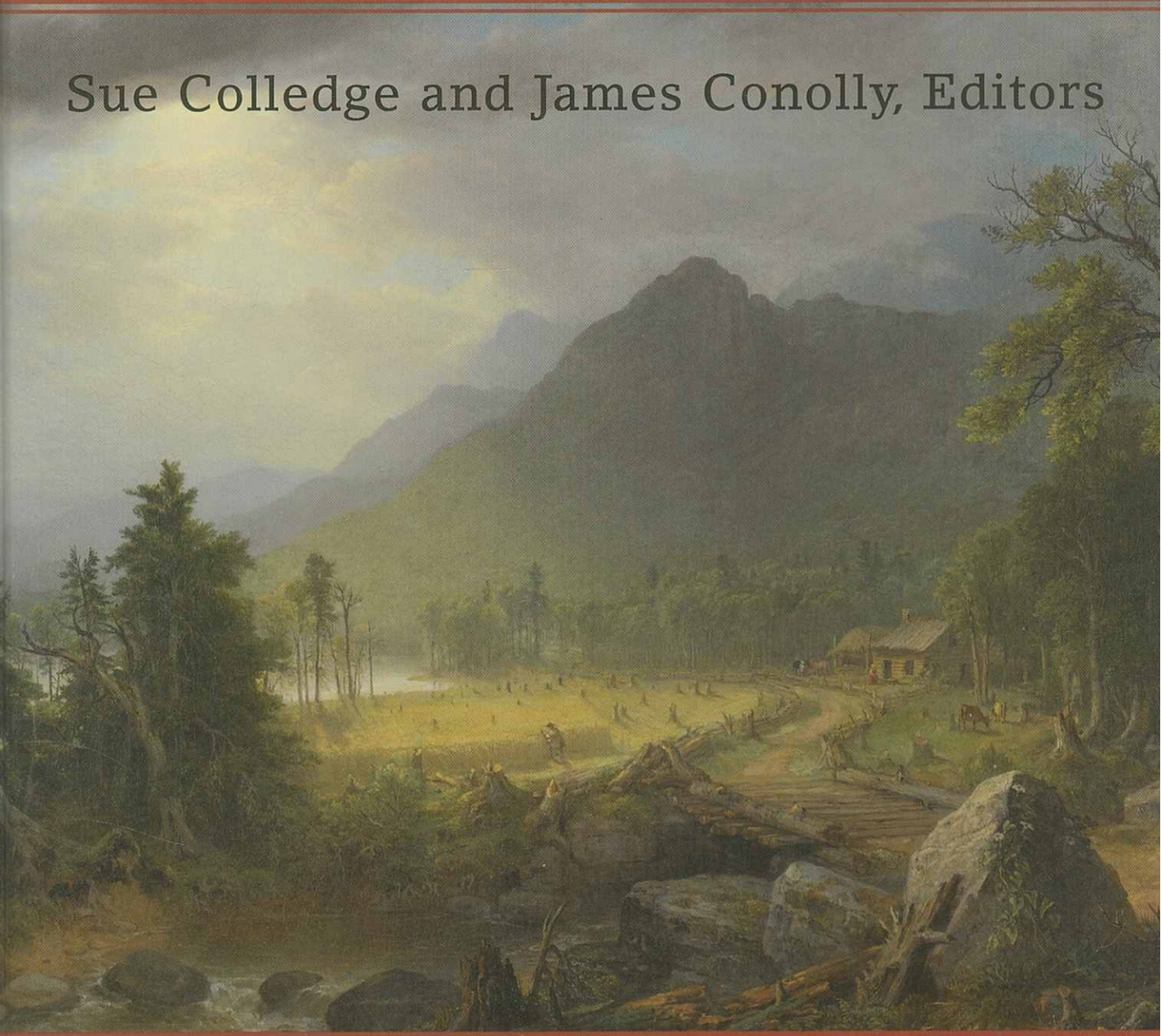
The Origins and Spread of Domestic Plants in Southwest Asia and Europe

Sue Colledge and James Conolly, Editors



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edited by

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Walnut Creek, CA

University College London Institute of Archaeology Publications

Publications of the Institute of Archaeology, University College London

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Left Coast Press, Inc.
1630 North Main Street, #400
Walnut Creek, CA 94596
http://www.lcoastpress.com

ISBN 978-1-59874-988-5 hardcover

Library of Congress Cataloguing-in-Publication Data

The origins and spread of domestic plants in southwest Asia and Europe / Sue Colledge and James Conolly, editors.
p. cm. — (Publications of the Institute of Archaeology, University College London)
Includes bibliographical references and index.
ISBN-13: 978-1-59874-988-5 (hardcover)
ISBN-10: 1-59874-988-9
1. Agriculture, Prehistoric—Middle East. 2. Agriculture, Prehistoric—Europe.
3. Agriculture—Origin. 4. Plants, Cultivated—Middle East. 5. Plants, Cultivated—Europe.
6. Plants, Cultivated—Origin. I. Colledge, Sue. II. Conolly, James, 1968– III. University College London. Institute of Archaeology.
GN857.O64 2007
630.93–dc22
2007005870

Printed in the United States of America

♾™ The paper used in this publication meets the minimum requirements of American National Standard for Information Sciences—Permanence of Paper for Printed Library Materials, ANSI/NISO Z39.48–1992.

Typeset using LaTeX 2_ε

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Chapter 18

Neolithic plant husbandry in the Kujawy region of central Poland

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18.1 Introduction

The archaeology surrounding the town of Brześć Kujawski in the Kujawy region of central Poland has been studied since the 1930s (Jażdżewski 1938; Grygiel 1986; Grygiel and Bogucki 1997). Archaeobotanical research started in the 1980s at Brześć Kujawski site 4 (Wasylikowa in Grygiel 1986) and was also undertaken at other archaeological sites during excavations conducted by P. Bogucki and R. Grygiel (Osłonki 1, Guźlin 2, Konary 1, Konary 1a, Miechowice 4, Miechowice 4a, Smólsk 4, Wolica Nowa 1, Zagajewice 1: Bogucki and Grygiel 1983, Grygiel and Bogucki 1997). Archaeobotanical material from these sites has been studied by K. Wasylikowa, Z. Tomczyńska and A. Bieniek (Nalepka et al. 1998; Bieniek 1999, 2002, 2003a, b).

