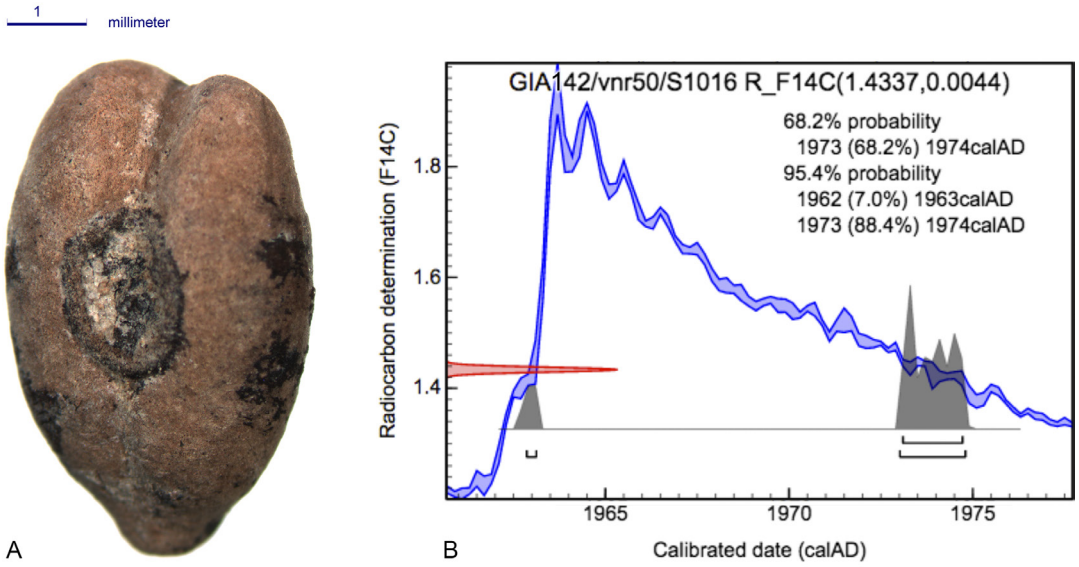

Fig. 6.8 The grape seed (*Vitis vinifera*) from Schettens-Sotterum (a) and the radiocarbon dating results (b) showing that this seed actually is a (relatively) recent contamination of the excavation layers. Photo M. Schepers.

vast majority of the plant remains included in this review are dated by context, which basically means that their age is determined through association with pottery found in the same feature. With the grape seed found at Schettens-Sotterum, neither ceramics nor other convincingly associated and sufficiently dateable material-culture remains were present. Nonetheless, yet tentatively, this seed was expected to be medieval or older. Given the rarity of the find, however, the single seed was captured on a photograph, and then sent in for radiocarbon dating (fig. 6.8). The results were clear, yet disappointing: the seed turned out to be modern contamination, with an almost certain date in 1973-1974.

Several other species occur very rarely, and mainly in the High and Late Middle Ages. Cappers and Bottema, for example, found both mulberry and melon or cucumber (*Cucumis melo/sativus*) in a 15th-century sample from Sneek-Martiniplein.[58] In the light of the overall occurrence of *Cucumis* remains from the Netherlands, this would be a very early find, but not impossible.[59] The context information provided in the original report does not allow a more detailed judgement upon the reliability of this date.

A specific group of edible juicy fruits can ecologically be related to peat- or heathland environments and dry forests. This is an ecologically rather broad category, but in this contribution we have grouped them together since they stand out from the other species. The group includes crowberry (*Empetrum nigrum*), bog cranberry *(Oxycoccus palustris*), and blueberry (*Vaccinium myrtillus*), all species within the heather family (Ericaceae). Crowberry and bogberry finds occur in a relatively high frequency at Leeuwarden-Gouverneursplein, but in general these are all very rare.[60]

6.3.2 Groups 2 and 3: dry fruits and vegetative plant food

An overview as presented for the species composing group 1 cannot be made for those in groups 2 and 3. Simply counting sample frequency or even seed counts would not allow insight into the likelihood of wild plants being consumed. This does not mean that no observations can be made at all. We select two species groups with clear examples from the Dutch-German coastal area to discuss the matter in somewhat more detail. For an in-depth discussion and a broader overview of collected dry seeds and fruits as prehistoric and early historic food we refer to Behre.[61] Finally, we will discuss some vegetative plant parts that may have been consumed. All species discussed here concern species that were commonly available in the area from the very beginning of settlement.

Oil and mustard (*Brassica* spp. and *Raphanis raphanistrum*)

Various plants within the Brassicaceae family produce oily seeds. Moreover, many of these have a strong mustardy or pungent taste. Two prime examples are black mustard (*Brassica nigra*) and field mustard (*Brassica rapa*). The discussion whether or not these plants were intentionally gathered and used by terp dwellers has a long history. Taking the find conditions as a prime argument, Körber-Grohne concludes that the use of *B. rapa* is unlikely at Feddersen Wierde: '*Kein einziger Fund deutet auf menschliche Sammeltätigkeit hin. Es gab weder Samenhäufchen auf Herden, noch in Speichern, noch in Gefäßen, auch haben sich keine Dresch- oder Mahlrückstände gefunden, wie es bei den vorher beschriebenen Kulturpflanzen der Fall war*'.[62]

58 Cappers & Bottema 2008.
59 In comparison to information in the Dutch database for archaeobotanical research RADAR (Van Haaster & Brinkkemper 1995, version 2010).
60 Van Zeist et al. 1987.
61 Behre 2008.
62 Körber-Grohne 1967, 187.

