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## FROM STUDIES ON THE ECONOMIC STRUCTURE AT THE DECLINE OF THE BRONZE AGE AND THE HALLSTATT PERIOD IN THE NORTH AND WEST ZONE OF THE ODR A AND VISTULA BASINS

Z BADAŃ NAD STRUKTURĄ GOSPODARCZĄ SCHYŁKU EPOKI BRĄZU  
I OKRESU HALSZTACKIEGO W PÓŁNOCNEJ I ZACHODNIEJ STREFIE DORZECZA  
ODRY I WISŁY

„...la cuisine-ce qu'on ne pas assez-constitue  
la deuxième, à côté du langage, forme variment  
universelle de l'activité humaine; car de même  
qu'il n'y a pas de société sans langue, il n'y en  
a pas qui de cette façon ou d'autre ne prendrait  
scin de curie au moins certains plats....”  
C. Levi-Strauss

In addition to a summing up of the present state of researches on the economy of the Lusatian Culture population in the north and west zone of the Odra and Vistula basins this article also deals with attempts — based in principle on available palaeobotanic and archaeozoological materials — at a new look at principal development tendencies prevailing in the final phases of the Hallstatt period. An analysis of collected materials and studies on settlement and demographic processes enabled the author to put forward a thesis on the complexity of the economic system of Lusatian Culture tribes. Stationary and movable forms of exploiting the natural environment (agriculture, animal breeding, gathering, hunting and fishing) resulted in an ecological emaciation of respective settlement microregions. This led to the downfall of fortified settlements, the depopulation of some, particularly exploited regions and, at the same time, initiated the gradual decline of Lusatian Culture.

Reflections which I would like to present here do not, of course, exhaust all economic problems from the decline of the Bronze Age and the Hallstatt period in Poland. They are rather an attempt at summing up present day deliberations on this subject.

An essay at a general economic problem of this period, or even only certain related issues, presents serious difficulties. They result from the spatial and chronological range of Lusatian Culture and by several so far insufficiently investigated settlement processes. Available archaeological sources do not allow to grasp the entire problem under investigation. We are, therefore obliged — in undertaking studies on economic problems of defined areas — to select problems concerning basic forms of economic activity including, without doubt, methods of procuring and as a further consequence of preparing food.<sup>1</sup> Common relations between individual means of obtaining food and their role in the complex economic structure of the ancient period under investigation are of particular importance.

<sup>1</sup> LANGE 1959; KULA 1963; CIPOLLA 1964.

The economic structure of a defined population group is reflected in archaeological sources which illustrate — frequently in a direct manner — the basic categories of the means of production (tools and production techniques) and more complex economic processes including, undoubtedly, problems of organization of production, the division of achieved products and the most typical and most common forms of exchange. It should be born in mind that excavated materials do not supply direct data for a more complete quantitative characteristic of studied economic phenomena. They merely provide material for deliberations on the increase or decrease, the sporadic or common occurrence of defined economic facts observed in source materials.<sup>2</sup>

The source base available to us is particularly poor as regards the period of the Lusatian Culture.<sup>3</sup> Reasons for this fact lie in the specificity of older archaeological investigations which preferred research

<sup>2</sup> TABACZYŃSKI 1970, p. 12-13.

<sup>3</sup> POR. GEDL 1961, p. 19; GODŁOWSKI 1960.

at cemeteries and did not create more complete possibilities for increasing the material base with work tools in particular, which were found as a rule at settlements or their close vicinity. Another difficulty concerns the fact that tools linked with agriculture or breeding and appearing in source materials cannot always be interpreted uniformly. We may quote as an example bronze and iron sickles occurring quite frequently particularly in hoards used for the harvesting of corn and the reaping of fodder for herds of bred cattle.<sup>4</sup>

Palaeobotanical and archaeological materials are among sources supplying the most direct data for studies on the economic structure in the Bronze Age and the Hallstatt period. They were frequently used in studies of this type concerning various chronological periods, particularly the Neolithic,<sup>5</sup> the Roman influence period,<sup>6</sup> or the early Middle Ages.<sup>7</sup> As regards the discussed period of ancient history former archaeological investigations have been subordinated in principle to defined research tendencies which — by means of discovered osteological materials — were to support the thesis on the predominance of animal breeding over hunting. The principal efforts of archaeo-zoologists invited to cooperate was limited to a percent compilation of wild game whose vestiges were found sporadically in cultural layers of investigated fortified settlements.<sup>8</sup>

We shall attempt to view the problem of changes which occurred in the economic structure of Lusatian Culture people at the decline of the Bronze Age and the Hallstatt period from a different angle, on the basis of paleobotanical and archaeological materials available at present. The picture thus achieved will, of course, not exhaust this complicated problem, yet it may introduce new facts into discussions on this subject.

Taking part in discussions on economic problems of that period we are conscious that the pre-historical share of the fate of many humanistic sciences, where questions concerning the real progress in a concrete problem implies very controversial evaluations and sometimes even creates pessimistic feelings since a specification of all humanistic disciplines — though characterized in a very general manner — makes a complete verification of many elucidating hypotheses difficult or quite impossible and warrants — in a very wide range — the coexistence of several

competing or supplementing interpretations concerning various aspects. These difficulties are particularly obvious in studies on economic structures of defined archaeological cultures.

To avoid ambiguity as regards such words as “agriculture” and “breeding” we shall define them at the beginning of our deliberations. Their range of meaning is much wider in modern times. But in this paper “agriculture” will define only activities linked with the tillage of soil, “breeding” though used here somewhat incorrectly, will define the raising of domestic animals.

Considering our general view on the scientific achievement in matters of interest to us we shall — in a further part of these deliberations — devote attention only to the most essential issues in discussions continued for several years in specialistic publications on the subject of economic forms prevailing at the decline of the Bronze Age and the Hallstatt period. Opinions, known so far from literature on the subject, show divergencies which occurred in the evaluation of the primacy of the two basic economic branches: agriculture and stock breeding. Some researchers emphasized the predominance of tillage over breeding as clearly distinct in that period,<sup>9</sup> others pointed out the supremacy of stock breeding over primitive agriculture.<sup>10</sup> A certain compromise between conflicting opinions was made by W. Hensel<sup>11</sup> and H. Łowmiański.<sup>12</sup> The first considered the morphological specificity of the region as the basic factor in economic production development, the other was of the opinion that the source material available to us does not entitle to make an authoritative statement which of these two economic types was predominant among Lusatian Culture tribes.

A summing up of the discussions presented in a very concise form was made by M. Gedl in his work on the subject of economic-social relations between Lusatian Culture tribes inhabiting south Poland.<sup>13</sup> This researcher decisively supported the predominance of soil tilling over other types of economy. According to Gedl this predominance is confirmed by the intensive and dense settlement network on the one hand, and the spatial permanence of Lusatian Culture — significant in available source materials — on the other hand. The presence of long-time Lusatian cemeteries

<sup>4</sup> HENSEL 1956, p. 59 nn.

<sup>5</sup> WIŚLAŃSKI 1969; TABACZYŃSKI 1970.

<sup>6</sup> WIELOWIEJSKI 1967; DYMACEWSKI 1968.

<sup>7</sup> ŁOSIŃSKI 1970, 1971.

<sup>8</sup> KRYSIAK 1957, p. 106.

<sup>9</sup> KOSTRZEWSKI 1949, p. 88; 1946, p. 30; JAŹDZEWSKI 1949, p. 43; TYMIENIECKI 1951, p. 237-238.

<sup>10</sup> HOŁUBOWICZ 1951, p. 8-9; GAŁUSZKA 1952, p. 49; SZAFRAŃSKI 1954, p. 110.

<sup>11</sup> HENSEL 1953, p. 42-45.

<sup>12</sup> ŁOWMIAŃSKI 1953, p. 19, 34-36, 39-40.

<sup>13</sup> GEDL 1961.

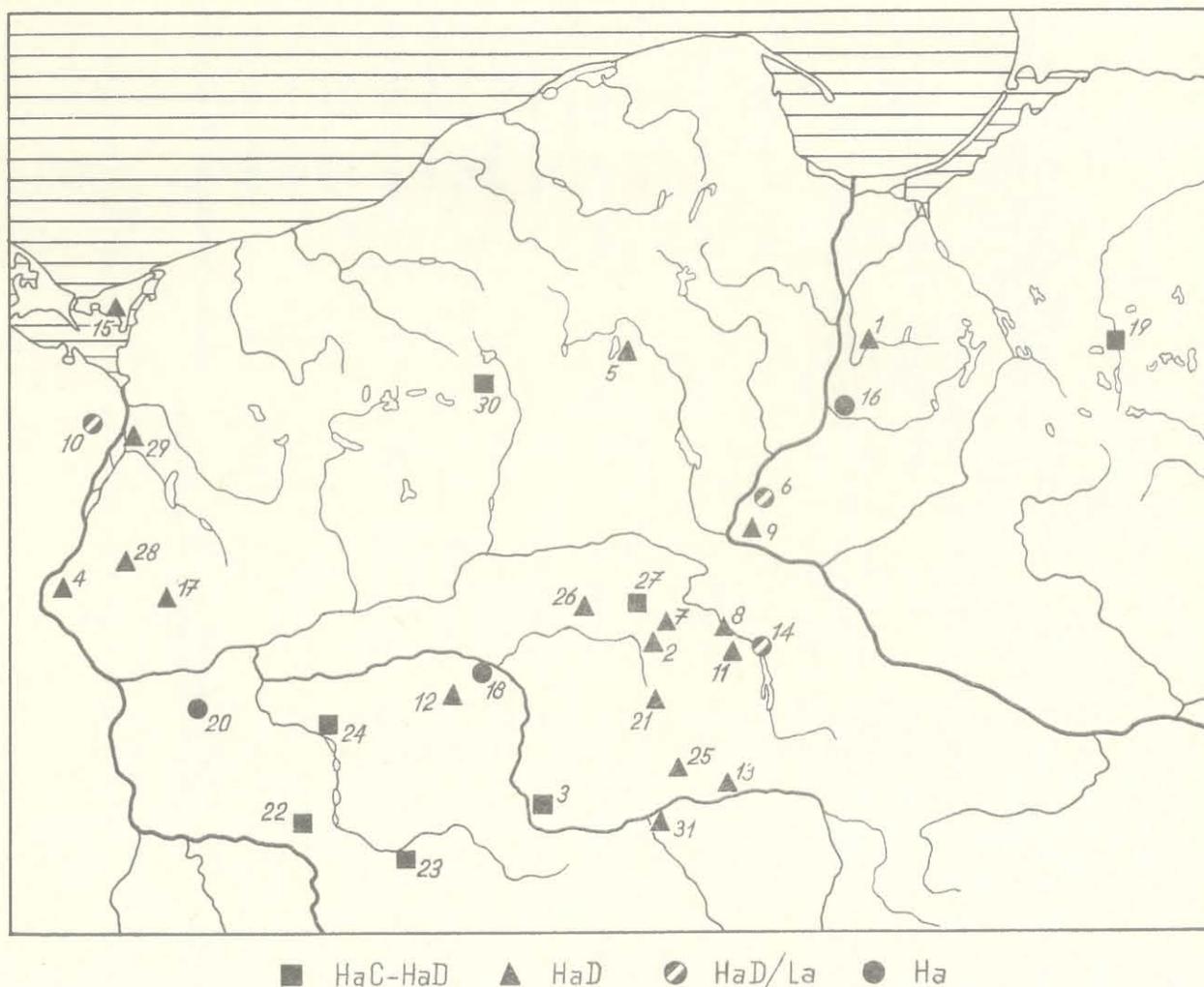


Fig. 1. Distribution of fortified settlements of the Lusatian Culture population in the north and west zone of the Odra and Vistula basins.