The Kujawy region is the driest part of the country with less than 500 mm of precipitation per year (Kondracki 2000, p.138; Szafer 1972, p.47) and it includes areas of steppe-like and halophytic vegetation (Szafer 1972, pp.44–50, 68–71; Matuszkiewicz et al. 1995). In the 6th millennium cal BC it was probably warmer and relatively drier in Central and Eastern Europe than today (Ralska-Jasieiczowa and Starkel 1999, p.176–179; Starkel 1995, p.38). The study area is covered mainly with black earth and brown or grey-brown podzolic soils (Dobrzański et al. 1972) and is bordered by the Płock Basin, which is covered mainly with sands. The region was under ice during the last glacial period. Despite the fact that the Kujawy region differs geographically from the southern Polish uplands, which are covered with loess, it was also occupied by early Danubian farmers from the beginning of the Neolithic period in Poland (from about 6670±70 bp Lodz-1177, i.e. 5650–5480 cal BC, Nalepka nd). On the basis of several radiocarbon dates it is supposed that the first indigenous neolithic culture (the Funnel Beaker culture or TRB) could have developed in the Kujawy region or in the area between the lower Elbe and the middle Vistula (Midgley 1992, pp.227–228; Nowak 2001, p.590). The neolithisation process in the Polish lowlands was long and complicated and was completed in about 3500 BC, but in the Kujawy region near-contemporary occurrence of the mesolithic tribes, the Lengyel-Polgar groups, and the early Funnel Beaker farmers has been observed (Nowak 2001, fig.4).

The studied archaeobotanical material comes from nine archaeological sites located in the vicinity of the town of Brześć Kujawski (figure 18.1) and from features dated to the Linear Pottery culture (ca. 5500–5000 cal BC, Guźlin 2, Miechowice 4, Smólsk 4, Wolica Nowa 1 and Zagajewice 1) the Lengyel culture (ca. 4400–4000 cal BC, Guźlin 2, Konary 1, Konary 1a, Miechowice 4, Miechowice 4a and Osłonki 1) and the Funnel Beaker culture (Wolica Nowa 1). In

the neighbourhood of Brześć Kujawski the Linear Pottery culture (LBK) was usually followed by intensive Lengyel settlement; this was observed at the sites of Guźlin 2, Miechowice 4 and Zagajewice 1 (Bieniek 2002). The settlement at Smólsk was similar and the LBK was followed by the Lengyel culture, but no archaeobotanical material was taken from the features dating to the latter period (Grygiel, pers. comm.). At site 1 of Wolica Nowa, apart from evidence of LBK occupation there was also a TRB settlement. At four archaeological sites only features dated to the Lengyel culture were discovered (Osłonki 1, Konary 1, Konary 1a and Miechowice 4a).

Plant material from features dated to the Linear Pottery, Lengyel and Funnel Beaker cultures (TRB) will be presented and compared in this paper.

18.2 Material and methods

Most of the samples were taken from archaeological features in the way described by Jones (1991, p.55) as 'purposive or judgement sampling'. The charred archaeobotanical material was usually recovered in the same way from soil samples processed either in the field or in a laboratory. Soil samples of known volume were mixed with water and the floating fraction was poured through sieves with mesh sizes of 0.2 and 0.5 mm. At the sites of Osłonki 1, Miechowice 4 and Miechowice 4a, soil samples of unknown volume were sieved in the field using very coarse meshes. The material from these samples is marked in table 18.1 by an asterisk (*) and has not been included in the graphs.

Dried material was sorted and identified under a binocular microscope with ×6 to ×70 magnification. For the examination of some fruits and seeds an incident light metallurgical microscope (×25 to ×200) was used when higher magnifications were required. Identification was undertaken with the aid of the seed reference collection of the Department of Palaeobotany and the herbarium of the W. Szafer Institute of Botany Polish Academy of Sciences. Plant nomenclature follows Mirek et al. (2002).

Only the charred plant remains have been studied fully. Uncharred macro-remains were extracted and stored separately, and tentative identifications have been made but these taxa do not form part of this study. The results of charcoal analysis and imprints in daub will be presented in another paper.

18.3 Results

Lists of taxa found in the samples are presented in table 18.1.

18.3.1 Cultivated plants

A wide range of cultivated plants was recorded in samples from LBK sites, including mainly the remains of glume wheats: einkorn (*Triticum monococcum*), emmer (*Triticum dicoccum*) and the 'new' type of glume wheat (figure 18.2a) (Jones et al. 2000; Kohler-Schneider 2003), but the most commonly occurring species was einkorn (table 18.1).

After thorough identification of the glume wheat remains dated to the Lengyel culture (figure 18.3), it is clear, particularly from the sum of the chaff items, that the 'new' type was dominant at two sites and that the proportions of einkorn were greater at five. Emmer was also present but never reached more than 35% of the identified chaff material (whole spikelet bases were rare in the studied material). It could be suggested on the basis of the composition of the remains that the wheats were sown as a mixture. Hulled barley (*Hordeum vulgare*) was present in the material dated to LBK and the Lengyel cultures, but was not found in the TRB. Bread wheat (*Triticum aestivum* s.l.) was only identified in the material dated to the Lengyel culture, and was always represented by very few specimens. The identifications of grains of millet (cf.