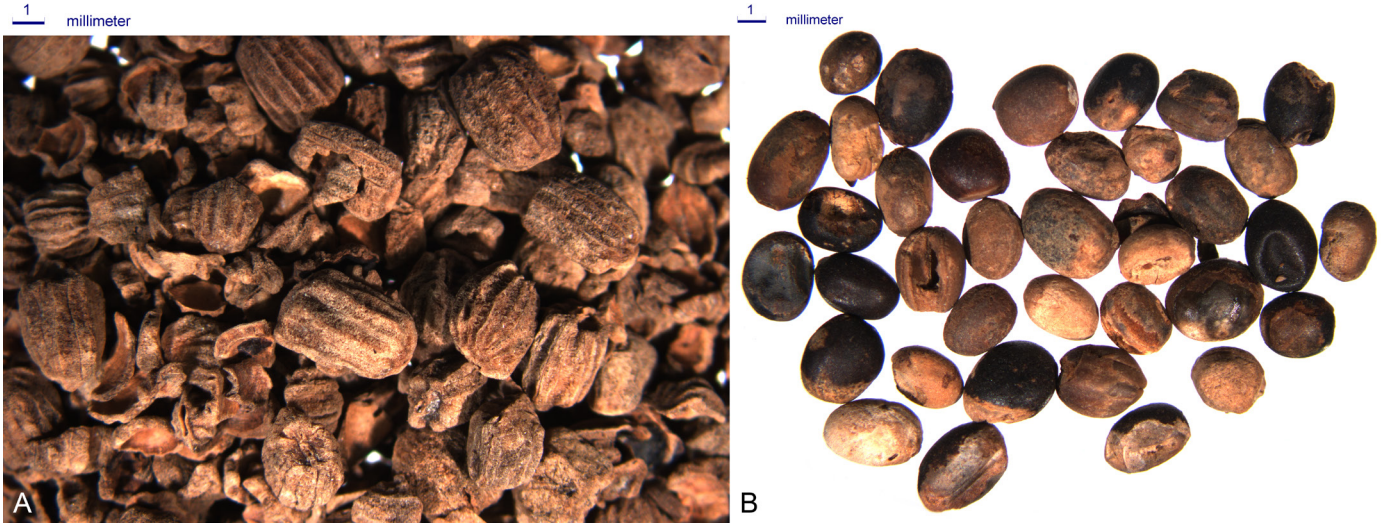

Fig. 6.9 Waterlogged (but dessicated) fruit remains (a) of wild radish (*Raphanus raphanistrum*) and its mineralized seeds (b) from the terp site of Saksenoord (B), dated AD 100- 250. Photos C. Assië.

Van Zeist disagrees, stating that *B. rapa* is not an indigenous species in Western Europe, and that it only escaped from cultivation and became part of the 'wild weed flora' at a later stage.[63] Many very early finds of this species have been reported from the Netherlands since Van Zeist made these comments, however, some dating back to the Neolithic.[64] In the light of this evidence, Körber-Grohne's hypothesis does become more likely. At the same time, there is no doubt that *B. rapa* became a crop plant at a later stage, cultivated not just for its oleaginous seeds, but, as suggested also by Van Zeist, for the turnips as well.[65] A concentration of more than 100 seeds at the high-medieval terp site of Sneek-Stinswier is attributed to a crop originally grown for turnips, whereby some of the plants had bolted (progressing into flowering and setting seed).[66] Several thousand seeds were found in a 12th-century well at Beetgumermolen, which definitely confirms cultivation in the High Middle Ages.[67]

It should be mentioned here that from both *Brassica* species known to have been cultivated for either their seeds or vegetative parts, neither significant concentrations nor finds from clear-cut contexts pre-dating the High Medieval period are known. A find that does deserve some discussion, however, is reported from Saksenoord.[68] In a sample dated to the Roman Iron Age, a concentration of fruit fragments and seeds of wild radish (*Raphanus raphanistrum*) was encountered (fig. 6.9). It cannot be ruled out that these remains represent intentionally collected material. However, *R. raphanistrum* was not included in the list of certainly collected plants in the aforementioned review of foraged wild seeds and fruits.[69]

Pale knotweed, henbane and orache

There was a long debate as to whether pale knotweed (*Persicaria lapathifolia*) was collected as edible or not. The solution was presented by a large pure find from the medieval terp of Hover-Warf at Bremen-Strom, situated in a freshwater environment close to the river Weser (fig. 6.1).[70] A thick layer of more than 4 litres of pure seeds (only 0.5% from other species) leaves no room for an interpretation other than intentional collection. This was one of the key finds discussed in the 2008 review of collected plants, and in that paper was accepted as one of six plants from which deliberate collection could be established with certainty. Pale knotweed is an extremely common find in terp research, and the way it grows makes it an easy plant to harvest seeds from (fig. 6.10).

The same is true for henbane (*Chenopodium album)*. This plant of the Amaranth family[71] is well-known in archaeobotanical research as a likely candidate for deliberate gathering, and several examples from convincing contexts attest to such.[72] Hence it also made the aforementioned list of certainly collected plants. However, another genus from the same family is even more common in salt-marsh ecosystems: orache (*Atriplex*). Several orache species occur in salt-marsh environments, including *A. portulacoïdes* (formerly *Halimione p.*) and *A. littoralis*/*A. prostrata*. The fruits of the last-named are not easy to distinguish morphologically from those of the closely related *A. patula*-type, but probably account for the vast majority of *Atriplex* fruits found in the area. Species from the former goosefoot family are known for their thick and durable walls, which will make them survive even less favourable preservation

63 Van Zeist 1974, 364.
64 Information retrieved from the Dutch database for archaeobotanical research RADAR (Van Haaster & Brinkkemper 1995, version 2010).
65 Van Zeist 1974, 364.
66 Hänninen & Van Waijen 2005.
67 Van Haaster 2005.
68 Schepers & Assië 2018.
69 Behre 2008, 71.
70 As an indication: remains from this plant were found in 135 out of the 332 samples included in a vegetation review based on Dutch terp research (Schepers et al. 2013, 764).
71 Amaranthaceae. This family includes the former goosefoot family (Chenopodiaceae)
72 Behre 2008.

Fig. 6.10 Pale knotweed (*Persicaria lapathifolia*). A: Fruiting plants at Adorp (July 2021), Photo M. Schepers; B: Fruits from the site of Bremen-Strom, dated to the 12th century or somewhat earlier. Scale bar = 2 mm. Photo K.-E. Behre.

conditions; this potentially causes their members to be overrepresented in the archaeobotanical record.[73]

The fruits not only occur in extremely high sample frequency, but also in considerable densities.[74] Extreme examples were reported by Cappers from Heveskesklooster (fig. 6.11).[75] Almost certainly these also are the fruits that Rijkens in 1835 described as "many small, flat, black, shiny seed kernels" in the Tuinsterwierde at Leens.[76]

Collecting vegetative plant parts

The usual emphasis on seeds and fruits in the study of edible plant species in archaeobotany, as also in the present contribution, does not at all mean that archaeobotanists underestimate the importance of vegetative plant remains. In particular in areas where juicy fruits are rare, these green parts offer an essential source of Vitamin C, as Nieuwhof recently mentioned with reference to the salt-marsh environment of the northern Netherlands.[77] For Bronze Age West-Frisia the same point was made by Van Amerongen, who goes into the subject more deeply and highlights various health issues that would ensue if none of these plant parts were eaten.[78] Various plants would have been commonly available and easy to collect for the terp dwellers. This includes specific parts of some of the plants mentioned above, but also other plants abounding in the salt-marsh environment. These plants include, among many others, great plantain (*Plantago major*), curled dock (*Rumex crispus*), and glasswort (*Salicornia europaea*). The most important one is *Triglochin maritima* (*sea arrow grass*), which is still collected and eaten in some German salt marshes.