Rozmieszczenie grodzisk ludności kultury łużyckiej w północnej i zachodniej strefie dorzecza Odry i Wisły

Accord. to A. Niesiolowska-Wędzka

- |                                    |  |                                |
|------------------------------------|--|--------------------------------|
| 1. Baldram, pow. Kwidzyn           | 12. Komorowo, pow. Szamotuły               | 22. Pomorsko, pow. Sulechów    |
| 2. Biskupin, pow. Żnin             | 13. Koziegłowy, pow. Konin                 | 23. Przemęt, pow. Wolsztyn     |
| 3. Bnin, pow. Śrem                 | 14. Kruszwica, pow. Inowrocław             | 24. Rybojady, pow. Międzyrzecz |
| 4. Cedynia, pow. Chojna            | 15. Lubin, pow. Wolin                      | 25. Słupca                     |
| 5. Charzykowie, pow. Chojnice      | 16. Mokre, pow. Grudziądz                  | 26. Smuszewo, pow. Wągrowiec   |
| 6. Gzin, pow. Chełmno              | 17. Myślibórz                              | 27. Sobiejuchy, pow. Żnin      |
| 7. Izdebnó, pow. Żnin              | 18. Objezierze, pow. Oborniki              | 28. Swobnica, pow. Gryfino     |
| 8. Jankowo, pow. Inowrocław        | 19. Olsztyn-Hermanowo                      | 29. Szczecin                   |
| 9. Kamieniec, pow. Toruń           | 20. Ośno Lubuskie, pow. Sulęcín            | 30. Szczecinek                 |
| 10. Kamieniec, pow. Szczecin       | 21. Ostrowite Trzemeszeńskie, pow. Gniezno | 31. Tarnowa, pow. Września     |
| 11. Kołuda Wielka, pow. Inowrocław |  |                                |

was to prove this assertion. An additional argument was supplied, moreover, by a large quantity of ceramic material which was — according to Gedl — “... seldom used by herdsmen or breeders...”<sup>14</sup> These arguments

are not very convincing and speak as well for the predominance of animal breeding over agriculture. The saturation of investigated settlement groups with ancient relics (particularly ceramics) — a fact strongly emphasized by Gedl — speaks only for a settled way of life, which could have been linked with agriculture

<sup>14</sup> GEDL 1964, p. 128.

Table 1. Corn and leguminous plants vestiges from sites from the decline of the Bronze Age and the Hallstatt period in the west and north areas of the Odra and Vistula basins  
Szczałki zbóż i roślin strączkowych ze stanowisk schyłku epoki brązu i okresu halszackiego w zachodniej i północnej strefie dorzecza Odry i Wisły

No	Locality Miejscowość	Chronology Chronologia	Type of object Rodzaj obiektu	The number of defined species of plants — Ilość oznaczonych gatunków roślin										Literature Literatura
				Corn — zboża			Leguminous plants — rośliny strączkowe							
				<i>Triticum*</i> pszenica	<i>Hordeum</i> jęczmień	<i>Panicum miltaceum</i> proso	<i>Avena</i> owies	<i>Secale cereale</i> żyto	<i>Pisum sativum</i> groch	<i>Vicia Faba</i> bób	<i>Lens culinaris</i> soczewica			
1.	Szczecin-Wał	Ha D	fortified settlement — gro- dzisko	4	4	—	—	—	—	—	17	4	MOLDENHAWER 1969	
2.	Wolin-Młynowska	BA-V/Ha C-D	settlement — osada	—	7	—	2	1	—	—	—	—	KLICHOWSKA 1967	
3.	Wolin-Wzgórze Wisielców	Ha C-D	ditto	3	831	3	—	1	—	1743	539	—	KLICHOWSKA 1967 a	
4.	Biskupin, pow. Żnin	Ha D	fortified settlement — gro- dzisko	6865	733	514	—	—	—	234	83	209	JARON 1936; 1938; MOLDENHAWER 1950	
5.	Kotlin, pow. Jarocin	Ha C	settlement — osada	1	30	1	—	—	—	—	—	—	KLICHOWSKA 1969	
6.	Słupca m. pow.	Ha D	fortified settlement — gro- dzisko	43	18	—	—	10	—	57	—	—	KLICHOWSKA 1958 MOLDENHAWER 1958	
7.	Słupca m. pow.	Ha D	settlement — osada	1	1	—	—	—	—	131	1	—	MOLDENHAWER 1958	
8.	Smuszewo, pow. Wągrow- wiec	Ha D	fortified settlement — gro- dzisko	101616	28025	76460	71	—	—	8885	13762	9648	KLICHOWSKA 1972	
9.	Sobiejuchy, pow. Żnin	Ha C	ditto	3	31	—	—	—	—	—	1	—	KLICHOWSKA 1971	
10.	Kamieniec, pow. Toruń	Ha D	ditto	140	15	10	—	—	—	25	20	1	WASYLIKOWA 1956	
11.	Wrocław-Osobowice	BA-V/Ha C	ditto	1	8	3	40	1	—	—	—	—	KLICHOWSKA 1968	

\* Wheat is presented collectively by a summing up of its respective types (emmer, spelt, bread wheat, fine grain wheat).  
\* Pszenice potraktowano łącznie, sumując znaleziska poszczególnych jej odmian (płatkurka, orkisz, zwycajna, drobnziarnista).

Table 2. Bones of domestic animals found at sites from the Bronze Age and the Hallstatt period from the north and west areas of the Odra and Vistula basins  
Kości zwierząt domowych na stanowiskach ze schyłku epoki brązu i okresu halszackiego w północnej i zachodniej strefie dorzecza Odry i Wisły

No	Locality Miejscowość	Chronology Chronologia	Type of object Rodzaj obiektu	Bones of domestic animals in % Kości zwierząt domowych w %					% of domestic animals % zwierząt domowych	Literature Literatura
				cattle bydło	pig świnia	sheep/goat owca/koza	hors koń	dog pies		
1.	Szczecin, ul. Grodzka	Ha	settlement — osada (?)	32	40	22.4	6.6	+	94.7	KUBASIEWICZ 1962
2.	Szczecin-Zamek	Ha	ditto	31.9	49.4	18.7	—	+	100.0	KUBASIEWICZ 1960
3.	Tolknicko, pow. Elbląg	Ha	fortified settlement — gro- dzisko	47.0	26.5	26.5	—	—	100.0	KUBASIEWICZ 1963
4.	Jeziorko, pow. Giżycko	Ha	ditto	17.3	12.8	30.3	39.3	+	88.3	KRYSIAK 1958
5.	Biskupin, pow. Żnin	Ha D	ditto	54.8	23.4	21.4	+	+	76.6	KRYSIAK 1950; LUBICZ-NIE- ZABITOWSKI 1936; 1938
6.	Jankowo, pow. Inowroc- ław*	Ha C/D	ditto	63.2	16.3	9.4	8.2	+	91.9	SOBOCIŃSKI 1971a
7.	Kotlin, pow. Jarocin	Ha D	settlement — osada	52.3	24.1	8.3	6.6	+	91.4	SCHRAMM 1965
8.	Smuszewo, pow. Wągro- wiec	Ha D	fortified settlement — gro- dzisko	41.7	34.8	8.3	8.3	+	95.6	DURCZEWSKI 1970
9.	Ślupca m. pow.	Ha D	ditto	65.8	14.3	20.4	+	+	92.6	CHMIELEWSKI 1958
10.	Sobiejuchy, pow. Żnin	Ha C	ditto	49.9	14.8	24.6	5.8	+	98.0	KUBASIEWICZ 1964
11.	Gzin, pow. Chelmino	HaD/La	ditto	56.4	1.3	25.5	14.4	+	99.2	SOBOCIŃSKI 1971b
12.	Niemcza, pow. Dzierżo- niów	Ha	ditto	45.0	22.0	21.0	12.0	—	100.0	KAŻMIERCZYK 1964
13.	Wrocław-Osobowice	BA-V/Ha C	ditto	57.0	17.0	15.0	10.0	+	98.0	GEDIGA 1966

\* Data presented in this Table refer to all phases of the object (older and more recent settlements and settlements on the site of former fortified settlements). The per cent participation of respective animal species within the framework of successive settlement layers is illustrated on Table 3.

\* Uwzględnione w tabeli dane odnoszą się do wszystkich faz obiektu (gród starszy i młodszy oraz osada podgrodowa). Udział procentowy poszczególnych gatunków zwierząt w ramach kolejnych poziomów osadniczych ilustruje tabela 3.

and breeding as well. Nobody has yet attempted to prove, considering the present state of research on Lusatian Culture, that its inhabitants belonged to tribes of nomadic herdsmen.<sup>15</sup>

Extensive researches undertaken in the last decade resulted in a significant increase in literature devoted to Lusatian Culture. Yet available monographs — older and newer as well — are devoted to characteristics of respective geographical regions or to defined groups of this Culture.<sup>16</sup> Economic problems, considering the scarcity of source materials, were treated marginally in these works. The only attempt at a synthetic elaboration of economic problems penned by A. Gardawski,<sup>17</sup> does not exhaust this complex issue. Although he made use of then available specialistic elaborations, he limited his work to a percent compilation of sites where the occurrence of defined types of cultivable plants and domestic animals had been registered.

A special place in researches on the economic structure of Lusatian Culture people is taken by studies by S. Kurnatowski who advanced a thesis on the existence — in defined parts of Poland — of permanent garden agriculture as a basic source of nourishment for Lusatian people, supplemented by rotation-burning out farming and forest breeding — i. e., the burning out of high often virgin forests and abandoning that area after its emaciation.<sup>18</sup> Thus, attention has for the first time been devoted to a multi-sided agricultural economy and the co-existence of various agrotechnical systems in different pre-historical periods.<sup>19</sup> In my opinion, this interest in hypothesis requires nevertheless further penetrating studies to determine proper relations between cultivations of the gardening and rotation-burning out systems of farming. The role of the second system of soil tillage had to be greater in the period of fortified settlements in the area under discussion than has hitherto been accepted (Fig. 1).

There is in central European literature a still greater insufficiency of works on respective source categories and defined sections of economy. There is a particular scarcity of works on complex economic problems of respective geographical regions. Problems of interest to us are undertaken as a rule on the margin

of monographic elaborations of concrete cultures or selected objects. Deliberations concerning economy are most frequently limited to a not very complicated recording of facts without any introductory studies on structures and economic processes. The authors of these works present knowledge of the cultivation of several basic types of corn or pulse plants and the breeding of herds of a known structure without a more extensive or complete use of specialistic elaborations. The lack of quantity-percent data makes it impossible to undertake more complete attempts at a reconstruction of the structure of agriculture and breeding, neither does it allow to determine most instructive quantitative relations between vestiges of respective cultivated plants and types of bred animals. This proves how deep-seated the views on economic foundations of Lusatian Culture tribes are in expert literature. Preference is given to the economic model based on agriculture and breeding, other ways of procuring food are treated marginally. Although many researchers indicated the significance of gathering and gardening they did not consider these activities when evaluating the economic structure. This problem will probably be solved only after a penetrating analysis of all available facts. This will require extensive studies on respective branches of the economic and social life.

We shall now present the source base of interest to us. The data presented below (Tables 1 and 2) do not represent the entire catalogue of available materials, since more general compilations of plant and animal vestiges from the decline of the Bronze Age and the Hallstatt period are not accessible. Lists of palaeobotanical vestiges published by M. Klichowska in 1967 do not suffice for our purpose, because the author limited her work to specifying the presence of particular types of plants on respective sites,<sup>20</sup> leaving out quantitative lists. While elaborating Tables, materials prepared in detail, found at various sites dated back principally to the end of the Bronze Age and the Hallstatt period have been used as a rule (Fig. 2). They included already published materials, those in print and those being prepared.<sup>21</sup> Considering the lack of data the work has been limited to several sites principally from north and west Poland (Fig. 2, Table 1). The predominance of corn over pulse plants was clearly distinct at the majority (8 to 11) of listed sites (Fig. 3). Pulse plants were represented chiefly by the pea (*Pisum sativum* L.), the Celtic

<sup>15</sup> GAŁUSZKA 1964, p. 461.

<sup>16</sup> SULIMIRSKI 1931; Z. DURCZEWSKI 1939/1948; KOS-TRZEWSKI 1958; PLESŁ 1961; GEDIGA 1967; GEDL 1964; MIŚKIEWICZ 1968; MOSKWA 1971; KOŁODZIEJSKI 1971; CHUDZIAKOWA 1972.

<sup>17</sup> GARDAWSKI 1964.

<sup>18</sup> KURNATOWSKI 1966.

<sup>19</sup> KURNATOWSKI, URBAŃSKA 1967, p. 57.

<sup>20</sup> KLICHOWSKA 1967 a, tabl. II.

<sup>21</sup> I was able to read unpublished materials thanks to Doctor M. Klichowska, for which I am very grateful.