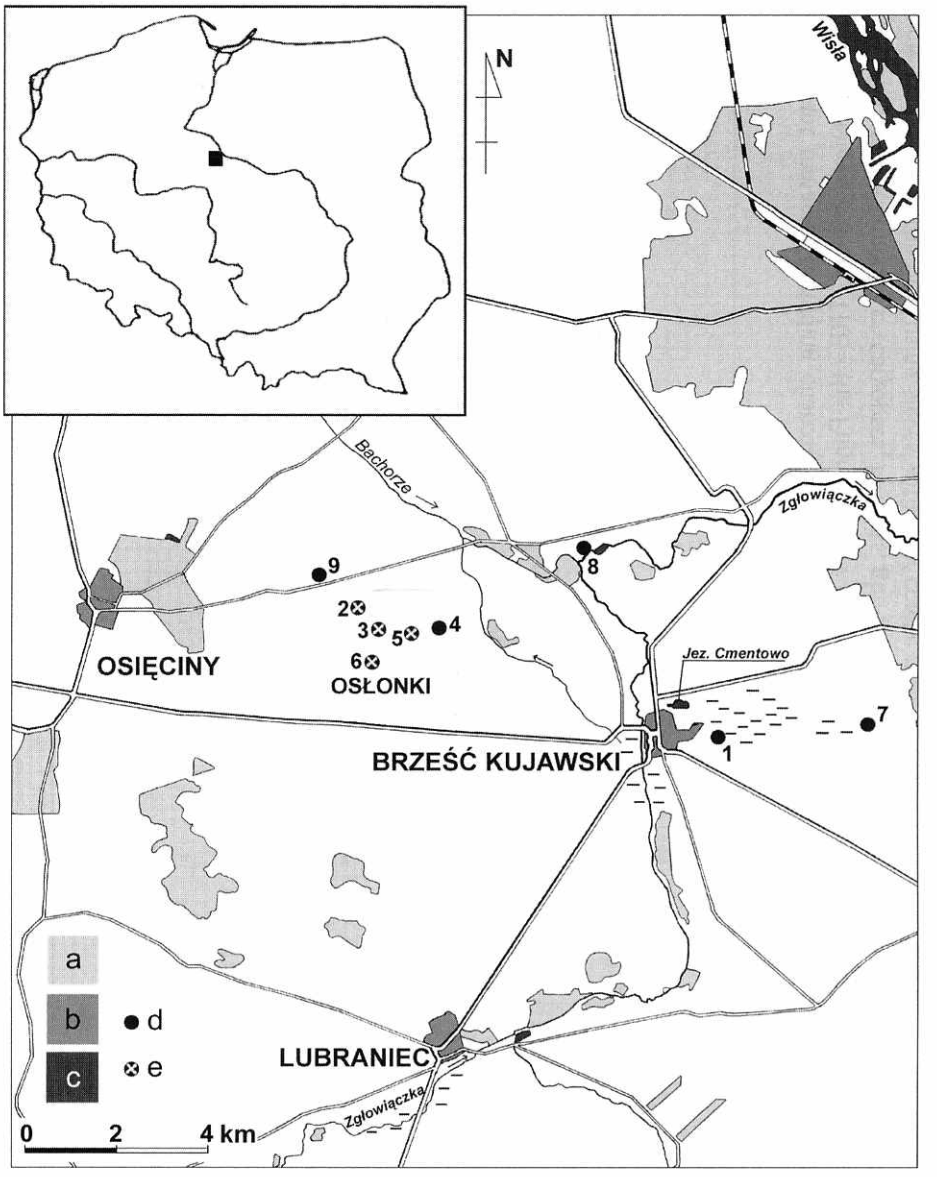

Figure 18.1: Location of sites mentioned in the text. 1. Guźlin 2 (G2); 2. Konary 1 (K1); 3. Konary 1a (K1a); 4. Miechowice 4 (M4); 5. Miechowice 4a (M4a); 6. Osłonki 1 (O1); 7. Smólsk 4 (S4); 8. Wolica Nowa 1 (WN1); 9. Zagajewice 1 (Z1); a. trees; b. buildings; c. water; d. sites with LBK features; e. sites with only the Lengyel culture material. Drawn by J.W. Wieser.

		LBK					L							TRB
Taxon	Type of remains	G2	M4	S4	WN1	Z1	G2	K1	K1a	M4	M4a	O1	Z1	WN1
Cultivated plants														
Hordeum vulgare, hulled	c	1	.	.	1	.	.	.	.	.	.	55*	.	.
Triticum aestivum s.l. (and cf.)	r	.	.	.	.	.	.	.	.	1	.	.	.	.
	c	.	.	.	.	.	.	.	.	1	2+3*	17+1*	.	.
Triticum monococcum type	c	.	1*	.	3	.	.	.	.	4+1*	1+1*	114+292*	2	4
	sb	.	23	.	10	.	.	1	2	41	21	18	9	6
	gb	.	122	.	20	.	2	8	6	54	32	20	18	51
Triticum dicoccum type	c	.	2*	.	4	.	.	.	.	40+20*	5+1*	257+1089*	.	8
	sb	.	2	.	5	.	.	.	.	.	.	.	3	.
	gb	.	29	.	7	.	.	2	2	104	12	31	14	6
Triticum 'new' type	sb	.	8	1	2	.	.	2	8	342	13	13	2	.
	gb	.	3	.	2	1	.	2	4	30	8	10	4	6
Triticum cf. 'new' type . terminal	sb	.	.	.	.	.	.	.	.	14	1	1	.	.
T. dicoccum/monococcum	c	.	.	.	.	.	.	.	.	.	.	249+1000*	.	.
Triticum sp. glume wheat	sb	3	11	.	8	.	.	6	3	494	18	51	10	20
	gb	8	99	1	23	.	25	35	23	2093	307	106	45	70
Triticum sp.	c	.	.	.	6	7	.	1	2	23+66*	4+4*	59+26*	1	12
cf. *Panicum miliaceum*	c	.	.	.	1	.	.	.	.	.	.	.	.	.
cf. *Secale cereale*	c	.	.	1	.	.	.	.	.	.	.	.	.	.
Cerealia indet.	c	5	7	6	32	14	5	10	3	104+69*	46+3*	35+43*	1	27
	gb	.	.	.	.	.	.	1	.	.	.	.	.	.
Linum usitatissimum	s	.	1	1	1	1	.	.	.	.	.	.	.	.
Papaver somniferum	s	.	.	1	.	.	.	.	.	.	.	.	.	8
cf. *Pisum sativum*	s	.	1	.	1	3	.	.	.	.	1	1	.	1
Wild plants														
Avena sp.	c	.	.	.	.	.	.	.	.	.	.	1	.	.
	a	1	.	.	.	.	.	.	.	.	.	.	.	.
Bromus hordeaceus	c	.	.	.	.	.	.	.	.	4	.	.	.	.
Bromus racemosus/arvensis	c	.	.	.	.	.	.	.	.	8	8+13*	5+1*	4	.
Bromus sterilis/tectorum	c	.	.	.	.	.	.	.	.	.	3	1	.	.
Bromus sp.	c	.	.	.	.	.	.	1	.	12	14 +4*	11	.	.
Campanula sp.	s	.	.	.	.	.	.	.	.	.	6	.	.	.
Chenopodium album type	s	.	50	5	24	9	.	2	15	4	47	13	.	26
Chenopodium sp.	s	1	.	.	.	.	.	5	.	.	.	.	.	2
Corylus avellana	f	.	.	.	.	.	.	.	.	.	1	.	.	.

Table 18.1: Charred plant remains (excluding charcoal and remains from daub) found at sites in the Kujawy region. Abbreviations: LBK: the Linear Pottery culture, L=the Lengyel culture, TRB=the Funnel Beaker culture, G=Guźlin, K=Konary, M=Miechowice, O=Osłonki, S=Smólsk, WN=Wolica Nowa, Z=Zagajewice, a=awn fragments, c=caryopses, f=fruits, gb=glume bases, s=seeds, sb=spikelet bases, *= specimens obtained from soils samples of unknown volume processed in the field using sieves with very coarse meshes (ca. 3 mm mesh size).