6.4 Discussion

It was already well-known among terp researchers that fruits and nuts were not commonly available in the area. With this contribution we hope to provide an overview that supports that claim with actual numbers. We once again stress that we have only included those sites and site groups in which at least one of the species featuring in this review was included. This might falsely suggest that many of these plants were considerably more common than previously thought.

None of the fruits and nuts (see par. 6.3.1) will have been abundantly available to the inhabitants of terp sites. Their availability partly relates to the local occurrence of trees and shrubs, which will have been extremely rare on the salt marshes. For Elisenhof, it has been suggested that even elderberries were collected in the alluvial forests or on the sandy soils at some distance from the terp, which may indeed be true.[79] In subsequent research at other terp sites, however, the more general occurrence of elder has led to the conclusion that elder trees could have grown locally on the actual terp mounds.[80] The present review shows that elderberries stand out as the most commonly available tree fruit in the region. While probably not present at every terp, and definitely not in high numbers, elderberries occur widely both in time and space.

This is different for the other fruits and nuts. Apples, pears and hazelnuts are rare, and the contexts of these plants on various occasions point to importation or gathering from elsewhere. Knol's general remark that various fruit trees grew on the terp mounds is definitely overstated.[81] This only changed in the High Middle Ages, when ecological conditions changed dramatically as a result of ongoing dike building. From this period onwards, a greater number of species could indeed be gathered locally, and the cultivation of e.g. apple trees became feasible.[82] The images

73 Brinkkemper 2007, 311 see also Behre 2008.
74 Remains from this plant were found in 310 out of 332 samples included in a vegetation review based on Dutch terp research (Schepers et al. 2013, 764).
75 Cappers 1995; Cappers & Neef 2021, 75.
76 Rijkens 1835, 59 (age unknown); see also Schepers 2016, 141-142.
77 Nieuwhof 2018, 46.
78 Van Amerongen 2016, 267-269.
79 Behre 1976, 22.
80 See for example Behre 1991, 151 (Niens); Lempiäinen & Behre 1997 (Misselwarden 33 & Cappel 27); Schepers et al. 2013, 768 (more general reflection on trees).
81 Knol 2009, 24.
82 Behre 1986, 110 (Alten Boomborg); Van Haaster et al. 2003, 10 (Dokkum).

of planted trees beside drinking ponds, as known from the Halligen, might well give an impression of the salt-marsh landscapes and the dwelling mounds in the period between ca. AD 1200 and AD 1600, but not of the landscape before that. Without going into too much detail, this also implies that at most terp settlements virtually all wood was imported or gathered as driftwood.[83] Despite the well-known methodological constraints with respect to pollen analyses from coastal environments, it must be stressed here that palynological studies have confirmed this view.[84]

Before the High Middle Ages, people entirely relied on other plant resources. This included mainly cultivated crops grown on elevated levees with low salinity in the salt marshes, collected seeds and fruits from plants such as orache and knotweed, and green parts of the wide variety of plants that the salt-marsh landscape had to offer. This also raises questions about the frequency with which people did have access to the occasional apple, pear or hazelnut. According to Nieuwhof, the remains of these plants are found 'now and then', and were 'sometimes' gathered further inland.[85] Nieuwhof uses so-called 'probability phrases' here, which are open to different interpretations.[86] In archaeology, these terms cannot, and need not always be avoided, but we should be aware of their potential impact. The number of samples from the area studied so far justifies a moderate downgrading of Nieuwhofs' statements: these are convincingly true only for a small number of terp sites with very intense investigations, such as Elisenhof, Feddersen Wierde, and early phases at Ezinge, where these species must have been collected on the sometimes distant Pleistocene grounds.[87] For the vast majority of sites, access to these fruits will have been highly exceptional far into the Early Middle Ages.

These observations are also relevant with respect to the likelihood of various crops having been grown locally or imported from elsewhere, in two ways. First, the overall scarcity of imported fruits and nuts may be considered somewhat surprising if people were already importing crops anyway. In other words: the lack of imported nuts and fruits is a circumstantial argument against the importation of crops. Secondly, the trends that do occur in the distribution of fruits and nuts (this contribution) do not align at all with the trends observed in the composition of crop plants, both in time and space. Finds of fava beans, flax and barley have long been known to be extremely common in terp samples, and often occur in major concentrations. Recent research, however, also shows that major changes in the crop assemblage happened even long before the High Middle Ages. This is a pattern that can be observed on site level at sites with long habitation, as well as in an overall summary of data available from terp research.[88]

Fig. 6.11 A huge concentration of orache (*Atriplex*) fruits from the terp Heveskesklooster, dated AD 800-1300. Photo D. Fennema.