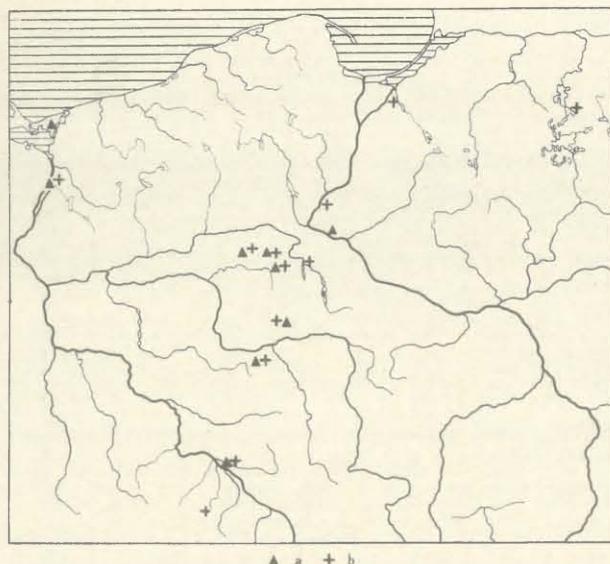


Fig. 2. Distribution of sites depicted in Table 1 and 2  
 a – palaeobotanical vestiges; b – archaeo-zoological vestiges.  
 Rozmieszczenie stanowisk uwzględnionych w tabelach 1 i 2  
 a – szczątki paleobotaniczne; b – szczątki archeo-zoologiczne

broad bean (*Vicia faba* L.) and the edible lentil (*Lens esculenta*) predominated clearly in only two sites. They are two open settlements dated to the Ha C-D (Wolin-Wzgórze Wisielców) and the Ha D (Słupca) periods (Fig. 4). The site near Szczecin cannot be considered in our deliberations because of the high degree of devastation of Lusatian Culture layers. Corn plants predominate decisively on the remaining

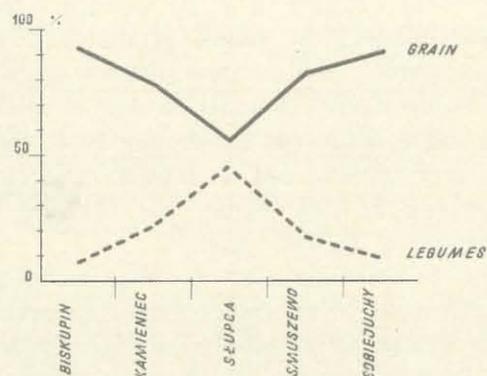


Fig. 3. The participation of corn and leguminous plants in Hallstatt fortified settlements from the Wielkopolska (Great Poland) and Kujawy regions.

Udział zbóż i roślin strączkowych w grodziskach halsztackich z terenu Wielkopolski i Kujaw

sites — principally in fortified settlements dated to the decline of the Hallstatt period. Quantitative relations between their respective types vary at different sites. Among corn plants at Biskupin, for example, the most common are various types of wheat: emmer

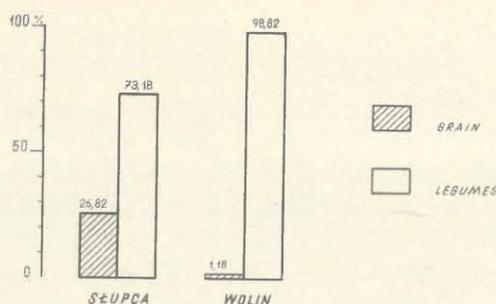


Fig. 4. The participation of corn and leguminous plants in open settlements from the Hallstatt period from north-western Poland.

Udział zbóż i roślin strączkowych w osadach otwartych z okresu halsztackiego z Polski północno-zachodniej

(*Triticum dicoccum*), spelt (*Triticum spelta* L.) and bread wheat (*Triticum vulgare*), next come barley (*Hordeum vulgare*) and millet (*Panicum miliaceum*). Similar proportions have been noticed at Słupca (a fortified settlement) and Kamieniec, pow. Toruń. As regards open settlements at Kotlin, pow. Jarocin, Wolin-Wzgórze Wisielców and also the fortified settlement at Sobiejuchy, pow. Żnin, there is a marked prevalence of barley over millet and various types of wheat. All the above mentioned sites date to the older phase of the Hallstatt period. The most interesting materials as regards significant numbers of indentified samples, were discovered at the fortified settlement at Smuszewo, pow. Wągrowiec. The marked saturation of these cultural layers with palaeobotanical materials enabled us to indicate certain changes occurring in the structure of cultivated plants at the final phase of the Hallstatt period in at least some areas of the Odra and Vistula river bassins. Ample amounts of millet in the form of heated shells of grains and groats have been discovered at e. g., Smuszewo and Jankowo, pow. Inowrocław. It may, therefore, be presumed that there was a decisive increase of millet planting at the end of the Hallstatt period, which must have influenced the importance of its growing among other cultivated and consumed plants.<sup>22</sup> A similar increase has been noticed as regards rye (*Secale cereale* L.) and oats (*Avena sativa*). These two varieties appear rather sporadically in materials found in Poland, but recent researches in Slovakia<sup>23</sup> have shown a marked increase in the importance of these two cereals particularly in the Hallstatt period.

Beginning to characterize the structure of plant cultivation in should be emphasized that an attempt

<sup>22</sup> Similarly as in the early phases of the early Middle Ages LOSIŃSKI 1971, p. 528, notes 27, 28.

<sup>23</sup> TEMPIR 1969.

at preparing a list of plants grown by Lusatian Culture people has been made on the basis of materials represented in Tables and of comparative materials and pollen analyses of samples including corn pollens and of plants associated with cultivation. Two separate groups may be distinguished among plants cultivated by Lusatian Culture tribes. The first comprises of cultivable plants — corn, root crops and pulse plants — the second includes concomitant weeds and vegetation characteristic of the local flora surrounding respective inhabitations.

The basic corn plants included at the end of the Bronze Age and the Hallstatt period various types of wheat, next barley and millet and sporadically rye and oats. It has been determined that wheat appeared on 40% of known sites with a clearly distinguishable regional differentiation in the participation of various types. Out of five types of wheat registered in the palaeobotanical material emmer, spelt and club wheat probably played a more significant role. As regards the material from cultural layers of Hallstatt settlements the most representative types include emmer, which prevails at Biskupin, pow. Żnin, over other types (58.2%), reaches 94.4% at Smuszewo and 60.2% at Kamieniec.<sup>24</sup> These proportions are different as regards open settlements where there was as a rule only one type of wheat — usually bread wheat — e. g., Kotlin,<sup>25</sup> or Wzgórze Wisielców at Wolin.<sup>26</sup>

The appearance of wheat has also been conspicuous on areas inhabited by tribes of the West-Baltic Barrow Culture, though the distribution of various types is different in these territories. Three types prevail: spelt, bread wheat and club wheat<sup>27</sup> though their role must have been much smaller considering more difficult vegetation conditions.

In the light of these remarks it may be assumed that emmer played the most important role among all known types of wheat, because it was — since the Neolithic<sup>28</sup> — the basic type of corn cultivated by tribes inhabiting the Odra and Vistula river basins. Its significance was also marked in Skandinavia where it appeared in Bornholm and the Goltand groups, though dated usually to older phases of the Roman period.<sup>29</sup> Individual varieties of wheat — not much different as regards their nourishment properties —

were often mixed for consumption purpose. This has been proven by the appearance of vestiges of all varieties together in investigated stock pits. But different vegetation requirements of respective types (in particular emmer and spelt) caused their separate sowing, although the possibility of sowing mixtures cannot be excluded. Even the possibility of sowing mixtures of corn and pulse plants has been considered as regards the Hallstatt period.<sup>30</sup>

Barley — found in various proportions on particular sites — was the second basic cereal cultivated by Lusatian Culture tribes. Vestiges of six-row barley were among the most frequently discovered varieties. It decidedly predominates in open settlements dated to the Hallstatt C/D period and amounts to 93.7% of all vestiges of corn plants found at Kotlin and even 98.2% at Wolin-Wzgórze Wisielców. Palaeobotanical materials from cultural layers of Lusatian fortified settlements indicate — with the exception of the settlement at Sobiejuchy where barley grain amounts to 91.1% — a disadvantageous relation of barley among cultivated corns. Barley vestiges comprised 9% at Biskupin. Proportions were similar at Kamieniec where vestiges of six-row barley comprised 9.9% of all identified corn varieties, as compared with 13.06% at Smuszewo and 22.2% at Słupca.

The predominance of barley over other sorts of cultivated corn was clearly marked on sites of East-Pomeranian Culture where it was found — according to M. Klichowska — on 37% of investigated objects.<sup>31</sup> The presence of barley was also observed on areas inhabited by people of the West Baltic Barrow Culture.<sup>32</sup> But on areas of the western zone of the Baltic Basin a gradual ousting of wheat by barley, which was in the last century B. C. and the beginning of our times, one of the plants most frequently cultivated in that region, was observed since early periods of the Iron Age.<sup>33</sup>

Millet was another sort of cereal cultivated by Lusatian Culture tribes. Data obtained at Smuszewo, seem to indicate an increase in the consumption role of this corn. Altogether 76,460 millet grains have been discovered in the cultural layers on this site, that is 37.05% of all defined cereal varieties. There was a much smaller share of millet at Biskupin. Altogether 514 grains have been collected there, i. e. — 6.2%. Millet grains also appear sporadically in cultural layers of other Lusatian objects and —

<sup>24</sup> These calculations were prepared by the author on the basis of published and unpublished materials.

<sup>25</sup> KLICHOWSKA 1969, p. 420.

<sup>26</sup> KLICHOWSKA 1967 a, p. 575.

<sup>27</sup> ANTONIEWICZ 1966, p. 29-30; OKULICZOWA 1970, p. 115.

<sup>28</sup> WIŚLAŃSKI 1969, p. 191; KLICHOWSKA 1972 a, p. 7.

<sup>29</sup> DYMACEWSKI 1968, p. 31.

<sup>30</sup> JAROŃ 1938, p. 106; WASYLKOWA 1956, p. 510.

<sup>31</sup> KLICHOWSKA 1962, p. 147.

<sup>32</sup> OKULICZOWA 1970, p. 115, note 34.

<sup>33</sup> DYMACEWSKI 1968, p. 31.

though not so often — as imprints on ceramic implements of East-Pomeranian Culture.<sup>34</sup>

The next discovered and determined sort of cereal is oat which played a much smaller role in the Lusatian Culture area than the remaining, already mentioned cereals. Oat vestiges appear in more significant quantities only at three sites: Smuszewo (71 grains), Wrocław-Osobowice (40) and Wolin-Młynówka (2). Relatively bigger quantities of oat vestiges were found in north-eastern Poland. Expressive quantities of oat grain mixed with chaff were discovered in layers of the fortified settlement at Ostrów, pow. Węgorzewo (site 6).<sup>35</sup> There is no data on the form of this mixture. It was found on a 10 m<sup>2</sup> area which — according to J. Antoniewicz — speaks for a spacious cultivation of this variety.<sup>36</sup> Oat imprints have also been found on Skandinavian, particularly west Danish relics from the decline of the Bronze Age. However we have no certainty that these imprints indicate the growing of this sort as a weed,<sup>37</sup> or whether it was planted in pure cultures since the Hallstatt period.

The least available data concern the last defined sort of corn, i. e. — rye. Very few vestiges have been discovered in cultural layers of fortified settlements: at Słupca (10 grains), Wrocław-Osobowice and open settlements at Wolin-Wzgórze Wisielców and Młynówka. This cereal grew originally as a weed in wheat fields and lively discussions on the origin of its domestication have continued until present days. It has been assumed until recently that rye was sown separately only since the Iron Age. It is thought at present that the origin of rye cultivation goes back much farther. It may be assumed on the basis of researches made by T. Wiślański that rye planting was significantly advanced already in the Engraved Band Ceramic Culture.<sup>38</sup> Rye imprints have also been discovered on East-Pomeranian Culture ceramics where they make up to 24% of all identified negatives,<sup>39</sup> equalling the number of barley imprints. The appearance of rye was also noted in pollen profiles from the Budzyńskie Lake near Mosiny,<sup>40</sup> and in north-eastern Poland (bed settlements of the Mikołajki Lake).<sup>41</sup> Our deductions cannot, of course, be based on calculation results of single samples from certain Polish regions. Such results are correct only as regards the close vic-

nity of their appearance. They cannot be taken as a basis for generalizations without preceding extensive palynological analyses aimed at reconstructing the natural environment pertaining to Lusatian Culture. It may, however, be presumed that the appearance of rye on only some areas seems to indicate a regional cultivation of this variety clearly depending on soil and climatic conditions.<sup>42</sup> This thesis may be illustrated to a degree by the relatively late rye planting in Skandinavia, where this variety of corn was sown in larger quantities only since the decline of the Roman period.<sup>43</sup> The problem concerning the beginning of rye cultivation remains, therefore, an open question and requires further extensive specialistic studies.