Taxa	Type of remains	LBK					L							TRB
		G2	M4	S4	WN1	Z1	G2	K1	K1a	M4	M4a	O1	Z1	WN1
Wild plants, cont.														
Echinochloa crus-galli	c	.	1	2	2	2	.	.	.	.	4	.	.	.
Fallopia convolvulus	f	2	11	34	9	10	.	4	2	23+1*	33+9*	7+2*	.	12
Fragaria vesca	f	.	.	.	.	.	.	.	.	.	1	1	.	.
Fragaria/Potentilla	f	.	1	.	1	.	.	.	.	.	2	.	.	8
Galium aparine	f	.	.	.	.	.	.	.	.	1	.	.	.	.
Galium spurium	f	.	.	.	.	.	.	.	.	9	3	.	.	.
Galium verum type	f	.	.	.	.	.	.	.	.	2	15	2	.	.
Hierochlöe cf. *australis*	c	.	.	.	.	.	.	.	.	.	15	2	.	.
Juncus sp.	f	.	.	.	.	.	.	.	1	.	.	.	.	.
Lamium amplexicaule/purpureum		.	.	.	.	.	.	.	.	.	.	.	1	.
cf. *Malus sylvestris*	s	.	.	.	1	.	.	.	.	.	.	.	.	.
Malva sp.	s	.	.	.	1	.	.	.	.	.	.	.	.	3
cf. *Mentha* sp.	f	.	.	.	.	.	.	.	.	.	1	.	.	2
Origanum vulgare	f	.	.	.	.	.	.	.	.	.	1	.	.	
Phleum pratense	c	.	.	.	3	.	.	.	.	.	.	.	.	8
Physalis alkekengi	s	.	.	.	1	.	.	.	.	.	.	.	.	.
Poa annua type	c	.	.	.	.	.	.	.	1	.	.	.	.	.
Poa nemoralis type	c	.	.	.	.	.	.	.	.	.	2	.	.	.
Polycnemum arvense	s	.	.	.	2	.	.	.	.	.	.	.	.	1
Polygonum aviculare	f	.	.	.	.	.	.	.	.	.	2	.	.	.
Polygonum lapathifolium/minus/persicaria	f	2	2	11	6	5	.	.	.	.	.	.	.	10
Polygonum sp.	f	.	.	.	2	.	.	.	.	.	.	.	.	1
Prunus/Cerasus	f	.	.	.	1	.	.	.	.	.	.	.	.	.
Rumex acetosella	f	.	.	.	.	.	.	.	.	.	.	.	.	1
Rumex sp.	f	.	.	3	.	.	.	.	.	.	.	.	.	1
Schoenoplectus tabernaemontani	f	.	.	.	.	1	.	.	.	.	2	.	.	.
Scleranthus sp.	f	.	.	.	.	.	.	.	.	.	.	.	.	3
Setaria viridis/verticillata	c	.	.	1	3	.	1	.	.	.	3	1	.	1
Silene sp.	s	.	1	1	5	.	.	1	.	.	.	.	.	.
Solanum nigrum	s	.	.	1	1	.	.	.	.	.	.	.	.	.
Stipa pennata s.l.	c	.	.	.	.	.	.	6	20	.	4+3*	2	.	.
	a	1	.	.	.	.	.	519	696	122	761	504	.	.
Trifolieae indet.	s	1	.	.	1	.	.	.	.	1	2	.	.	9
cf. *Vaccinium vitis-idaea*	f	.	1	.	.	.	.	.	.	.	.	.	.	.
Verbascum sp.	s	.	.	.	1	.	.	.	.	.	2	.	.	.
cf. *Veronica / Plantago*	s	.	.	.	.	.	.	.	3	.	.	.	.	2
Vicia cf. *tetrasperma*	s	.	.	.	.	.	.	.	.	.	1	.	.	.
Boraginaceae type	f	.	.	.	1	.	.	.	.	.	.	.	.	1
Caryophyllaceae indet.	s	.	.	.	1	.	.	.	.	1	.	.	.	.
Chenopodiaceae indet.	s	.	.	.	.	.	.	.	.	.	1	.	.	.
Cyperaceae indet.	f	.	.	.	.	.	.	.	.	.	3	.	.	1
Lamiaceae indet.	f	.	.	.	.	.	.	1	.	.	1	.	.	1
Poaceae indet. (small)	c	1	1	1	.	.	.	.	1	4	7	3	.	27
Poaceae indet. (large)	c	4	.	2	10	2	.	6	.	14	10+5*	1	1	11
Ranunculaceae indet.	f	.	.	.	.	.	.	.	.	.	.	.	1	.
Rubiaceae indet.	f	.	.	1	.	.	.	.	.	.	.	.	.	.
Solanaceae indet.	s	.	.	.	1	.	.	.	.	.	.	.	.	.
no. of features		2	2	3	2	2	1	13	3	7	12	15	2	3
no. of samples		2	2*	3	22	6	1	20	6	7*	26*	24*	3	12
volume of soil [dm^3]		16	16*	49	189	56	8	20	62	64*	130*	80*	89	92

Table 18.1, cont.

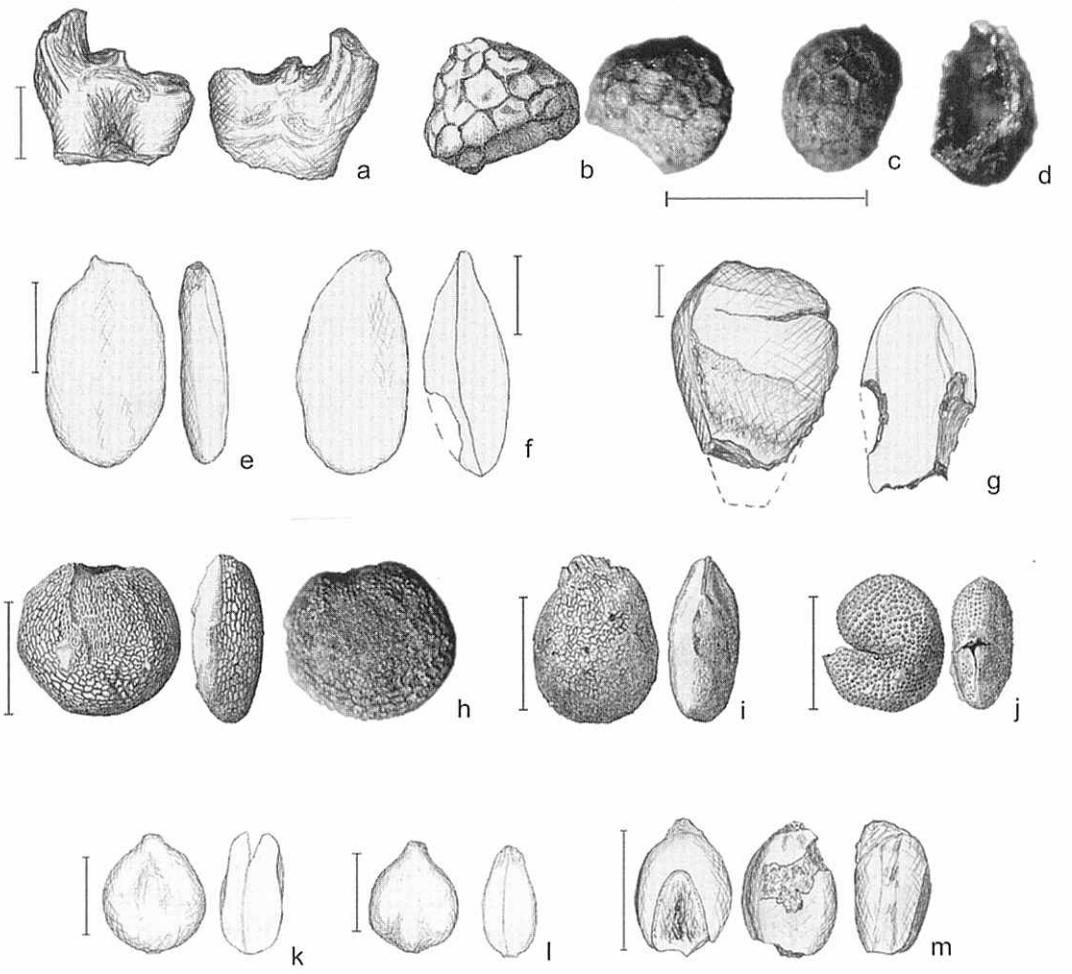

Figure 18.2: Charred plant macroremains. a. *Triticum* "new" type, spikelet base; b-d. *Papaver somniferum*; e, f. *Linum usitatissimum*; g. cf. *Malus*; h. *Physalis alkekengi*; i. *Solanum nigrum*, j. *Polycnemum arvense*; k, l. *Polygonum lapathifolium* s.l./ *minus/persicaria*; m. *Setaria viridis/verticillata*. Scale bars: 1 mm; c and d are dated to the Funnel Beaker culture; others dated to the LBK. Items b and h–j drawn by J.W. Wieser.