In the High and Late Middle Ages, the degree to which other plants, and perhaps 'luxuries' became available was no longer dominated by environmental constraints, thanks to the ongoing endikement. Even more important was the increase in mobility, which promoted trade. The degree of urbanization becomes an important factor as well. Van Haaster et al. point out that the low number of fruits and nuts in 13th-century Dokkum testify to the town's predominantly rural character at the time.[89] The high- and late-medieval terp sites of Leeuwarden-Gouverneursplein, Leeuwarden-Speelmanstraat, and Sneek-Martiniplein are exceptional in terms of variety with respect to fruits and nuts. This marks the transition of these terp settlements from rural, self-sufficient settlements to early (modest) towns. Interesting in this respect is also the find of grapevine wood in Sneek.[90]

6.5 Conclusion

Fruits and nuts were extremely rare in terp settlements for most of their history. The only fruit tree that commonly occurred on the mounds was elder. Edible fruits and nuts such as plums, apples and hazelnuts did not grow locally and were on rare occasions gathered further inland or acquired through exchange. In contrast to crop plants and

83 See also Bottema-Mac Gillavry 2010.
84 Woldring & Kleine 2008; Nieuwhof & Woldring 2008; Behre 1976, 57.
85 Nieuwhof 2018, 46.
86 See e.g. Willems et al. 2020.
87 As also stated by Nieuwhof 2020, 55.
88 Schepers & Behre in prep.; See also Schepers in prep. A.
89 Van Haaster et al. 2003, 10.
90 Stuijts 2008.

domesticated animals, major changes in these types of plants are lacking before the High Middle Ages. Fruits and seeds as well as vegetative parts of wild plants will have been a constant and essential component of the terp dwellers' diet.

In general, terp archaeologists have demonstrated a major interest in the period of 'true salt-marsh life'. In future terp excavations, features dated between approximately AD 1300 and 1600 should also receive special attention. Interesting in this respect are the 'monastic-period' samples from Heveskesklooster, which differ considerably from those recorded from the upcoming urban centres mentioned above. For these centuries in particular, it would be most interesting to find out what the botanical differences are between the evolving towns, agricultural villages that retained a rural character, the many scattered monasteries, and, perhaps, the residences of a rising aristocracy.[91] Close cooperation between archaeologists, including archaeobotanists, and historians, including landscape historians, would then be essential.

Acknowledgements

The authors would like to thank Annet Nieuwhof for her huge contribution to terp archaeology. Terp archaeology is characterized by substantial differentiation in research intensity, ranging from exuberant flowering to virtual dormancy. Annet is an absolute frontrunner in the current period of bloom. She has also been a key player in making sure that terp archaeology is practised in close cooperation between Dutch and German researchers, as also is the case in this chapter. A strong interest in archaeobotany, at least partly caused by her love of gardening, has been clear throughout her 'terp career'. The first author's earliest active memory of her is when she was inspecting dung fragments from the Wierde Englum at the archaeobotany laboratory. We discussed the identification of a fruit stuck on the outside, which happened to be an elder fruit (*Sambucus nigra*). The occurrence of elder in dung can tentatively be regarded an indication for local occurrence. The results from the systematic overview presented in this contribution further support this interpretation. We would also like to thank Johan Nicolay for his critical comments on an earlier version, as well as Jochem Dorrestein for preparing the distribution map.

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Mans Schepers' research centres upon human-environment interaction in various landscapes. In the northern clay region, he has mainly worked on crop cultivation and other ways in which people made use of the environment. He is currently employed as assistant professor at the Centre for Landscape Research of the University of Groningen.

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91 For the upcoming nobility, see chapter 4.

Literature

Van Amerongen, Y.F., 2016: *Wild West Frisia. The role of domestic and wild resources exploitation in bronze age subsistence* (=dissertation, Leiden University). Leiden.

Bakels, C.C., 1997: De cultuurgewassen van de Nederlandse prehistorie, 5400 v.C–12 v.C. In: A.C. Zeven (ed.), *De introductie van onze cultuurplanten en hun begeleiders, van Neolithicum tot 1500 AD*. Wageningen, 15-24.

Behre, K.-E., 1972: Kultur- und Wildpflanzenreste aus der Marschgrabung Jemgumkloster/Ems (um Christi Geburt). *Neue Ausgrabungen und Forschungen in Niedersachsen* 7, 164-184.

Behre, K.-E., 1976: *Die Pflanzenreste aus der frühgeschichtlichen Wurt Elisenhof*. Bern/Frankfurt am Main

Behre, K.-E., 1977: Acker, Grünland und natärliche Vegetation während der römischen Kaiserzeit im Gebiet der Marschensiedlung Bentumersiel/Unterems. *Probleme der Küstenforschung im südlichen Nordseegebiet* 12, 67-84.

Behre, K.-E., 1986: Ackerbau, Vegetation und Umwelt im Bereich früh- und hochmittelalterlicher Siedlungen im Flußmarschgebiet der unteren Ems. *Probleme der Küstenforschung im südlichen Nordseegebiet* 16, 99-123.

Behre, K.-E., 1991: Umwelt und Ernährung der frühmittelalterlichen Wurt Niens/Butjadingen nach den Ergebnissen der botanischen Untersuchungen. *Probleme der Küstenforschung im südlichen Nordseegebiet* 18, 141-168.

Behre, K.-E., 2008: Collected seeds and fruits from herbs as prehistoric food. *Vegetation History and Archaeobotany* 17, 65-73.

Beijerinck, W., 1929: *De subfossiele plantenresten in de terpen van Friesland en Groningen. Eerste gedeelte: vruchten, zaden en bloemen*. Wageningen.

Bittman, F. & S. Wolters, 2020: Eisenzeitliche und frühmittelalterliche Kultur- und Wildpflanzenreste aus der Dorfwurt Upleward. In: J.F. Kegler (ed.), *Ostfriesland – Niedersachsenweit. Festschrift für Rolf Bärenfänger*. Aurich, 81-90.

Boersma, J.W., 2005: Colonists on the clay. The occupation of the northern coastal region. In: L.P. Louwe Kooijmans, P.W. van den Broeke, H. Fokkens & A. van Gijn (eds), *The prehistory of the Netherlands*. Amsterdam, 561-576.

Bottema-Mac Gillavry, J.M., 2010: Scheepshout en andere houtvondsten. In: J.A.W. Nicolay (ed), *Terpbewoning in oostelijk Friesland. Twee opgravingen in het voormalige kweldergebied van Oostergo* (= Groningen Archaeological Studies 10). Eelde, 155–162.

Brinkkemper, O., 2006: Study of the Preservation Quality of Archaeological Sites Using Botanical Macroremains, *Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek* 46, 303-312.

Cappers, R.T.J., 1995: Botanical macro-remains of vascular plants of the Heveskesklooster terp (the Netherlands) as tools to characterize the past environment. *Palaeohistoria* 35/36, 107-169.

Cappers, R.T.J. & R.M. Bekker, 2021: *A manual for the identification of plant seeds and fruits* (= Groningen Archaeological Studies 23, 2nd revised edition). Groningen.