As regards the structure of plants cultivated by Lusatian Culture tribes in addition to cereals, pulse plants and root crops also played an important role. The pea was one of the most common leguminous plants grown at the decline of the Bronze Age and in the Hallstatt period. Pea seeds have been found at almost all investigated Lusatian sites. A decisive predominance of peas over other pulse plants has been noticed in open settlements of the Hallstatt period. Pea seeds amount up to 76.6% of all leguminous plants at Wolin-Wzgórze Wisielców, and 99.2% at Słupca. In fortified settlements this relation was as follows: Biskupin — 44.4%, Smuszewo — 28.1%, Kamieniec — 54.3%. 57 pea seeds were found at Słupca as the only variety of pulse plant.

The cultural layers of investigated settlements supplied moreover, though in a much smaller quantity, vestiges of Celtic broad beans and lentils. The largest quantity of broad bean (13,762) was found at Smuszewo together with significant amounts of edible lentil (9,648).

Vestiges of oleaginous plants, cultivated by Lusatian Culture tribes, discovered primarily at Biskupin<sup>44</sup> include: 125 poppy seeds (*Papaver somniferum* L.), 58 rape seeds (*Brassica rapa* L.) and as regards fibrous plants, only 8 flax seeds (*Linum usitatissimum* L.).

While discussing the structure of plants cultivated by Lusatian Culture tribes it is necessary to mention weeds which grew among cultivated plants and indicate the system of cultivation, environmental conditions and the appearance of particular cultivated plants. Recent studies by W. Giźbert dealing with weeds in archaeological finds<sup>45</sup> indicate the role they played in the structure of vegetable food of

<sup>34</sup> KLICHOWSKA 1962, p. 147.

<sup>35</sup> ANTONIEWICZ 1964, p. 20-23.

<sup>36</sup> ANTONIEWICZ 1964, p. 186.

<sup>37</sup> HJELMQUIST 1955, p. 138; LA BAUME 1961, p. 31.

<sup>38</sup> WIŚLAŃSKI 1969, p. 194.

<sup>39</sup> KLICHOWSKA 1962, p. 147.

<sup>40</sup> WIŚLAŃSKI 1969, fig. 28.

<sup>41</sup> RALSKA-JASIEWICZOWA 1966, p. 35.

<sup>42</sup> WIŚLAŃSKI 1969, p. 169.

<sup>43</sup> DYMACZEWSKI 1968, p. 32.

<sup>44</sup> MOLDENHAWER 1950, p. 80-81.

<sup>45</sup> GIŹBERT 1971.

Lusatian Culture tribes. We dispose of an extensive list of various weeds from that cultural period. Basing on investigations conducted so far it may be stated that weeds most frequently found in preceding periods (Neolithic and early Bronze Age) including white goosefoot, corn cockle (*Agrostemma githago* L.) and chess (*Bromus secalinus*) have still been noted in layers from the decline of the Bronze Age and the Hallstatt period. Most of the weed vestiges were discovered during works at Biskupin and Smuszewo.<sup>46</sup> Among the most frequently represented was gold of pleasure (*Camelina sativa* L. — Smuszewo 571,500, Biskupin 154 seeds), followed by various types of pale persicaria (*Polygonum convolvulus* L.) and goosefoot. At Biskupin there were, moreover, though in much smaller numbers, other varieties of weeds intentionally collected by settlers.

Large quantities of weeds were also found in Czechoslovakia and Hungary. 47 chess and a great number of corn cockle were identified there on culture sites from the late Bronze Age and the Hallstatt period.<sup>47</sup> Other weeds include gold of pleasure imprints found on Danish ceramics from the Bronze and Iron Ages. Later finds of this plant — at a burned homestead in Jutland (2nd century A. D.) — indicate its domestication. Gold of pleasure was appreciated for its contents of oil equalling flax.<sup>48</sup> A great quantity of weeds was also discovered at Danish sites dated to the early Iron Age. Compilations prepared by W. Giźbert<sup>49</sup> indicate that weeds most common in the period under discussion included white goosefoot, pale persicaria, wild oat, gold of pleasure and hemp nettle (*Galeopsis*). The accumulation of a large quantity of weeds at respective settlements indicates their role in the structure of vegetable nourishment. Weeds constituted a valuable addition to food during periods of cereal insufficiency.<sup>50</sup>

An essential element in evaluating the level of agricultural economy concerns the basis of tools. We shall not discuss here in detail the entire complex problem concerning the production and function of various types of tools since this would require separate, extensive studies. We should like to add that tools linked with agricultural activity of man were studied ten years ago by K. Godłowski,<sup>51</sup> who did not exhaust all source materials then available nor did he use all interpretation possibilities included in presented ma-

terials. The situation concerning tools used for the production of corn food is slightly better. A recently published monograph on this category of sources<sup>52</sup> indicates an apparent increase in the employment of handmills in the late Bronze Age and the Hallstatt period, this fact might have influenced the quantitative-qualitative progress as regards tillage. There is still the question concerning the function of numerous tools linked with agriculture. We have already indicated the use of sickles in reaping corn and grass. We should also like to mention the not very precise definition of the function of hoes made of stag horn,<sup>53</sup> frequently appearing in settlements particularly of the Hallstatt period. Without enumerating all implements which might have been used for tillage we should like to state that their list is essentially limited to sets of tools the function of which is not precisely defined.

Another subject open to discussion is the problem concerning the technique of soil cultivation. In the light of available archaeological facts we may presume that one of three systems was applied, but the selection of the most probable or the determination of common relations between simultaneous systems always meets with considerable difficulties. The hitherto rather common opinion on the prevalence of "rotation" tillage based on the burning out of forests<sup>54</sup> has recently been questioned.<sup>55</sup> Authors writing on this subject have indicated the coexistence of various agrotechnical systems.<sup>56</sup> However, the recognition of the priority of garden tillage over forest burning raises some reservations.

Considering the soil-climatic conditions in the discussed period in the Central European lowlands a satisfying of food requirements based principally on a system of garden tillage seems little probable. The cultivation of pulse plants and vegetables on small fields, even if they spread over the most favourable soil conditions, required constant and almost individual care. The crops were affected — next to the necessary moisture of the soil — by optimum climatic conditions. Any, even periodical, climatic changes resulted in a marked decrease in crops up to the disastrously bad harvests. As regards those cultivations ethnologic analogies clearly indicate the basic significance of permanent, optimum moisture of the soil and its continuous fertilization. Plots which had not been irrigated and fertilized produced insignificant crops and could be used only after prolonged regene-

<sup>46</sup> MOLDENHAWER 1950, p. 83.

<sup>47</sup> GIŹBERT 1971, p. 20.

<sup>48</sup> GIŹBERT 1971, p. 20.

<sup>49</sup> GIŹBERT 1971, p. 22-33.

<sup>50</sup> MAURITIO 1926, p. 90, 95-98, 100-120; HENSLOWA 1962.

<sup>51</sup> GODŁOWSKI 1960.

<sup>52</sup> BUKOWSKI, WIELOWIEJSKI 1970.

<sup>53</sup> GODŁOWSKI 1960, p. 40.

<sup>54</sup> HENSEL 1958, p. 69; 1957, p. 13.

<sup>55</sup> KURNATOWSKI 1966, p. 93-94.

<sup>56</sup> KURNATOWSKI, URBAŃSKA 1967, p. 57.

ration periods.<sup>57</sup> The gaining of new areas for cultivation was linked with burning out procedures which were rather advanced in the earlier phase of the Lusatian Culture period. Its two basic forms must also be taken into account — as was done by A. Dymaczeński who elaborated the earlier Stone Age.<sup>58</sup> The first would be characterized by the burning out of high virgin forests and the abandoning of the soil after it became emaciated, the second was probably the changing-fallow system based on the growing of different crops in a regular rotating order to avoid soil emaciation. The tempo of these changes must have depended on regeneration possibilities of the soil and — what is of importance for the Hallstatt period on the demographic situation.

It seems, therefore, that the role of corn cultivation according to the burning-out-rotation system (and perhaps also to the changing-fallow system) must have been much greater during the demographic pressure observed at the decline of the Bronze Age and the Hallstatt period. Together with the concentration of Lusatian settlers in fortified settlements the beginning of a gradual process of improving soil cultivation must also be taken into account. We may accept the growing of more complex agrarian systems based on dividing fields into two zones depending on their distance from the settlement. Thus, fields in the closer vicinity of a settlement could have been tilled continuously, but those farther away were cultivated in accordance with the changing-fallow system.<sup>59</sup> We come here to the still definitely unsolved problem of the beginnings of the utilization of ards. Recent investigations suggest that the Funnel Beaker Culture period should be accepted as the time span when this implement was used more commonly, though its more general employment must be dated to the beginnings of the Bronze Age.<sup>60</sup> Beginning with this period ards became a basic tool supporting former techniques of manual tillage. The introduction of new, more productive tools did not, of course end automatically the former ways of tillage but only provided an impulse towards their improvement. The degree of soil exploitation also speaks for a higher development of cultivation. Investigations of this problem have shown that similar types of soil were used in the Hallstatt period as in the Roman influence period or the early Middle Ages.<sup>61</sup>

The structure of animal breeding in the period under discussion also speaks for a more developed technique of soil cultivation. The quantity of bone vestiges found in cultural layers of investigated sites — principally settlements — is one of the basic standards of the economic significance of animal breeding in the economy of Lusatian Culture tribes. Independent of reservations concerning the reconstruction of the structure of herds on the basis of osteological materials,<sup>62</sup> an analysis of particular types of animals illustrates not only their share in consumption but facilitates attempts at reconstructing general development tendencies of those breedings. They are also illustrated by diagrams of pollen analyses. They indicate that the period coinciding with the development of Lusatian Culture was characterized by a significant culmination of synanthropic plants with a high index of pasture plants. This indicates an intensification of breeding economy — supported by bone

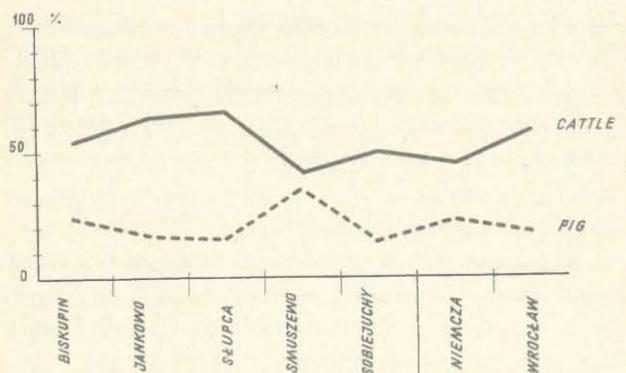


Fig. 5. The per cent participation of bone vestiges of cattle and pigs in Hallstatt fortified settlements from Wielkopolska and — comparatively — Silesia.

Udział procentowy pozostałości kostnych bydła rogatego i świń w grodziskach halsztackich z terenu Wielkopolski i porównawczo Śląska

vestiges appearing in settlements of Lusatian Culture. Compilations of osteological materials from sites of Lusatian Culture dated to the Hallstatt period (Table 2, Fig. 2) point to a decisive predominance of cattle over other species of bred animals. The percent of pigs is rather low at all investigated sites (Fig. 5) and does not exceed 35%, while the share of cow bones fluctuates between 40-65%. A decisive predominance of pig vestiges was recorded only at the Szczecin-Zamek site (49.4%) dated to the Ha C/D period. This individual find cannot be taken into consideration as there were considerable disturbances in Lusatian layers by later early Mediaeval settlements.

<sup>57</sup> FRANKOWSKA 1967, p. 107.

<sup>58</sup> DYMACZEWSKI 1968, p. 21; WIŚLAŃSKI 1969, p. 206-217; TABACZYŃSKI 1970, p. 160.

<sup>59</sup> TABACZYŃSKI 1970, p. 161, note 321.

<sup>60</sup> JAŹDŹEWSKI 1968, p. 21; WIŚLAŃSKI 1969, p. 203-204.

<sup>61</sup> DYMACZEWSKI 1968, p. 33, DANIELCZYK 1969.

<sup>62</sup> KRYSIAK 1957, p. 106.

The share of remaining domestic animals, particularly small ruminants (sheep and goats) was — in certain sites, particularly fortified settlements in Wielkopolska (Great Poland) — decisively higher than that of pigs and amounted to 20.4% at Słupca, 24.6% at Sobiejuchy. At Biskupin the quantity of bones of the two species was almost equal with a certain predominance of pig vestiges (23.4%) over sheep and goat bones (21.4%).