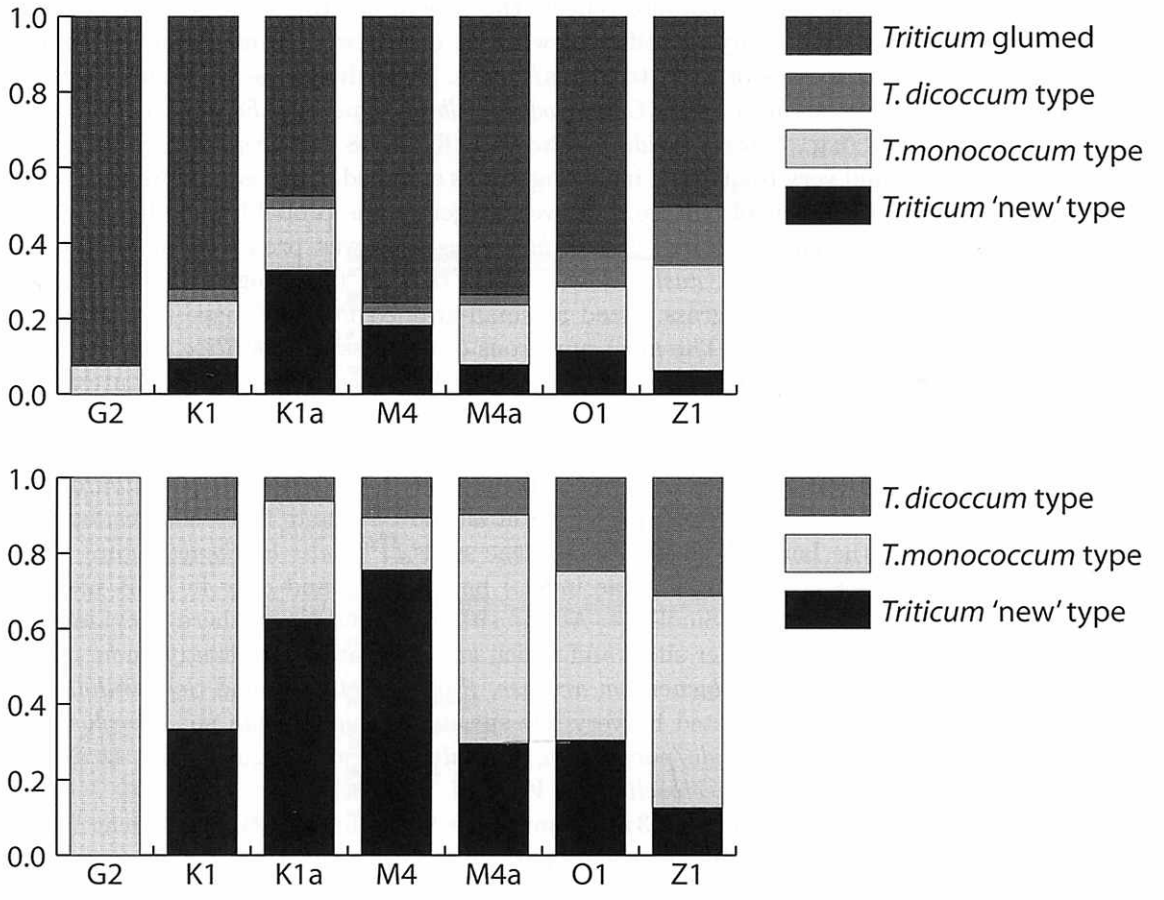

Figure 18.3: Lengyel culture wheat chaff composition. Upper: total number of glume bases; lower: identified glume bases only. Spikelet bases are counted as two glume bases in both graphs. See figure 1 for definition of site abbreviations.

Panicum miliaceum) and rye (cf. *Secale cereale*) in the LBK were uncertain because of their poor preservation.

In addition to the cereals, peas (cf. *Pisum sativum*, present only as fragments and without testa) were probably also cultivated by neolithic settlers in the vicinity of Brześć Kujawski. Flax (*Linum usitatissimum*) (figure 18.2e, 18.2f) was found only in the LBK material. Poppy seeds (*Papaver somniferum*) (figure 18.2b–d) have been recorded at two sites (Smólsk 4 and Wolica Nowa 1). The find of this taxon in the feature dated to the Linear Pottery culture (Smólsk site 4) is very important because such early evidence has been recorded only in the west of Poland (Bakels 1992; Knörzer 1974, 1980, 1998; Kreuz 1990; Wasylikowa et al. 1991, table 7). It should be noted that poppy found at Zesławice was incorrectly reported by Zohary and Hopf (2000, after Giżbert 1960b) as being dated to the LBK; the site is dated to the Radial Pottery culture (3500–2900 cal BC) (Giżbert 1960a, p.350).

18.3.2 Wild plants

The composition of wild plants (table 18.1) differs slightly at each site and in each culture. This is in part connected with the type of the archaeobotanical material that comes from different archaeological features, but may also be due to the fact that the numbers of samples taken from

the sites varied greatly. The list of taxa also reflects the ease of identification of the specimens; some well-preserved and were easily identifiable, whereas others were damaged and therefore could not be assigned to species or even to genus/family. Nevertheless, some plants occurred in each culture and either at most (e.g., *Chenopodium album* type and *Fallopia convolvulus*) or only some of the sites (e.g., *Setaria viridis/verticillata*, figure 18.2m, *Trifolium* sp.). Grasses (Poaceae) have been found very frequently, including grains assigned to the genus *Bromus*, which were identified only in the Lengyel culture, however, larger grains probably also belonging to this genus were present in each culture. *Echinochloa crus-galli* was preserved in four of the five LBK sites, while *Hierochloe* cf. *australis* was found only in the Lengyel material (some damaged specimens similar to this grass, listed as small-grained Poaceae, have been recorded in the material from other periods). The most numerous of the grasses was *Stipa pennata* (s.l.), represented mainly by awn fragments. This species was closely associated with the features dated to the Lengyel culture (very high numbers of awn fragments were found in five of the seven sites) but a single awn fragment was also recovered from a LBK feature at the site of Guźlin 2.