Cappers, R.T.J. & F. Bottema, 2008: Botanische macroresten. In A. Ufkes (ed.), *Een middeleeuws leerbewerkerskwartier in Sneek. Een archeologische opgraving aan het Martiniplein te Sneek, gemeente Sneek (Fr.)* (= ARC-publicaties 17). Groningen, 229-230.

Cappers, R.T.J. & R. Neef, 2021: *Handbook of Plant Palaeoecology* (= Groningen Archaeological Studies 19, 2nd revised edition). Groningen.

Cappers, R.T.J., F. Vrede & H. Dopmeijer, 2005: Plantenresten uit de Friesestraatweg-wierde. *Hervonden Stad* 10, 93-104.

Caspers, S., 2010: *Scrapheap Challenge Hallum. Archaeometallurgical investigation of a 3rd century bronze hoard* (= Master thesis, VU Amsterdam). Amsterdam.

Es, W.A., van, 1967. Friesland in Roman Times. Berichten van de Rijksdienst voor het Oudheidkundig Bodemonderzoek 15/16, 37-68.

Groenman-Van Waateringe, W., 1999: The vegetation on the terp. In: J.C. Besteman, J.M. Bos, D.A. Gerrets, H.A. Heidinga & J. de Koning (eds), *The excavations at Wijnaldum. Reports on Frisia in Roman and Medieval times*. Rotterdam, 125-138.

Haaster, H. van, 2005: *Voedingsgewoonten en milieuomstandigheden op en rond twee nederzettingen uit de 12e/13e eeuw te Beetgumermolen (Fr.)* (= BIAXiaal 229). Zaandam.

Haaster, H. van, 2006: *Voedingsgewoonten en milieuomstandigheden op en rond een middeleeuwse vindplaats aan de Kimswerderlaan bij Zürich (Fr.) alsmede enkele archeobotanische waarnemingen op de locatie Hegewiersterfjild* (= BIAXiaal 282). Zaandam.

Haaster, H. van, D. Brinkhuizen, P. van Rijn & J.T. Zeiler, 2003: *Plantaardige en dierlijke resten uit enkele 13e-eeuwse ophogingslagen in Dokkum* (= BIAXiaal 153). Zaandam.

Haaster, H. van & O. Brinkkemper, 1995: RADAR, a relational archaeobotanical database for advanced research, *Vegetation history and archaeobotany* 4, 117-25.

Hänninen, K. & M. van Waijen, 2005: *De Stinswier van Sneek. Resultaten van archeobotanisch onderzoek aan materiaal uit de 12e en 13e eeuw* (= BIAXiaal 237). Zaandam.

Knol, E., 2009: Het rijke Groningerland. In: D. Bosscher, P. Breukink, F. Ekkers, S. Van der Hoek & J. Paauw (eds), *Ooit gebouwd voor altijd*. Groningen, 24-25.

Körber-Grohne, U., 1967: *Geobotanische Untersuchungen auf der Feddersen Wierde*. Wiesbaden.

Körber-Grohne, U., 1996: *Pflaumen, Kirschpflaumen, Schlehen*. Stuttgart.

Lempiäinen, T. & K.-E. Behre, 1997: Zur Umwelt und Ernährung einiger hochmittelalterlicher Wurtsiedlungen in der Marsch des Landes Wursten, Ldkr. Cuxhaven (Niedersachsen), nach archäobotanischen Untersuchungen. *Probleme der Küstenforschung im südlichen Nordseegebiet* 24, 275-300.

Maurer, A., 2010: *Een studie naar de flora bij de terp Anjum-Schanskerwei gedurende de opkomst van bedijking (800-1300 n. Chr.)* (= Bachelor's thesis, University of Groningen). Groningen.

Maurer, A., 2016: Bijlage 8: Macrobotanische analyse. In: B.I. van Hoof (ed.), *Plangebied Johan Frisosluis, gemeente Súdwest Fryslân; archeologisch onderzoek: een noodopgraving* (= RAAP-Rapport 2923). Weesp, 113-122.

Maurer, A., 2019: Akkerbouw en mogelijke veeteelt in een brak tot zoet landschap: botanisch onderzoek aan de terp Arkum. In: M. Bakker & G. de Langen (eds), *Opgraving Tjerkwerd-Arkum. Ontginning en hergebruik van een later verdwenen (klei-op-)veenlandschap* (= Grondsporen 46). Groningen, 209-220.

Nieuwhof, A., 2018: Dagelijks leven op terpen en wierden. In: A. Nieuwhof, J. Nicolay & J. Wiersma (eds), *De geschiedenis van terpen- en wierdenland. Een verhaal in ontwikkeling* (= Jaarverslagen van de Vereniging voor Terpenonderzoek 100). Groningen, 27-56.

Nieuwhof, A., 2020: *Ezinge revisited. The ancient roots of a terp settlement. Volume 1* (= Groningen Archaeological Studies 37). Groningen.

Nieuwhof, A. & H. Woldring, 2008: Botanische resten. In: A. Nieuwhof (ed.), *De Leege Wier van Englum. Archeologisch onderzoek in het Reitdiepgebied* (= Jaarverslagen van de Vereniging voor Terpenonderzoek 91). Groningen, 160-176.

Out, W.A. & S. Kaaijk, 2010: Botanische macroresten. In: S.J. Tuinstra & N. van Malssen (eds), *Een archeologische opgraving op de locatie van twee archeologische monumenten aan het Oude Diep tussen Goutum en Wirdum, gemeente Leeuwarden (Fr)* (= ARC-publicaties 210). Groningen, 105-109.

Pals, J.P., 1999: Preliminary notes on crop plants and the natural and anthropogeneous vegetation. In: J.C. Besteman, J.M. Bos, D.A. Gerrets, H.A. Heidinga & J. de Koning (eds), *The excavations at Wijnaldum. Reports on Frisia in Roman and Medieval times*. Rotterdam, 139-149.

Rijkens, J.G., 1835: Korte schets omtrent de Leensterwierden. *Almanak ter bevordering van kennis en goeden smaak*. Leens, 59-68.

Roller, G.J., de 1999: De macroresten. In G.J. de Roller & I.L.M. Stuijts (eds), *Een palaeo-botanisch onderzoek bij Hempens-Teerns, gem. Leeuwarden* (= ARC-publicaties 25). Groningen, 7-24.