The share of horse vestiges also increased in the osteological material discovered in sites from Lusatian settlements from the decline of the Bronze Age and the Hallstatt period. Domesticated at the outset of the Bronze Age the horse began to play a more important role only since the decline of that Age.<sup>63</sup> The share of horses in the breeding structure of animals is not quite clear (cf. Table 2) since horse vestiges did not appear anywhere in greater quantities and their percent does not exceed 10% as a rule. Data from the fortified settlement at Niemcza, pow. Dzierżoniów, where bone fragments of horses comprise 12% of all identified domestic animals, are an exception. It may, however, be assumed that the relatively high share of horse vestiges there in comparison with other Lusatian sites resulted from a contamination of the osteological material with bone fragments from early Mediaeval layers.

The structure of breeding is different in Polish north-eastern areas. We dispose of only two larger series of osteological analyses from this area (East Pomerania and the Mazurian Lake District). Particularly interesting results have been achieved at the fortified settlement at Jeziorko, pow. Giżycko.<sup>64</sup> An analysis of the osteological material there collected revealed that the horse was absolutely at the head of the list of bred animals, its vestiges prevailed over those of sheep and goats — ahead of cattle and pigs. This individual discovery cannot, of course, be taken as a general rule, but it suggests that the structure of breeding there observed has been the result of a conscious selection of animal species adapted for climatic-fodder conditions existing in a defined natural environment.<sup>65</sup> Similar proportions of species have also been recorded in Lithuanian, Latvian and Estonian areas,<sup>66</sup> i. e. — environments resembling the Polish north-eastern environment. The east-Baltic region up to the Finnish Bay constitutes a part of the east European forest area where the

predominance of horses in the structure of bred animals was quite distinct.<sup>67</sup> This indicates that proportions in animal breeding structures observed in Polish north-eastern areas are quite different than those on areas inhabited by Lusatian Culture tribes. The cause for this difference lies undoubtedly in the above mentioned different climatic-fodder conditions.

Data obtained from two settlement centres in the Alpine region may illustrate the suggestion concerning the considerable influence of environmental conditions on the breeding structure of herds. One of these sites is situated at the foot of the Alps (Montlingerberg) at the height of 80 m. above sea level, the other (Mottata Ramosch) is one of the typical concentrations occurring at the height of 1500 m.<sup>68</sup> Inhabited settlements prevailed in these two regions — with breaks hard to trace with the help of source materials — since 1600 B. C. up to the decline of the first millennium B. C. Analyses of osteological materials there collected have indicated a continuous predominance of breeding over hunting. A certain essential increase in bone fragments of hunted animals has been noticed only in the transitional period between the decline of the Bronze Age and the early phase of the Iron Age. This coincides with climatic changes registered in those times. We cannot, however, be sure whether these changes resulted directly in a part break down of breeding and a following increase in hunting, because changes in the demographic situation which occurred in that period must also be taken into account. Archaeo-zoological investigations of bone material from the two above mentioned sites have revealed that the presence of respective species was different in both sites. There was a unilateral decrease of cattle vestiges at Montlingerberg and slight increase in the share of cattle at the outset of the La-Tène period. As regards the Mottana Ramosch settlement centres there was, at the outset, a shift from the cattle breeding to the raising of smaller ruminants (sheep and goats) with a simultaneous distinct regression of pig breeding beginning in 1000 B. C. (Fig. 6).<sup>69</sup> In the light of the above data we may accept the existence of a dependence between quantitative changes in herd breeding structures and the cultural, demographic and environmental influences.

Problems concerning fodder stocks are among the basic factors shaping the structure of breeding economy. This notion includes the existence of suitable pasture areas and possibilities of providing fodder for animals

<sup>63</sup> HANČAR 1956; WIELOPOLSKI 1967.

<sup>64</sup> KRYSIAK 1958, p. 71.

<sup>65</sup> LEPIKSAAR 1962, p. 115.

<sup>66</sup> PAAVER, KULIKAUSKAS 1965, tabl. I-III; CALKIN 1962.

<sup>67</sup> OKULICZOWA 1970, p. 120.

<sup>68</sup> WÜRGLER 1962.

<sup>69</sup> WÜRGLER 1962, p. 40, tabl. 3.

in winter time. An essential standard of progress as regards animal breeding techniques was the more extensively applied form of grazing herds on rich pasture land so far not systematically exploited. In our geographical zone a particular role is attributed to forests which — considering their abundant natural environment — provided basic pasture areas in conditions of primitive breeding.<sup>70</sup> This problem is still open as regards the duration of Lusatian Culture — in particular since several settlement and socio-economic processes have not yet been sufficiently investigated. Archaeological facts revealed so far indicate the existence of two basic mutually supplementing methods of solving fodder problems. The first concerns the above mentioned extensive forms of grazing herd animals, the second — methods of gathering and preparing stores for the winter. Fodder insufficiencies always constituted important problems and created unfavourable conditions for a more complete and general development of breeding economy not only in the period here discussed but also — confirmed by source data — in much later periods (e. g., in the early Middle Ages).<sup>71</sup> The optimum development of breeding depended moreover on the quality of fodder, particularly on mineral ingredients necessary for the proper development of animals. It was even thought that the lack of certain organic components resulted directly in the failure of breeding economy.<sup>72</sup> Difficulties concerning fodder were, therefore, undoubtedly, the principal cause of a decrease in the head of raised herds. There were most probable departures caused by local conditions and the already mentioned factors: the system of grazing, methods of gathering fodder and the seasonal decrease in the head of bred animals.

The solution of these problems — if only as regards areas inhabited by the Lusatian Culture population — requirew separate comparative studies within the framework of selected eco-systems by both: archaeologists and ecologists. This type of research has for years been among the most urgent research requirements. It is possible at present only to indicate a sway in the ecologic balance of respective regions caused by an intensification of breeding economy. In a natural state phytophagous animals adapt themselves to pasture conditions of a particular region and the natural mechanism regulating the development and decline of the respective population maintains appropriate proportions between the growth of

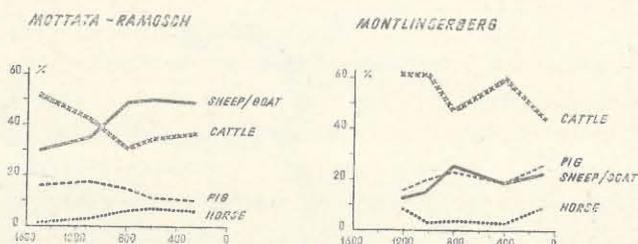


Fig. 6. The participation of bone vestiges in Alpine settlement groups.

Udział pozostałości szczątków kostnych z alpejskich skupień osadniczych

Accord. to F. E Würgler

vegetation and its drop caused by grazing animals. These proportions vacillated when breeding economy was intensified and gradually pushed out onto poorer areas by vegetable cultivation.<sup>73</sup> The degree of environment emaciation depended certainly on the species of bred animals. The grazing of smaller ruminants causes much greater damage than the grazing of cattle, although cattle grazing in large numbers on areas where precipitation is smaller may over long periods cause analogical emaciation of the region. The ecologic function of grazing is not limited to changes on the surface of the soil, it reaches down into deeper layers, impoverishes the soil and results in a systematic sterilization.<sup>74</sup> Forest grazing predominant in the period under discussion, strongly linked with other sectors of economy (principally agriculture) exerted decisive influence on the ecological devastation of certain microregions; with its peak during the mentioned demographic pressure.<sup>75</sup>

Another essential problem linked with the breeding economy concerns the use of domestic animals. It may be assumed in the light of revealed archaeological facts that animal breeding was of a distinct „meat” character, since all animals were killed and eaten. It seems that only the use of cows and smaller ruminants was of a more general character. In addition to meat these animals supplied organic material utilized in further treatment (skin, bones, wool, horn) and (particularly cows) milk. The milk yield of cows must have been relatively small in those times and did probably not exceed 700 l. p.a. These assumptions are based on results of studies on the output of cows in central Poland in the 17th c. when the average output of a cow kept by peasants was 720 l. of milk

<sup>70</sup> PYRGAŁA 1970, p. 34-35.

<sup>71</sup> DYMACEWSKI 1968, p. 31.

<sup>72</sup> GLOB 1951.

<sup>73</sup> OLSZEWSKI 1971, p. 107.

<sup>74</sup> OLSZEWSKI 1971, p. 108-109.

<sup>75</sup> BUKOWSKI 1971, p. 172-174.

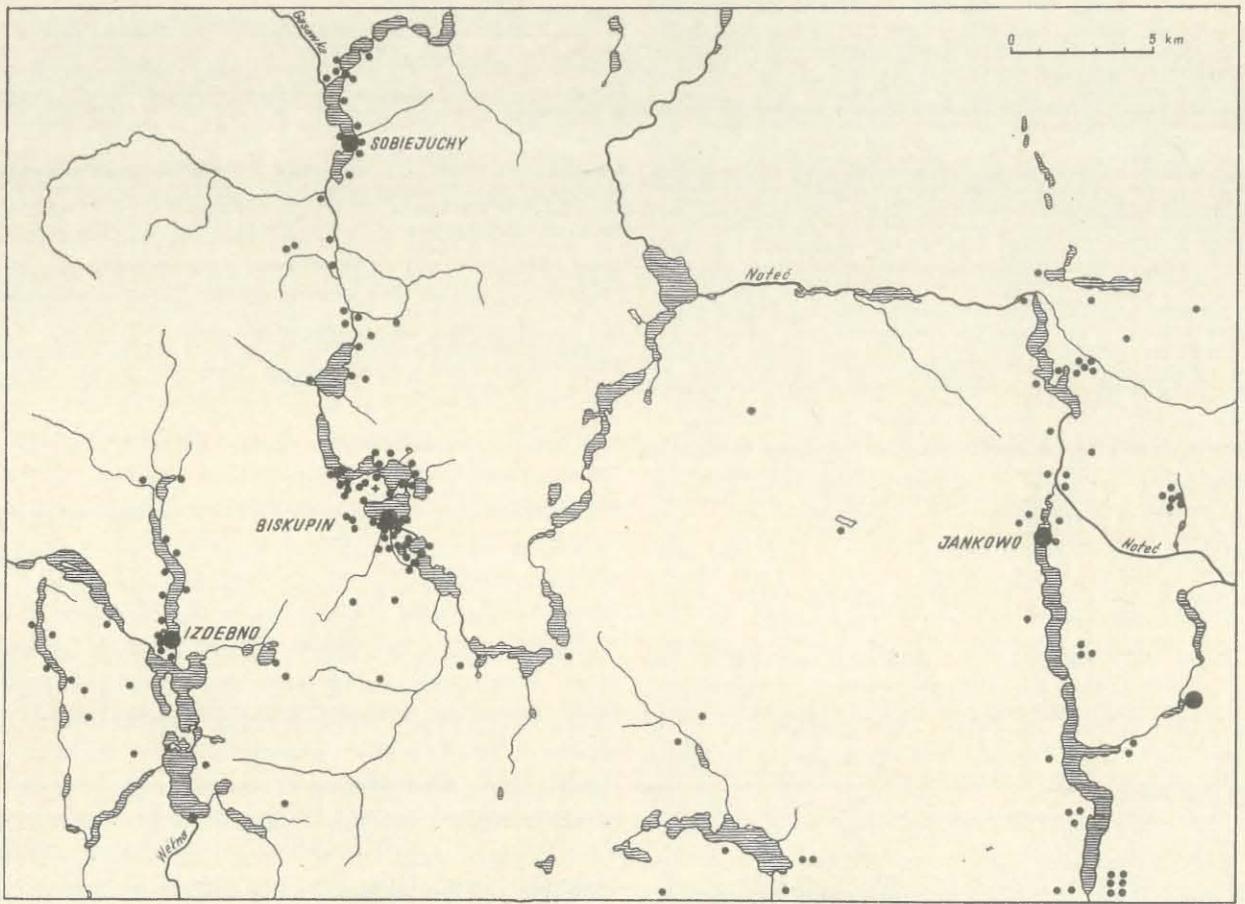


Fig. 7. Concentration of sites in the fortified settlement region within the limits of particular inhabited districts.

Koncentracja stanowisk w rejonie osiedli obronnych w ramach poszczególnych ekumen

p.a.<sup>76</sup> The relatively small milk yield of cows resulted from their being used as beef cattle and — this should also be kept in mind — as draft animals.