Galium species have been identified only in the Lengyel material. *Polygonum lapathifolium/minus/persicaria* (figure 18.2k, 18.2l) was preserved in all the LBK and TRB features, but was completely absent from the Lengyel culture. Solanaceae seeds (*Physalis alkekengi,* figure 18.2h, *Solanum nigrum*, figure 18.2i, and Solanaceae indet.) have been found only in LBK material from two sites, Wolica Nowa 1 and Smólsk 4. At the site of Wolica Nowa there is evidence of several plants that are absent at other sites, and which are associated with sandy, more or less acid soils (e.g., *Phleum pratense*, *Polycnemum arvense*, *Rumex acetosella* and *Scleranthus* sp.). Many of the taxa listed are represented by very few specimens (e.g., *Avena* sp., *Corylus avellana*, *Juncus* sp., *Lamium amplexicaule/purpureum*, cf. *Malus sylvestris,* figure 18.2g, *Origanum vulgare*, *Physalis alkekengi*, *Rumex acetosella* and *Vicia* cf. *tetrasperma*).

One seed of *Physalis alkekengi* (1.4×1.3×0.55 mm) was found in the LBK feature at Wolica Nowa site 1. The seed-coat has a distinct reticulate pattern typical of this species and is composed of bigger cells than those of *Solanum dulcamara*, which has a very similarly sculptured testa. The cells are unstructured in the centre of the seed but they form very regular rows at the margins; these were clearly visible in the charred specimen (figure 18.2h). This is the first find of *Physalis alkekengi* in the Neolithic of the present-day territory of Poland. It was quite common in archaeobotanical material dated to the late Neolithic (3800–3600 cal BC) from Lake Zurich, where it was found in densities of more than 10 specimens per 1 dm^3 of sediment (Brombacher and Jacomet 1997, p.280, table 43).

18.3.3 Comparison of the different cultures

For the purposes of comparison the plant remains have been divided into large groups, for example, glume bases (i.e., one spikelet base is counted as two glume bases), cereal grains, seeds of other cultivated plants, grains of wild grasses, *Chenopodium* seeds, *Fallopia convolvulus* fruits, *Polygonum* spp. fruits and seeds of other wild plants (awn fragments have been omitted from the calculations). In figure 18.4 the number of remains in each of the groups is represented as a percentage of the total found in each culture. The first graph (figure 18.4a) includes chaff remains, fruits and seeds, but for clarity, in the second graph chaff remains have been excluded (figure 18.4b). The material dated to the Lengyel culture is dominated by cereals (chaff and grains), however, the high values represented in figure 18.4 are more a reflection of the rich contents of a single storage pit discovered at the Osłonki site, and so in the third graph the remains from this feature have been omitted from the totals (figure 18.4c).

Wheat chaff is the most abundant plant type in each of the cultures, but in the Lengyel material it represents almost 80 % of the total number of the remains (figure 18.4a). Comparison of only fruits and grains/seeds without chaff clearly shows that the percentage of cereal grains in the Lengyel culture is far higher than in the other cultures (figure 18.4b, 18.4c), and of note

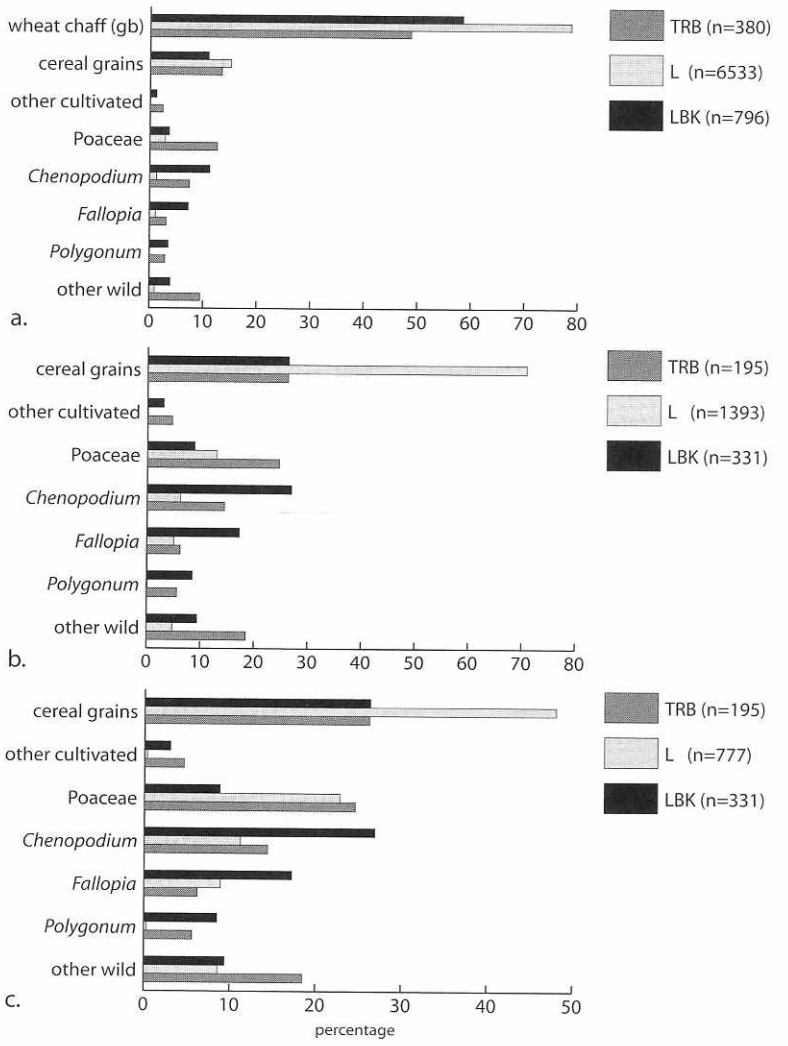

Figure 18.4: Composition of plant macro-remains (excluding charcoal and awn fragments) in the studied cultures. Graph a: including chaff remains; b: only fruits and seeds, c: excluding remains from the storage pit from Osłonki. Data are given as a percentage of total number of specimens found in features dated to each culture.

also for the Lengyel material is the near absence of other cultivated plants (with the exception of two peas). The proportions of wild grasses increase with time from less than 10 % in LBK to 25 % in TRB. *Chenopodium* seeds and *Fallopia convolvulus* fruits are abundant in all the studied material, but they are significantly more numerous in LBK. Fruits of the genus *Polygonum* are present in very low numbers in the Lengyel culture (only two fruits of *Polygonum aviculare* have been found) and are more numerous in the LBK (ca. 8%) and TRB (ca. 6%).

18.3.4 Comparison of the sites

The graphs presented in figure 18.5 are based on the proportions of the different groups of plant types in the separate sites, ordered by culture, to enable a more detailed comparison of taxonomic composition. The charts include two separate bars for the site of Osłonki, one with the data from the storage pit included in the calculations of relative proportions and a second with these excluded from the calculations (marked by an asterisk).