Roller, G.J. de, 2003a: Botanische macroresten. In: J.B. Hielkema (ed.), *Een laatmiddeleeuwse terp bij de Tomashof. Een Aanvullend Archeologisch Onderzoek in Workum, gemeente Nijefurd (Fr.)* (= ARC-publicaties 73). Groningen, 23-26.

Roller, G.J. de, 2003b: Botanische macroresten. In: C.G. Koopstra & M.A. Huisman (eds), *Resten van het Thiascingacloster; een archeologische begeleiding in de dorpskern van Thesinge, gemeente Ten Boer (Gr.)* (= ARC-publicaties 87). Groningen, 67-70.

Roller, G.J. de, 2006: Botanische macroresten. In: M.C. Blom & C.G. Koopstra (eds), *Een archeologisch inventariserend veldonderzoek (IVO) door middel van proefsleuven op de dorpsterp van Wons, gemeente Wûnseradiel (Fr.)* (= ARC-publicaties 112). Groningen, 23-25.

Roller, G.J. de, 2015: Botanische macroresten. In: A.R. Wieringa (ed.), *Archeologische begeleiding Hoofdweg, Molenweg en Stelterweg te Godlinze, gemeente Delfzijl (GR)*(= MUG-publicatie 2014-93). Leek, 45-53.

Roller, G.J. de & G. Korf, 2002: Archeobotanie. In: C.G. Koopstra (ed.), *Archeologisch onderzoek op de wierde van Baflo, provincie Groningen* (= ARC-publicaties 47). Groningen, 25-36.

Schepers, M., in prep. A: Variatie in cultuurplanten in Friese terpen. In: J.A.W. Nicolay & G.J. de Langen (eds), *Friese terpen in doorsnede. Landschap, bewoning en exploitatie* (= Jaarverslagen van de Vereniging voor Terpenonderzoek). Groningen.

Schepers, M., in prep. B: Veenweiden en voszegge als akkeronkruid: de archeobotanie van Wartena. In: M. Bakker & G.J. De Langen (eds), Working title*: Archeologisch onderzoek naar terpen en vroege ontginningen rond Warten en Warstiens (Fr.)* (= Jaarverslagen van de vereniging voor Terpenonderzoek). Groningen.

Schepers, M., 2014: Pollen en zaden. In: J. van Dalfsen, E. Schrijer & C. Tulp (eds), *Winsum, Boogplein, Gemeente Winsum. Archeologische opgraving* (= Steekproefrapport 2012-04/04U). Zuidhorn, 50-51.

Schepers, M., 2015a: Akkerbouw en vegetatie in Marssum. In: J.B. Hielkema (ed.), *Nederzettingssporen op de kwelder. Haak Noord, vindplaats 1: Marssum-It Aldlân* (= RAAP-Rapport 2997). Weesp, 231-251.

Schepers, M., 2015b: Zilt met een korreltje zout. Nieuw licht op vegetatie rond de terp. In: J.A.W. Nicolay & G.L. de Langen (eds), *Graven aan de voet van de Achlumer dorpsterp. Archeologische sporen rondom een terpnederzetting* (= Jaarverslagen van de Vereniging voor Terpenonderzoek 97). Groningen, 183-204.

Schepers, M., 2016: Gebruiksplanten in het terpen- en wierdengebied. In: A. Nieuwhof (ed.), *Van Wierhuizen tot Achlum. Honderd jaar archeologisch onderzoek in terpen en wierden* (= Jaarverslagen van de Vereniging voor Terpenonderzoek 98). Groningen, 141-152.

Schepers, M., 2018a: Langzame toename van mariene invloed triggert gewaskeuze: de archeobotanie van Sneek-Harinxmaland. In: M. Bakker, G.J. de Langen & T. Sibma (eds), *Opgraving Sneek-Harinxmaland. Van vlaknederzetting in een veengebied tot afgetopte terp onder een kleipakket* (= Grondsporen 36). Groningen, 138-149.

Schepers, M., 2018b: Lijnzaadpap na het hooien: vegetatie, landgebruik en plantgebruik tijdens de late middeleeuwen en Nieuwe tijd. In J.A.W. Nicolay (ed.), *Huisplaatsen in De Onlanden. De geschiedenis van een Drents veenweidegebied* (= Groningen Archaeological Studies 34). Eelde, 614-641.

Schepers, M., 2020: Droge heide, kwelderkreken en veenweide: ecosysteemdynamiek en landschapsgebruik. In: M. Bakker & G.J. de Langen (eds), *Opgraving Leeuwarden-Bullepolder. Van vlaknederzetting op het hoogveen in de midden-ijzertijd tot terpbewoning in een klei-op-veengebied in de Romeinse tijd* (= Grondsporen 38). Groningen, 111-121.

Schepers, M. & C. Assië, 2018: Archeobotanisch onderzoek. In: T.W. Varwijk & G.J. de Langen (eds), *Opgraving Lollum-Saksenoord. Archeologisch onderzoek aan de zool van de commercieel afgegraven terp Saksenoord bij Lollum in Westergo (Friesland)* (= Grondsporen 35). Groningen, 93-102.

Schepers, M. & K.-E. Behre, in prep: A review of crop plants in the Dutch and German terpen area between 700 BC and AD 1600 AD. To be submitted to *Vegetation History and Archaeobotany*.

Schepers, M., R.T.J. Cappers & R.M. Bekker, 2013: A review of prehistoric and early historic mainland salt marsh vegetation in the northern-Netherlands based on the analysis of plant macrofossils. *Journal of Coastal Conservation* 17, 755-773.

Schepers, M. & A. Maurer, 2018: Archeobotanisch onderzoek: paalkuilen, plaggenwanden en putvullingen. In: T.W. Varwijk & G.J. de Langen (eds), *Opgraving Lollum-Saksenoord. Archeologisch onderzoek aan de zool van de commercieel afgegraven terp Saksenoord bij Lollum in Westergo (Friesland)* (= Grondsporen 37). Groningen, 93-102.

Schepers, M. & K.M. de Vries 2018: Potplanten en plantpotten. Een model voor het systematisch categoriseren van relaties tussen aardewerk en botanie. In: A. Nieuwhof, E. Knol & J. Schokker (eds), *Fragmenten uit de rijke wereld van de archeologie* (= Jaarverslagen van de Vereniging voor Terpenonderzoek 99). Groningen, 221-236.