A considerable role in supplementing daily food requirements in the economic structure of Lusatian people was played by hunting and fishing. Stag vestiges followed by roe deer, boar, bison and elk are on the top of lists embracing remains of game discovered at Lusatian sites.<sup>77</sup> A similar list may be applied to fortified settlements from north-eastern Poland in the Iron Age,<sup>78</sup> and those from east Baltic areas (principally Latvia, Lithuania and Estonia).<sup>79</sup> It should also be kept in mind that the available osteological material does not reflect the entire share of hunting in the ecologic structure of Lusatian tribes. Only selected fragments of hunted animals were included in cultural layers of settlement sites. A part

of those animals was probably prepared and eaten on the hunting ground.

Fishing also played an important role in the economic structures at the decline of the Bronze Age and the Hallstatt period. This is indicated by large finds of fish vestiges, principally scales, in cultural layers of investigated objects, and also by sets of tools linked with fishing (net sinkers, bark floats, fish hooks made of bone, horn, bronze or more recently of iron).<sup>80</sup> Insufficient source material causes difficulties in a present evaluation of the role of fishing among particular Lusatian tribes. It may be assumed that its role grew chiefly in regions offering suitable natural conditions.

Demographic relations prevailing within respective settlement eco-systems play an important role in studies on the economic structure of Lusatian Culture tribes. The already mentioned insufficiencies of source material make observations concerning the entire area inhabited by the investigated cultural group impossible. We are, therefore, restricted to

<sup>76</sup> BARANOWSKI 1957; PYRGAŁA 1970, p. 31.

<sup>77</sup> SOBOCIŃSKI 1971 a.

<sup>78</sup> OKULICZOWA 1970, p. 118.

<sup>79</sup> OKULICZOWA 1970, p. 118, notes 54 and 55; PAAVER, KULIKAUSKAS 1965, p. 275.

<sup>80</sup> KAJ 1950.

remarks on the population density of several more completely investigated habitations, particularly from north-eastern areas of Wielkopolska<sup>81</sup> and Lower Silesia.<sup>82</sup>

As regards the first region,<sup>83</sup> where the concentration of Lusitan fortified settlements was clearly defined (Fig. 7), the dimensions of respective habitations were limited to 500-800 km<sup>2</sup>; and to about 200 km<sup>2</sup> as regards Lower Silesia.<sup>84</sup> Demographic relations which prevailed in these two regions were shaped in similar proportions. 10-12 persons have been agreed upon as the number of inhabitants of one homestead at Biskupin which amounts to

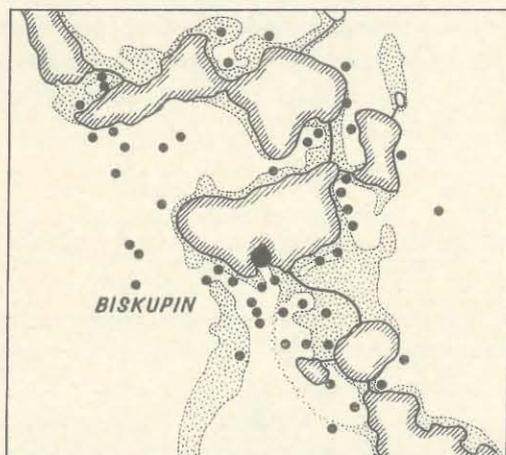


Fig. 8. Lusitan Culture settlements from the Hallstatt period in the Biskupin, pow. Żnin.

Osadnictwo kultury łużyckiej z okresu halsztackiego w rejonie Biskupina, pow. Żnin

Accord. to Z. A. Rajewski

population standards correspond approximately with data calculated by S. Kurnatowski<sup>87</sup> for certain phases of the early Middle Ages. The concentration of homesteads within fortified settlements created, therefore, substantial economic problems concerning primarily the provision of daily food as regards both the quantity of supplied food and — what is of great importance — the quality of procured food products.

We arrive here at a more general problem — i. e. the occurrence of nourishment insufficiency particularly during “quality” (partial) hunger. A clear distinction should be made between extreme scarcity

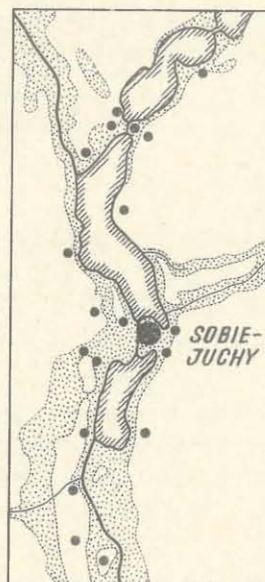


Fig. 9. Lusitan Culture settlements from the Hallstatt period in the Sobiejuchy, pow. Żnin.

Osadnictwo kultury łużyckiej z okresu halsztackiego w rejonie Sobiejuch, pow. Żnin

Accord. to Z. Bukowski

1000-1250 inhabitants accepting the hypothetically determined number of (102-106) houses. The number of inhabitants at Sobiejuchy was — according to Z. Bukowski's<sup>85</sup> calculations — 2000-2500 individuals. It may, therefore, be assumed that the population density was 3-4 individuals per 1 km<sup>2</sup> in the investigated habitations,<sup>86</sup> and depended on the economic utility of particular settlement groups and their localization as regards trade routes existing in those times. Consequently, there were densely inhabited areas (e. g., Biskupin, Jankowo or Sobiejuchy — Figs. 8 and 9) and others where settlements were less numerous (Słupca — Fig. 11). The here accepted average

<sup>81</sup> RAJEWSKI 1957; 1958.

<sup>82</sup> GAŁUSZKA 1963.

<sup>83</sup> RAJEWSKI 1957, p. 157; BUKOWSKI 1967, p. 109, note 131.

<sup>84</sup> GAŁUSZKA 1963, p. 514.

<sup>85</sup> BUKOWSKI 1967, p. 109, note 132.

<sup>86</sup> BUKOWSKI 1967, p. 109, 110, fig. 7.

of food and partial lack of food. The first led rapidly to starvation and an increased death rate, the second resulted in a decrease in the dynamics of physical development of children in particular and increased the death rate of the age group prior to its reproduction possibilities. We may speak of “quality” hunger when the daily intake of calories does not exceed 200 units per head. However, attention must be drawn to the fact that the cause of hunger resulted most frequently from unfavourable climatic conditions, floods, long-lasting hard frosts, and sometimes from such factors as wars, pillage or epidemics<sup>88</sup>. Food insufficiency, resulting in considerable handicaps of the

<sup>87</sup> KURNATOWSKI 1971, p. 472, tabl. II.

<sup>88</sup> OLSZEWSKI 1971, p. 160; HENSEL 1972, p. 72.

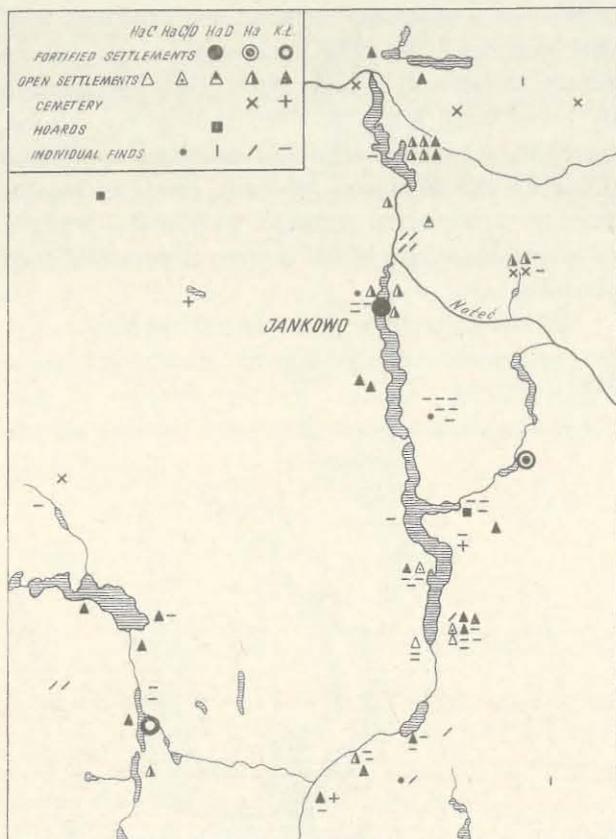


Fig. 10. Lusatian Culture settlements from the Hallstatt period in the Jankowo, pow. Inowrocław.

Osadnictwo kultury łużyckiej z okresu halsztackiego w rejonie Jankowa

Accord. to J. Ostoja-Zagórski

health of the Lusatian Culture population, must have been particularly cumbersome in the period under discussion. Qualitative nourishment deficiency repeated in cycles compelled man, fending the tantalizing hunger, to devour everything edible in order to satisfy the minimum of energy requirements.<sup>89</sup> This explains partly the large quantity of weed vestiges discovered in cultural layers of — principally fortified — settlements (incl. Biskupin and Smuszewo). It indicates, moreover, the — at least periodical — increase of the significance of gathering. Periods of qualitative and probably also quantitative food scarcity, recurring in cycles particularly at the end of the Hallstatt period, caused among other factors by climatic changes, and consequent poor harvests resulted probably in the sprouting of various diseases, which became most probable one of the causes for a decrease in the demographic potential recorded at the turn of the Hallstatt and the early La-Tène periods. We may presume that

<sup>89</sup> SZCZYGIEL, WYSKOŃSKA 1966, p. 23-24.

they were also one of the reasons for a decline of fortified settlements and, consequently, the downfall of Lusatian Culture.<sup>90</sup> This has been indicated, among others, by significant vacillations of the death rate registered for this period, which proves an insufficient environmental control. However, this problem requires more extensive studies on demographic conditions prevailing at the decline of the Bronze Age and the Hallstatt period (Ha C/D) in the north and west districts of the Odra and Vistula basin areas, and particularly an elaboration of new methods in anthropological studies carried out on cremation cemeteries.<sup>91</sup>

The demographic density of Lusatian Culture tribes, noticeable especially at the decline of the Bronze Age and the Hallstatt period was probably disproportionate to their technical abilities concerning the management of crops during fertile and poor harvests as

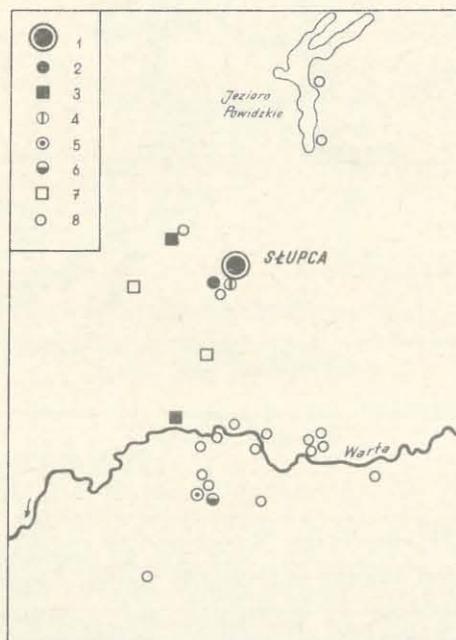


Fig. 11. Lusatian Culture settlements in the Słupca region  
1 — fortified settlement; 2 — open settlement from the early Iron Age; 3 — cemetery from the early Iron Age; 4 — dike; 5 — an undefined site from the early Iron Age; 6 — open settlement generally dated to the Lusatian Culture period; 7 — cemetery dated as before; 8 — an undefined site dated as before.

Osadnictwo kultury łużyckiej w rejonie Słupcy

1 — grodzisko; 2 — osada otwarta z wczesnej epoki żelaza; 3 — cmentarzysko z wczesnej epoki żelaza; 4 — grobla; 5 — stanowisko nieokreślone z wczesnej epoki żelaza; 6 — osada otwarta datowana ogólnie na okres trwania kultury łużyckiej; 7 — cmentarzysko datowane jw.; 8 — stanowisko nieokreślone, datowane jw.

Accord. to T. Malinowski

<sup>90</sup> Cf. ANGEL 1969a; 1969b and 1972; COCKBUR 1971. In Polish archaeological literature this problem was mentioned by W. HENSEL (1971, p. 72).

<sup>91</sup> BUKOWSKI 1967, p. 107; STRZAŁKO, OSTOJA-ZAGÓRSKI 1974.