The figure 18.5a graph shows that chaff comprises a majority of the remains in the Lengyel sites (always more that 50%). In the LBK material from the different sites the proportion of chaff varies greatly, from ca. 2% at the Zagajewice site 1 to ca. 82% at the Miechowice site 4, but at four of the five sites chaff forms less than 50% of the remains. In the TRB material from the Wolica Nowa site chaff comprises approximately half of the total number of the remains. The comparison of fruits and grains/seeds (after having omitted cereal chaff from the calculations, figure 18.5b) shows very different proportions of cereal grains at each site, with no apparent trend according to the cultures, but in the LBK and TRB material these never reach more than 40%. Cereal grains constitute more than 65% of the remains in the Lengyel material at three sites (Guźlin 2, Miechowice 4 and Osłonki 1). Other cultivated plants, i.e., *Pisum sativum* (present in all three cultures), *Papaver somniferum* (present in both the LBK and TRB cultures), and *Linum usitatissimum* (only identified in LBK features), are found in very low proportions at all sites. Wild grasses and cereals together usually comprise more than 50% of the remains (with the exception of LBK Miechowice 4 and Smólsk 4, each less than 20%); in the Lengyel material from four of the sites they constitute more than 80% of fruits and seeds (Guźlin 2, Miechowice 4, Osłonki 1 and Zagajewice 1). Fruits of *Polygonum* are noticeable in every LBK and TRB bar. *Chenopodium* and *Fallopia convolvulus* have been found at every site, with the exception of the Lengyel material from Zagajewice.

18.4 Discussion and final remarks

The archaeological evidence dated to the Linear Pottery culture and the Funnel Beaker culture is rather poor, especially when compared with Lengyel settlements, which have many archaeological features including houses and even a fortification ditch (Osłonki 1, Grygiel and Bogucki 1997). Nevertheless, it has been possible to gain some information about the earliest plant husbandry in the region.

Evidence in the form of well-preserved cereal chaff and grains is proof that the cultivation of wheat was common from the beginning of the Neolithic in the Kujawy region. The composition of the wheat remains is very similar at each of the sites studied: the neolithic settlers cultivated mainly einkorn (*Triticum monococcum*), the 'new' type of glume wheat and emmer (*Triticum dicoccum*), probably together as a mixed crop. If we assume that the 'new' wheat type is equivalent to *Triticum timopheevi*, the mixture of crops would have been similar to Georgian 'zanduri', which consists mainly of *Triticum monococcum* and *Triticum timopheevi* (Hanelt and Institute of Plant Genetics and Crop Plant Research 2001, p.2567).

The only obvious difference in the overall composition of the cereals is the presence of bread wheat in the Lengyel material, but it is possible that the large numbers of samples taken from

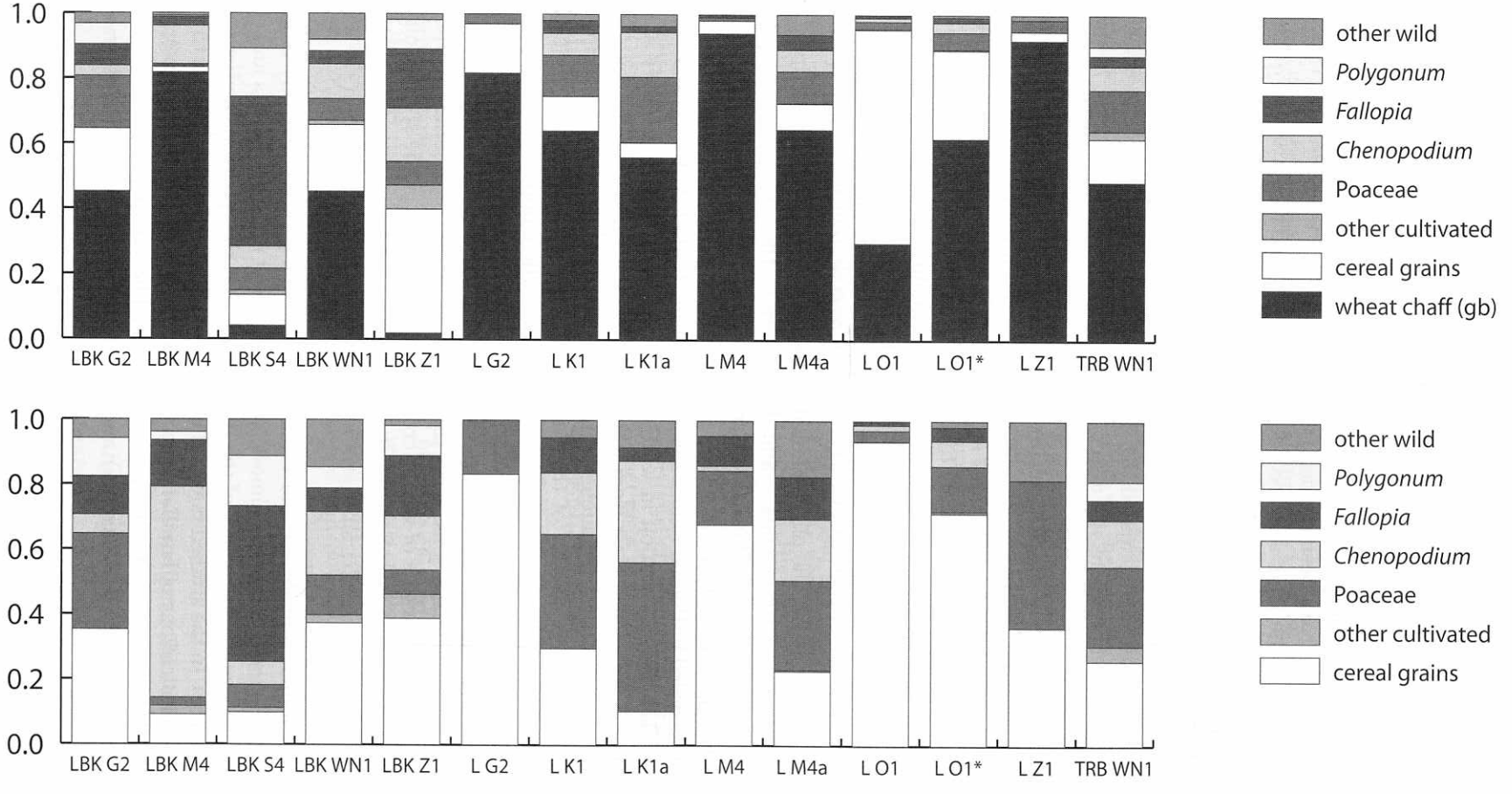

Figure 18.5: Composition of plant macro-remains (excluding charcoal and awns) at separate sites. Graph a (upper) fruits and seeds including chaff remains; graph b (lower) fruits and seeds only.

this period meant that there was better overall representation of taxa than in the other cultures. The lack of free-threshing cereal rachis (naked wheats and barley) could be accounted for by their under-representation in archaeobotanical material, as a result of removal during crop processing and/or due to the fact that they are less likely to survive (in recognisable form) after charring (Boardman and Jones 1990). Grains of hulled barley are poorly represented in the LBK and the Lengyel material and their absence in the TRB could be because only three archaeological features dated to this culture have been studied (table 18.1).

When we compare only the fruit and seed composition, misinterpretation is quite likely. In the LBK, at the Miechowice 4 and Smólsk 1 sites, cereal grains comprise less than 10% of the assemblage, which suggests that crop cultivation was of little significance in LBK plant husbandry (figure 18.5b). However, the picture is completely different when we compare the presence of chaff remains (figure 18.5a). Cereal remains (chaff and grains) are prominent in the Lengyel material if the sites are amalgamated (figure 18.4) and also when the individual sites are compared (figure 18.5). Cereal remains are also present, but in lower frequencies, in the other cultures.