Stuijts, I.-L., 2008: Hout. In A. Ufkes (ed.), *Een middeleeuws leerbewerkerskwartier in Sneek. Een archeologische opgraving aan het Martiniplein te Sneek, gemeente Sneek (Fr.)* (= ARC-publicaties 17). Groningen, 221-228.

Vrede, F., H.G. Dopmeyer, F.J.M.B. Kortmann & A. Valk, 2010: De cultuurgewassen en wilde planten. In: J. Huis in 't Veld (ed.), *Wonen op een huiswierde in de Late Middeleeuwen en Nieuwe Tijd. Archeologisch onderzoek in de toekomstige nieuwbouwwijk de held III te Groningen* (= Stadse Fratsen 22). Groningen, 81-84.

Willems, S. J. W., C.J. Albers, and I. Smeets, 2020: Variability in the interpretation of probability phrases used in Dutch news articles — a risk for miscommunication. *Journal of Science Communication* 19 (02), A03. https://doi.org/10.22323/2.19020203.

Woldring, H., 2012: Traditional plum varieties in the northern Netherlands: modern occurrences and archaeological evidence. *Palaeohistoria* 53/54, 393-423.

Wolters, S., 2012: Pollenanalytische und archäobotanische Untersuchungen am mittelalterlichen Kirchhügel

in Ellens. In: H. Haiduck (ed.), *Eine untergegangene Kirche am Jadebusen. Archäologische grabungen und Untersuchungen auf dem mittelalterlichen Kirchhügel von Ellens* (=Kataloge und Schriften des Schlossmuseums Jever 29). Jever, 165-176.

Zeist, W. van, 1974: Palaeobotanical studies of settlement sites in the coastal area of the Netherlands. *Palaeohistoria* 16, 223-371.

Zeist, W. van, 1988a: Archeobotanisch onderzoek van Oldeboorn. In: M. Bierma, A.T. Clason, E. Kramer & G.J. de Langen (eds), *Terpen en wierden in het Fries-Groningse kustgebied*. Groningen, 190-195.

Zeist, W. van, 1988b: Botanical evidence of relations between the sand and clay districts of the north off the Netherlands in medieval times. In: H. Küster (ed.), *Der prähistorische Mensch und seine Umwelt. Festschrift für Udelgard Körber-Grohne*. Stuttgart, 381-387.

Zeist, W. van, 1989: Plant remains from a Middle Iron Age coastal marsh site near Middelstum. An intriguing cereal grain find. *Helinium* 28, 103-116.

Zeist, W. van, R.T.J. Cappers, R. Neef & H. During, 1987: A palaeobotanical investigation of medieval occupation deposits in Leeuwarden, the Netherlands. *Procedeedings of the Koninklijke Nederlandse Akademie van Wetenschappen* 90, 371-426.

Appendix 6.1

Sample frequencies per site group for the taxa in Group 1. See table 1 for an explanation of the phases. Numbers refer to the number of samples on that site that contain a particular taxon; x=taxon is present, but number of samples unclear. Underlined numbers indicate that at least one sample on that location contained a concentration of >10 specimens. See fig. 6.1 for locations (loc.). Site groups are arranged according to phase and subsequently alphabetically. Location numbers are assigned from west to east.

Loc.	Site	Phase	*Sambucus nigra*	*Corylus avellana*	*Malus sylvestris*	*Malus/Pyrus*	*Pyrus communis*	*Rubus fruticosus*	*Rubus idaeus*	*Rubus*	*Juglans regia*	*Prunus avium/cerasus*	*Prunus domestica*	*Prunus*	*Ficus carica*	*Vitis vinifera*	*Rosa*	*Ribes rubrum*	*Quercus*	*Rhamnus cathartica*	*Cucumis melo/sativus*	*Morus*	*Vaccinium myrtillus*	*Empetrum nigrum*	*Oxycoccus palustris*	Reference
30	Ezinge	1		x										x					x							Nieuwhof 2020
19	Goutum	1																		1						Out & Kaaijk 2010
17	Jelsum	1			1																					Schepers in prep. A
9	Saksenoord	1	3																							Schepers & Assië 2018
11	Tritsum	1								1																Van Zeist 1974
7	Schettens-Sotterum	1/2	1																							Unpublished data
6	Achlum	2	1																							Schepers 2015b
8	Arkum	2	1																							Maurer 2019
33	Baflo	2	1																							De Roller & Korf 2002
43	Bentumersiel	2	1														1									Behre 1977
29	Englum	2	5																							Nieuwhof & Woldring 2008
47	Feddersen Wierde	2	1	x																						Körber-Grohne 1967
35	Friesestraatweg	2						1					1													Cappers et al. 2005
18	Hallum	2		1	1												1									Schepers 2016
22	Hempens-Teerns	2	1			1																				De Roller 1999
38	Heveskesklooster	2						3	3					1												Cappers 1995
17	Jelsum	2	1		1			1																		Schepers in prep. A
42	Jemgumkloster	2		1				1	1								3									Behre 1972
23	Leeuwarden-Bullepolder	2						2						1												Schepers 2020
16	Marssum	2	5																	1						Schepers 2015a
9	Saksenoord	2	7																							Schepers & Assië 2018
14	Sneek-Harinxmaland	2	3					1																		Schepers 2018a
36	Thesinge	2	1																							De Roller 2003b
25	Wartena	2						1																		Schepers in prep. B
28	Anjum	3			1		1																			Schepers in prep. A
33	Baflo	3	1																							De Roller & Korf 2002
49	Elisenhof	3	2	18															1							Behre 1976
40	Hatzum-Burg	3	1	1				1																		Behre 1986
20	Leeuwarden Gouverneursplein	3			2																					Van Zeist et al. 1987
21	Leeuwarden Speelmanstraat	3			1																					Van Zeist et al. 1987
16	Marssum	3	1																							Schepers 2015a
45	Niens	3	4	3																			2			Behre 1991
24	Oosterbeintum	3														1										Schepers in prep. A
9	Saksenoord	3	7																							Schepers & Assië 2018
7	Schettens-Sotterum	3	1																							Unpublished data
39	Upleward	3	2																							Bittman & Wolters 2020
5	Wijnaldum	3	1		?											1										Pals 1999 & unpublished data
33	Baflo	3/4	1																							De Roller & Korf 2002
38	Heveskesklooster	3/4	3					1																		Cappers 1995
21	Leeuwarden Speelmanstraat	3/4									1															Van Zeist et al. 1987
1	Stavoren	3/4										1	1													Maurer 2016
6	Achlum	4	1	4																						Schepers 2015b
41	Alten Boomborg	4	1		1			1																		Behre 1986
48	Cappel 27	4	1																							Lempiäinen & Behre 1997
34	De Held	4			1													1					1		1	Vrede et al. 2010
27	Dokkum	4	2	2																						Van Haaster et al. 2003
10	Firdgum	4	1																							Schepers in prep. A

Appendix 6.1

Cont.