Tabela 3. Jankowo, pow. Inowrocław. The percent share of bone vestiges of basic species of domestic animals within the framework of successive settlement layers — Procentowy udział szczątków kostnych podstawowych gatunków zwierząt domowych w ramach kolejnych poziomów osadniczych\*

Settlement layers — Poziomy osadnicze	Chronology Chronologia	Number of defined bones — liczba kości ozna- czonych	Horse Konia	Cattle Bydło	Pig Świnia	Sheep/goat Owca/koza	The share of	
							domestic animals Udział szczątków domowych	wild animals zwierząt** dzikich
III — open settlement on the ruins of a fortified settlement — osada otwarta na ruinach grodu	Ha D/LA	2962	6.51	72.99	13.27	6.89	90.09	9.91
II — more recent fortified settlement — gród młodszy	Ha D	2353	11.94	59.35	16.34	12.33	88.10	11.90
I — the older fortified settlement — gród starszy	Ha C/D	2139	10.84	68.12	13.50	7.14	89.98	10.02

\* Percent calculations have been carried out by summing up horse + cattle + pig + sheep and goat vestiges = 100%.  
Obliczenia procentowe dokonano sumując szczątki konia + bydła + trzody chlewnej + owcy i kozy = 100%.

\*\* Calculations have been based on the entire bone material (vestiges of domestic and hunted animals) — Obliczenia dokonano na całym materiale kostnym (szczątki zwierząt domowych i łownych).

well as the ability to prevent various epidemic diseases. It seems, that when the concentration of Lusatians in fortified settlements exceeded a certain permissible level there occurred a sudden catastrophe which resulted in a significant decrease in the population number,<sup>92</sup> or even in a complete depopulation of certain regions.<sup>93</sup> These problems require further extensive studies in order to define principal characteristics of socio-economic changes which occurred in the prehistorical period here discussed. It seems, that an explanation of the still unsolved question concerning the decline of fortified settlements should be sought in the breakdown of the then prevailing economic system.

Stressing the rather hypothetical character of these arguments which suggest one of the possible but far from univocal solutions concerning economic problems from the decline of the Bronze Age and the Hallstatt period we should like to sum up the above remarks. Contrary to opinions prevailing in present-day literature on the subject we have accepted the possible existence of a more complex economic structure in the period under discussion, where, in addition to leading economic sectors: agriculture and breeding, the traditional forms of procuring food, i. e. — gathering, hunting and fishing, also played a significant role. All these economic subdivisions merged into one complex entity which was the basis for the existence of particular tribes, but the share of various branches was differentiated in accordance with regions. The

<sup>92</sup> CIPOLLA 1964, p. 77, note 3. Cf. BRAUDEL's (1971, p. 189) remarks on the subject of the influence of inhabitation on the regularity of economic development.

<sup>93</sup> GODŁOWSKI 1969, p. 151.

primacy of agriculture and animal breeding might have been signaled in the quantity of supplied food. This was accompanied by a rather clearly progressive process of internal differentiation which divided the area inhabited by Lusatian Culture tribes into regions characterized by a various degree of specialization in these two basic sections of economy. Regional environmental conditions played an important role in this division. These tendencies are reflected in a significant economic differentiation of the here discussed areas of the Central European lowlands. We must, therefore, take into account an insignificant predominance of agriculture — as regards the quantity of supplied food — in certain regions, whereas this role was fulfilled by animal breeding in others. The continuous considerable share of gathering and hunting linked with fishing should also be born in mind. The belief prevailing in literature on the insignificant role of hunting — as regards the supply of meat by Lusatian tribes (ca. 20% of game of all the meat consumed) — is not sufficiently supported by documents, forasmuch some of the meat was consumed directly on the hunting ground. Only selected parts were brought to homesteads, hence the insignificant percent of bones of wild animals in the cultural layers of settlements. It should also be remembered that bone fragments of smaller mammals could have been scattered without trace.<sup>94</sup> As regards this subject, observations concerning a distinct increase in hunting — at least in some regions — at the turn of the decline of the Bronze Age and the Hallstatt period seem to

<sup>94</sup> KRYSIAK 1957, p. 106.



Fig. 12. Sobiejuchy, pow. Żnin. Aerial photograph taken in 1960 by T. Biniewski  
Zdjęcie lotnicze wykonane w 1960 r.

be characteristic. This phenomenon was probably linked with the demographic pressure prevailing in that period and the consequent population concentration in fortified settlements. There was in those times certainly also an increase in gathering and fishing.

The previously emphasized interdependence between environmental conditions and the differentiation in the economic structure of defined microregions are clearly illustrated by compilations of palaeobotanical and archaeo-zoological materials. The relatively scanty material base makes it impossible to put forward any far reaching conclusions. On the basis of available data it seems, however, that we may already indicate certain moments of this regional economic differentiation. Data of interest to us have been supplied chiefly by archaeo-zoological materials. A large quantity of cattle bones discovered in north-eastern Wielkopolska has been dated to the decline of the Hallstatt period. These fragments make up 60-50% of identified vestiges of domesticated animals. An exception here is the fortified settlement at Smuszewo, where remnants of cattle embrace 41% of all defined archaeo-zoologi-

cal materials. These proportions are different in West Pomerania — the share of cow vestiges does not exceed 35% there. Simultaneously, a progressive increase in the share of pig bone remnants up to 50% of all defined species of domestic animals may be observed. Nevertheless, results obtained in Pomerania should be treated with circumspect since the Lusatian osteological material might have been contaminated by later early mediaeval settlements. It seems, however, that observed changes resulted in a high degree from different climatic conditions of the environment which decisively influenced the selection of species of bred animals. Simultaneously with changes in the structure of animal breeding there must have been changes in corn cultivation. This is manifest particularly in Pomerania in the predominance of barley over other varieties of corn. Similar tendencies were also noticed in Skandinavia where the predominance of barley over other cereals is evident particularly in the final periods of 1000 B. C.<sup>95</sup>

<sup>95</sup> DYMACEWSKI 1968, p. 31.



Fig. 13. Izdebno, pow. Żnin, Aerial photograph taken in 1959 by T. Biniewski  
Zdjęcie lotnicze wykonane w 1959 r.

One of recently lively discussed problems concerns the technique of soil cultivation in the period under discussion. The still insufficiently investigated settlement and socio-economic processes occurring on areas inhabited by Lusatian tribes prevent us from defining the principal form of soil cultivation of those times. The interesting, though not sufficiently documented hypothesis on the predominance of garden cultivation over other techniques of tillage<sup>96</sup> requires further studies to be carried out together with representatives of natural sciences. It seems that the intensification of garden plot cultivation supplemented only by rotation-burning out agriculture and forest grazing could not provide the basis for supporting people grouped in extensive settlements, particularly fortified settlements. These proportions must have changed greatly when people came in flocks to live in fortified settlements. It may be assumed that corn farming based on the rotation-burning out system of soil cultivation or forest grazing — depending on specific regions — was the basis of food supply

for people living in fortified settlements. These two principal branches of economy were in our opinion considerably supported by garden cultivation and also by traditional forms of providing food (gathering, hunting and fishing).<sup>97</sup> There is no doubt that soil cultivation techniques and the character and structure of animal breeding underwent — often significant — changes within respective settlement areas, but most of these are impossible to define at the present state of our knowledge considering the insufficient precision of chronological definitions.

It is not easy to reconstruct the directions of socio-economic changes which occurred at the decline of the Hallstatt period on the basis of available, fragmentary archaeological facts. It seems, however, that they are linked directly with factors causing the decline of fortified settlements. Attention needs to be given to the interesting thesis advanced recently by Z. Woźniak.<sup>98</sup> This researcher thinks that fortified settlements were inhabited by people who cultivated fields together.

<sup>96</sup> KURNATOWSKI 1966, p. 93-94.

<sup>97</sup> HOŁUBOWICZ 1960, p. 90.

<sup>98</sup> WOŹNIAK 1971, p. 207.



Fig. 14. Jankowo, pow. Inowrocław, Aerial photograph taken in 1969 by T. Biniewski

Zdjęcie lotnicze wykonane w 1969 r.

When these settlements were liquidated and the inhabitants returned to smaller, open hamlets there was a change in the system of farming manifest chiefly in the abandonment of common tillage methods. It may be that the significance of garden cultivation increased in that period. The abandoning of the burning out system dated to the middle of the first century B. C. has also been proved by palynologic studies.<sup>99</sup> This suggestion may also be illustrated by investigations of the osteological material from the fortified settlement at Jankowo, pow. Inowrocław. It supplied capital data concerning changes in the share of particular animal species within the framework of successive settlement layers differentiated in accordance with stratigraphic principles. Investigated series of osteological material are quite numerous (more than 2000 bone fragments defined for each strata) which makes it possible to accept these results as representative (Table 3). In the first settlement stratum (the older settlement) there is a clear predominance of cattle (68.12%) over other species of bred animals, i. e. — pigs (13.50%) and small ruminants (7.14%). These proportions differ in the second (later) stratum. This is undoubtedly linked with a partly change in planning of the object, a greater density of buildings and the degree of saturation of the cultural strata with ancient materials, particularly ceramics. As regards the later of the fortified settlements there was a significant increase in the share of smaller ruminants of 5.19% and in pigs of 2.84% at the expense of cattle the percent of which was 8.77% lower than in the previous (older) settlement.

Achieved results undoubtedly influenced the settlement intensification in the Jankowo region and

also the demographic pressure determined for the Ha D period which led to an increase in food consumption. The nourishment structure indicating an increase in that period undoubtedly influenced the selection of species of bred animals. This might explain the preference of those species which have a shorter production cycle, i. e. — smaller ruminants and pigs. The intensification of plant production and an increase in gathering, hunting and fishing fall certainly also on that period. The highest percentage of wild animal bones (11.90%) indicates an increase in the role of hunted animals in the consumption structure. The intensification of economic activity clearly visible in that period must have contributed to a considerable exploitation of respective settlement regions and later of microregions which was undoubtedly linked with causes for the breakdown of settlements and the decline of fortified settlements. The above assertions are supported by analyses of the bone material collected in cultural strata of the settlement established on ruins of a former fortified settlement, indicating a renewed increase of cattle (up to 72.99%) and a concurrent decrease in the number of small ruminants (of 5.44%) and of pigs (3.07%). We obtained, therefore, data approaching those recorded for the first stratum.

We have arrived here at the basic problem signalled in the course of these deliberations concerning the socio-economic development noticed primarily during the final phase of the Hallstatt period embracing certain areas of the Odra and Vistula basins. As a result of these changes, undoubtedly influenced by events in the Hallstatt and also Etruscan circles,<sup>100</sup> there appeared on certain areas fortified settlements of the Biskupin type, often situated on islands or semi-peninsulas (cf. Figs. 12-14) and characterized by similar defence constructions, planning and the building-up around the maidan (Figs. 15 and 16) which included various basic characteristics (in the earliest stage of development, of course) of later urban centres.<sup>101</sup> The already mentioned demographic pressure, particularly the exceeding of demographic density levels permissible in that period and events of a political nature (inter-tribal warfare, Scythian raids) together with climatic changes and resulting poor harvests (perhaps also periodical starvation) led to a downfall of fortified settlements and a partial (or at some places complete) depopulation of certain districts. The inflorescence process of Lusatian Culture was suddenly interrupted, this is seen in the dispersal of settlements, the appearance of open colonies on the

<sup>99</sup> RALSKA-JASIEWICZOWA 1968.

<sup>100</sup> HENSEL 1970, 1972.

<sup>101</sup> HENSEL 1972, p. 13.