Pea was cultivated by settlers of each culture but was always represented by only a few fragments of seeds. Flax is interesting because it has not yet been found in the features dated to the Lengyel and the Funnel Beaker cultures at the studied sites. The absence of flax in the Lengyel features could not be explained purely by chance because there was good archaeological evidence for the culture at the studied sites and also the quantities of plant remains of the same date were much greater than in the LBK (table 18.1). It is possible that it was no longer cultivated in that microregion after the LBK. Alternatively, the lack of flax seeds could have been caused by a change in the use of the plant and/or agrarian techniques. When flax is cultivated for its fibres rather than for its oil, the plants should be harvested before the seeds ripen (at the white seeds stage) (Kaznowski 1951, p.604)—and if this were so there would be less likelihood of finding charred seeds in the archaeological material.

The discovery of poppy in the LBK and TRB is very important for this area because it has not previously been recorded in Poland before the late Neolithic Radial Pottery culture (Giżbert 1960a). Poppy was taken into cultivation in western Mediterranean Europe (Zohary and Hopf 2000). It was not known in the Near East from where the 'package' of cultivated plants together with the knowledge of agricultural techniques spread into Europe. The finds of poppy in the Kujawy region possibly suggest contact of the settlers with the western groups of the Linear Pottery culture. In the material from the site 1 of Wolica Nowa, where poppy were most probably cultivated in the TRB,[1] there were some indicators of poor, sandy and acid soils *Polycnemum arvense*, *Rumex acetosella* and *Scleranthus* sp.). The plant material preserved at seven of the other sites is more typical of fertile soils, with the exception of the xerothermic feather grass (*Stipa pennata* s.l.). No typical weeds of winter crops have been found in the studied material.

The plant material from the sites dated to the Linear Pottery, Lengyel and Funnel Beaker cultures indicates that plant gathering must still have played an important role in the economy of the settlers.

The presence of *Fallopia convolvulus* and *Chenopodium album* type in relatively large numbers at each site (e.g., *Fallopia* comprises almost 50 % of the total number of fruits and seeds at Smólsk 4) could be interpreted as evidence of the significance that the role of gathering played in the subsistence economies. In the studied material dated to the Linear Pottery culture there were also some tentative identifications of familiar collected plants; for example, crab apple (cf. *Malus sylvestris*), mint (cf. *Mentha* sp.), red bilberry/whortleberry (*Vaccinium vitis-idaea*), sloe/wild cherry (*Prunus/Cerasus*), mallow (*Malva* sp.) and wild strawberry (*Fragaria/Potentilla*). No

[1]The doubt expressed in this case refers to the difficulty in distinguishing between the seeds of the cultivated species (*Papaver somniferum*) and the wild/weedy species/subspecies (*Papaver setigerum/ Papaver somniferum* subsp. *setigerum*).

traces of hazelnut shells *(Corylus avellana)* have been discovered in the material dated to the LBK and TRB and only one fragment has been found in the Lengyel material (table 18.1). The find of *Physalis alkekengi* (figure 18.2h), a species that is not a native of the flora of Poland (Mirek et. al. 2002), is the first in the Neolithic of Poland. Its berries are edible and it can also be used as a spice or for medicinal purposes (e.g., it is a diuretic and a remedy for rheumatism) (Podbielkowski 1989, p.226; Broda and Mowszowicz 2000, pp.563–564). Nowadays it is used mainly as a decorative plant in Poland.

Comparison of the wild plant taxa shows an increase in the proportions of grasses with time, indicating that large parts of the area were being deforested because of intensive exploitation for wood. In addition, the presence of *Stipa pennata* suggests that the area could have been partly covered by dry, steppe-like grasslands. Certain archaeological features, for example a well dated to the Stroke-Ornamented Ware culture at Konary I (Grygiel 2002), could indicate a lack of fresh water in the neighbourhood, possibly because of eutrophication and erosion of the surrounding area from deforestation (Gąsiorowski and Nalepka nd; Nalepka nd; Nowaczyk et al. 2002).

It could be concluded, therefore, that the first allochthonous farmers in the Kujawy region used similar cultivated plants as other LBK tribes. The exception is their use of poppy, which could be evidence of their contact with western groups. The presence of the 'new' type of glume wheat along with einkorn and emmer has been attested in the material dated to the Linear Pottery and Lengyel cultures as well as the Funnel Beaker culture. Glume wheats are the most common remains in all the studied material—einkorn, the 'new' type of glume wheat and emmer are always found together, suggesting that they were cultivated as a mixed crop. Bread wheat has only been found in the Lengyel features. Flax has been recorded in the Linear Pottery culture and its absence in later periods was probably due to the fact that it was no longer cultivated or that there were changes in the use of the plant (from its use for oil to exploitation for its fibres). Hulled barley and possibly pea were also cultivated by the settlers.

Many of the wild plants found at the sites are now common weeds; the presence of some (e.g., *Fallopia convolvulus* and *Chenopodium album* type) was significant, especially in LBK and TRB material, suggesting that their edible fruits and seeds could have been collected. Gathered plants are represented by a few specimens of *Corylus avellana*, cf. *Malus sylvestris*, cf. *Cerasus/Prunus*, *Fragaria vesca* and cf. *Vaccinium vitis-idaea*. In fact most of the wild plants found in the material potentially have some useful properties.

The Lengyel culture differs from the other cultures because of the dominance of crop taxa, very few other cultivated plants and an abundance of feather grass (*Stipa pennata* s.l.) remains. Despite the fact that feather grass could also have been collected (Bieniek 2002) the relatively high numbers of grains/awns during the Lengyel culture suggests that the area was strongly deforested by this date. The increase in presence of other wild grasses supports this suggestion.

There are some differences in the material from the sites studied; Wolica Nowa 1 (TRB) and Smólsk 4 (LBK) differ from the other sites by the presence of *Papaver somniferum*. Some of the plants that prefer sandy soils have been found only at the Wolica Nowa site (e.g., *Phleum pratense*, *Polycnemum arvense*, *Rumex acetosella* and *Scleranthus* sp.). Wolica Nowa was the only site in the studied micro-region where there was a TRB settlement.

Acknowledgements

I would like to thank my tutor Professor Krystyna Wasylikowa for her care and comments on the first draft of the paper. I am very grateful to Professor Stefanie Jacomet for the *Physalis alkekengi* identification. I am also obliged to thank Dr. Hab. R. Grygiel for archaeobotanical material and necessary archaeological data regarding chronology.

I should also like to thank the Foundation for Polish Science (FNP) for the metallurgical microscope NIKON Eclipse ME600. Much of this work has been done thanks to the State

Committee for Scientific Research grants 6 PO4F 041 15 and 6 PO4F 026 18 and the W. Szafer Institute of Botany of the Polish Academy of Sciences.

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