Loc.	Site	Phase	*Sambucus nigra*	*Corylus avellana*	*Malus sylvestris*	*Malus/Pyrus*	*Pyrus communis*	*Rubus fruticosus*	*Rubus idaeus*	*Rubus*	*Juglans regia*	*Prunus avium/cerasus*	*Prunus domestica*	*Prunus*	*Ficus carica*	*Vitis vinifera*	*Rosa*	*Ribes rubrum*	*Quercus*	*Rhamnus cathartica*	*Cucumis melo/sativus*	*Morus*	*Vaccinium myrtillus*	*Empetrum nigrum*	*Oxycoccus palustris*	Reference
37	Godlinze	4	1																							De Roller 2015
40	Hatzum-Burg	4	1						2																	Behre 1986
20	Leeuwarden Gouverneursplein	4	2	9	6		1				2	3												2	5	Van Zeist et al. 1987
21	Leeuwarden Speelmanstraat	4	2	3	4		1				1	2			3								1			Van Zeist et al. 1987
46	Misselwarden 33	4	1																							Lempiäinen & Behre 1997
26	Oldeboorn	4			1		1				1															Van Zeist 1988a
31	Onlanden	4	1	2				7																		Schepers 2018b
9	Saksenoord	4	3																							Schepers & Assië 2018
15	Sneek Martiniplein	4		1							1	1														Cappers & Bottema 2008
13	Sneek Stinswier	4												1												Hänninen & Van Waaijen 2005
1	Stavoren	4		3	1																					Maurer 2019
36	Thesinge	4	1																							De Roller 2003b
32	Winsum Boogplein	4													1											Schepers 2014
4	Workum Nijefurd	4		1																						De Roller 2003a
2	Zürich Kimswerderlaan	4	1					2																		Van Haaster 2006b
44	Ellens	4/5	1	1																						Wolters 2012
38	Heveskesklooster	4/5	5		1			3	2				1		1											Cappers 1995
12	Wommels	4/5	4																							Schepers & Maurer 2018
3	Wons	4/5	1																							De Roller 2006
21	Leeuwarden Speelmanstraat	5	1	2	1							1			3	2										Van Zeist et al. 1987
15	Sneek Martiniplein	5				2					1	1			1	2		1			1	1				Cappers & Bottema 2008
Total number of site groups		**68**	**44**	**17**	**15**	**2**	**4**	**13**	**4**	**1**	**6**	**6**	**3**	**4**	**5**	**4**	**3**	**2**	**2**	**2**	**1**	**1**	**3**	**1**	**2**	

Vereniging voor Terpenonderzoek

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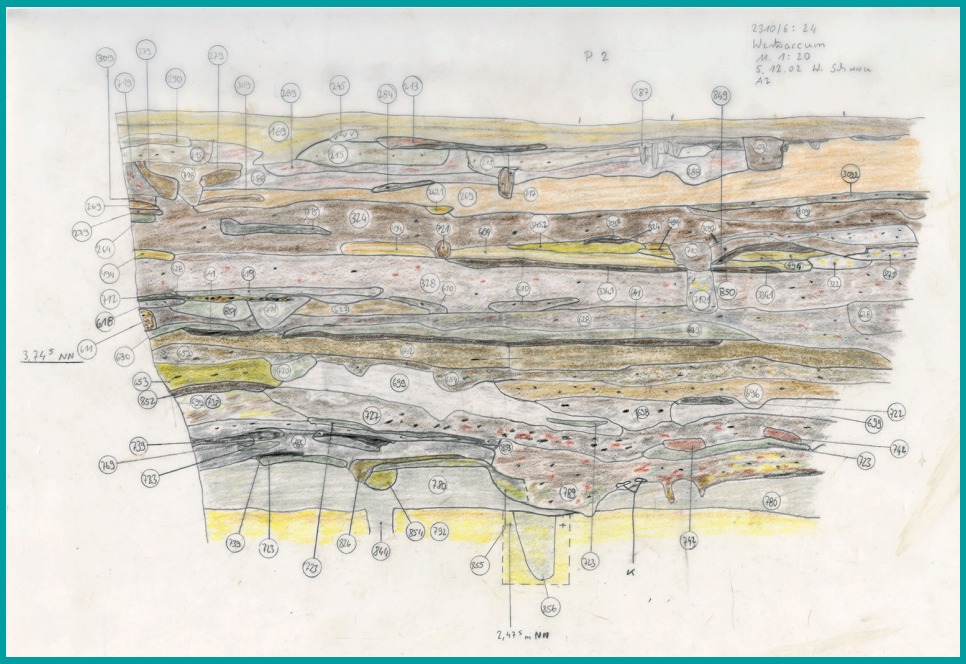

From a modern-day perspective, it may seem odd that people should have chosen to dwell in the open salt-marsh landscape along the Wadden Sea coast. While the beauty of the salt marshes is widely acknowledged, the idea of living there seems to suggest struggle and misery. Yet the salt-marsh settlers, dwelling on their settlement mounds or terps, did not just 'survive' or 'get by', but actually managed to live a good life, by embracing this marshy world and its peculiarities.

This collection of papers focuses on foraging, farming and food preparation in the context of the salt-marsh environment. The various contributions celebrate the career and work of Annet Nieuwhof, who has been an inspirational colleague and great friend to many of us. She passionately embraced terp research, always actively stimulating cooperation across disciplines as well as national borders. Reflecting some of Annet's wide-ranging interests, the present volume is dedicated to her in friendship and gratitude.

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