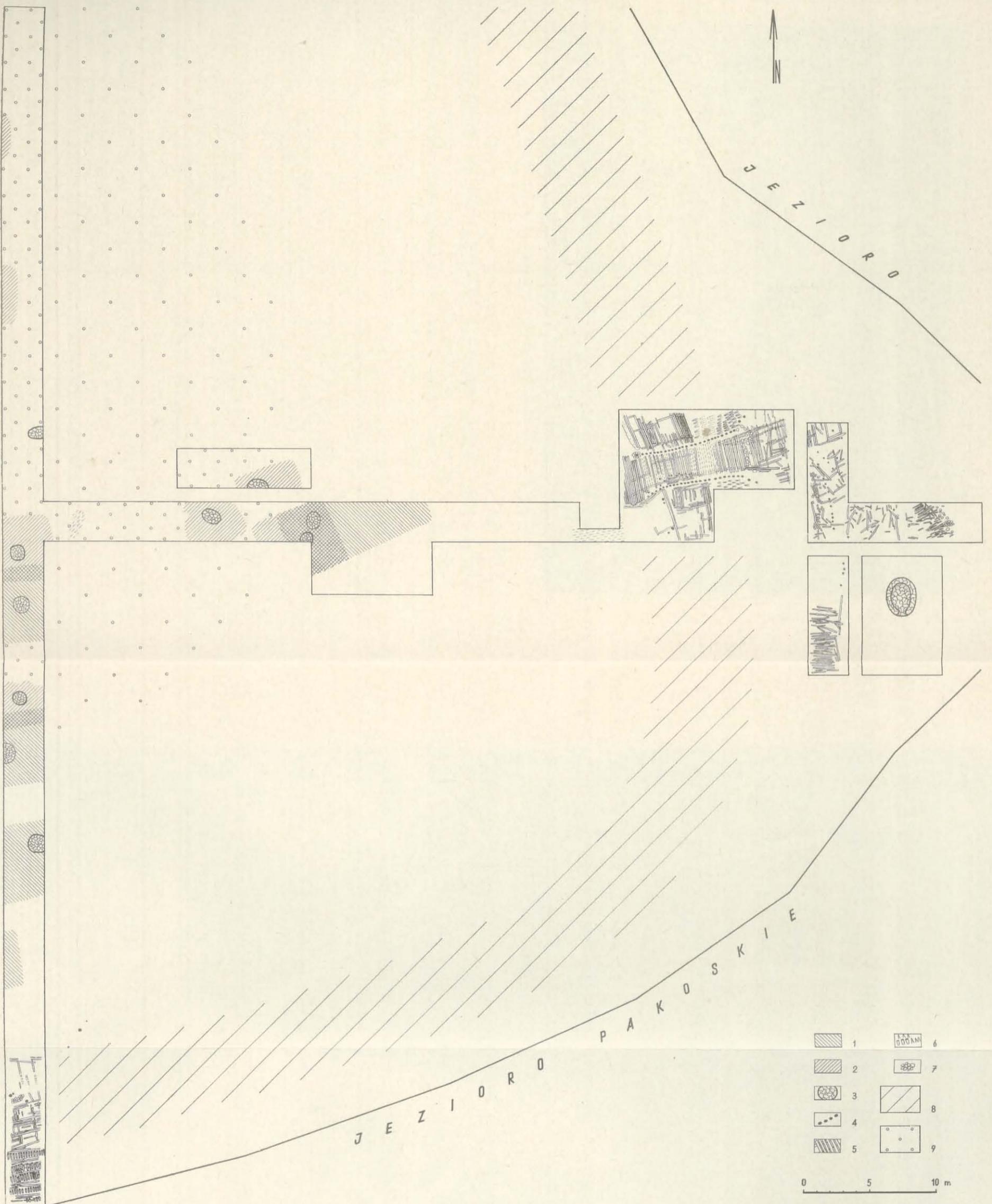


Fig. 15. Jankowo, pow. Inowrocław. The plan and buildings of the older and more recent fortified settlement — Rozplanowanie i zabudowa grodu starszego i młodszego  
 1 — older homesteads; 2 — later homesteads; 3 — firebeds; 4 — wood pillars; 5 — wood constructions; 6 — breakwaters; 7 — stone concentrations; 8 — an outline of defence walls; 9 — stone pavement  
 1 — domostwa starsze; 2 — domostwa młodsze; 3 — paleniska; 4 — słupy drewniane; 5 — konstrukcje drewniane; 6 — falochrony; 7 — skupiska kamieni; 8 — zarys wału obronnego; 9 — bruk kamienny







Fig. 16. Biskupin, pow. Żnin. Gateway of the fortified settlement — Brama grodu

Acord. to Z. Rajewski

ruins of fortified settlements (e. g., Biskupin, Jankowo) and in the change of the model of economy. There is a return to economic forms prevailing in the period preceding the establishment of fortified settlements and still surviving in the first phase of their existence. The Lusatian Culture drawing to its close was absorbed by East-Pomeranian Culture tribes.

Summing up our deliberations we arrive at the following conclusion:

1. The economic system of Lusatian Culture tribes was complex and comprised various applications of stationary and mobile forms of exploiting natural resources.

2. Particular settlement regions were inhabited continuously though there is evidence for periodic settlements which indicates an existing rotation of cultivated areas.

3. Particular settlement districts were permanently exploited despite the intensive rotation cycle.

4. This created a gradually progressing and — in the final phase of the Hallstatt period, as a result of the concentration of the population in fortified settlements — a sudden staggering of the local eco-

logical balance, which must have caused considerable perturbations in the so far applied economic system and contributed towards a breakdown of fortified settlements and initiated the decline of Lusatian Culture.

As regards several problems discussed in this treatise our research proceedings, lacking sufficient (chiefly specialistic) research results had to be limited to an introductory formulation of possibilities, where intuition often takes place of material proof. Apprehension by sense cannot be a basis for scientific theses, it is, nevertheless, not without significance in outlining the here introduced working hypotheses. Resolutions of these complicated problems should be sought in detailed archaeologic-ecological studies dealing with particular settlement regions (microregions) situated in quite different environmental conditions.

*Translated by Jan Rudzki*

Poznań, September-November, 1972

## BIBLIOGRAPHY

## Abbreviations

- AP — "Archeologia Polski", Wrocław-Warszawa.  
 FAP — "Fontes Archaeologici Posnanienses", Poznań.  
 MS — "Materiały Starożytne", Warszawa.  
 MZP — "Materiały Zachodnio-Pomorskie", Szczecin.  
*Materiały* — *Materiały do prahistorii ziem polskich*, Warszawa.  
 PA — "Przegląd Archeologiczny", Poznań, Wrocław.  
 SA — "Sprawozdania Archeologiczne", Wrocław-Warszawa-Kraków.  
 SDGW — *Studia z Dziejów Gospodarstwa Wiejskiego*, Warszawa.  
 WA — "Wiadomości Archeologiczne", Warszawa.

## Literature

- ANGEL J. L.  
 1969a *The Basse of Palaeodemography*, "American Journal of Physical Anthropology", vol. 30, No 3, p. 427-437.  
 1969b *Palaeodemography and Evolution*, ibidem, vol. 31, No 3, p. 343-353.  
 1972 *Ecology and Population in the Eastern Mediterranean*, "World Archaeology", vol. 4, No 1, p. 88-105.
- ANTONIEWICZ J.  
 1964 *Osiedla obronne okresu wczesnożelaznego w Prusach*, (Sum.: Early Iron Age Fortified Settlements in Prussia), "Światowit", vol. 25, p. 5-211.  
 1966 *Einige Bemerkungen über den Getreidebau und die Viehhaltung bei den westbaltischen Stämmen in der Früh- und Mitteleisenzeit*, [in:] *Pronusijast varse fedal-simini*, Tallin, p. 29 and next.
- BARANOWSKI B.  
 1957 *Chów bydła w drugiej poł. XVII w. i w XVIII w. w Łęczyckiem i na terenach sąsiednich* (Sum.: Cattle Breeding in Łęczyca Voivodeship and Adjacent Territories during the Second Half of the 17th and in the 18th Centuries), SDGW, vol. 1, p. 198-258.
- BRAUDEL F.  
 1971 *Historia i trwanie*, Warszawa.
- BUKOWSKI Z.  
 1967 *Uwagi o problematyce badań osadnictwa kultury łużyckiej* (Résumé: L'Etat des recherches sur l'habitat humain de la civilisation lusacienne), *Studia z Dziejów Osadnictwa*, vol. 5, Wrocław, p. 52-125.  
 1971 *Charakter osadnictwa kultury łużyckiej w fazie osiedli obronnych na przykładzie Śląska i Wielkopolski* (Sum.: The character of Settlement of the Lusatian Culture in the Phase of Fortified Settlements in Silesia and Great Poland), WA, vol. 36, No 2, p. 155-177.
- BUKOWSKI Z., WIELOWIEJSKI J.  
 1970 *Narzędzia przetwórstwa zbożowego na ziemiach Polski od wczesnego neolitu do okresu wczesnośredniowiecznego* (Résumé: Outils pour la transformation du blé sur les terres Polonaises à partir du Néolithique ancien jusqu'à la période du haut Moyen Age), SDGW, vol. 12, z. 1, s. 9-100.
- CAŁKIN V. J.  
 1962 *Životnovodstvo i ochota w lesnoj połosie Vostočnoj Evropy w rannem železnom veke*, *Materiały i Issledovanija po Archeologii SSSR, Moskva-Leningrad*, No 107, p. 5-96.
- CHMIELEWSKI K.  
 1958 *Zwierzęce szczątki kostne z grodziska kultury łużyckiej w Słupcy* (Résumé: Le Material ostéologique animal de l'enceinte fortifiée de la civilisation lusacienne de Słupca), FAP, vol. VIII/IX, p. 115-136.
- CHUDZIAKOWA J.  
 1972 *Z badań nad kulturą łużycką w międzyrzeczu Wisły, Drwęcy i Osy* (Zus.: Zur Forschung der Lausitzer Kultur im Flussgebiet der Weichsel, Drwęca und Osa), AP, vol. XVII z. 1, p. 87-125.
- CIPOLLA M. C.  
 1964 *The Economic History of World Population*, Penguin Books.
- COCKBUR A. T.  
 1971 *Infections Disease in Ancient Populations*, "Current Anthropology", vol. 12, z. 1, p. 45-62.
- DANIELCZYK B.  
 1969 *Badania powierzchniowe w dorzeczu Górnej Noteci* (Sum.: Surface investigations in the Upper Noteć Basin), SA, vol. 21, p. 312-317.
- DURCZEWSKI D.  
 1970 *Prasłowiański gród w Smuszewie*, Poznań.
- DURCZEWSKI Z.  
 1939/1948 *Grupa górnośląsko-malopolska kultury łużyckiej w Polsce*, vol. 1 i 2, Kraków.
- DYMACZEWSKI A.  
 1968 *Zachodnia strefa basenu bałtyckiego w późnej starożytności*, [w:] *Materiały*, vol. 5, No 3: *Epoka żelaza*.
- FRANKOWSKA M.  
 1967 *Podstawy gospodarki wiejskiej w Peru w ostatnim okresie panowania Inków i w pierwszym stuleciu po konkwicie* (Sum.: The Foundations of Rural Economy in Peru in the Last Period of the Inca Domination and the First Centure after the Spanish Conquest), Poznań.
- GAŁUSZKA A.  
 1952 *Grody kultury łużyckiej na Śląsku*, "Z otchłani wieków", vol. XXI, No 2, p. 47-49.  
 1963 *Die Frage von Genese und Funktion der Burgwälle der Lausitzer Kultur Niederschlesiens*, "Arbeits- und Forschungsberichte zur sächsischen Bodendenkmalpflege", vol. 11/12, p. 511-517.  
 1964 Rev.: M. GEDL, *Kultura Łużycka na Górnym Śląsku*, AP, vol. IX, No 2, p. 458-464.
- GARDAWSKI A.  
 1964 *Rozwój rolnictwa od VII do II w. p. n. e.*, [in:] *Zarys historii gospodarstwa wiejskiego w Polsce*, vol. 1, Warszawa, p. 93-119.
- GEDIGA B.  
 1966 *Wyniki prac wykopaliskowych na osiedlu obronnym kultury łużyckiej we Wrocławiu-Osobowicach w 1964 r.* (Sum.: Results of Excavations on a Fortified Site of the Lusatian Culture at Wrocław-Osobowice, in 1964), SA, vol. XVIII, p. 67-73.  
 1967 *Plemiona kultury łużyckiej na Śląsku środkowym w epoce brązu* (Sum.: Tribes with Lusatian Culture in Middle Silesia in the Bronze Age), Wrocław-Warszawa-Kraków.

- GEDL M.  
1961 *Uwagi o gospodarce i strukturze społecznej ludności kultury łużyckiej w południowej Polsce* (Zus.: Anmerkungen über die Wirtschaft und die soziale Struktur der Bevölkerung zur Zeit der lausitzer Kultur im Süden Polens), Kraków.
- 1964 *Kultura łużycka na Górnym Śląsku* (Rés.: La civilisation lusacienne en Haute Silesie), Wrocław-Warszawa-Kraków.
- GIŻBERT W.  
1971 *Problem chwastów w znaleziskach archeologicznych* (Rés.: Le problème des mauvaises herbes dans les trouvaillies archéologiques), PA, vol. XIX/XX, p. 17-35.
- GLOB P. V.  
1951 *Jyllands ode Arge*, "Kuml", p. 136-144.
- GODŁOWSKI K.  
1960 *Źródła archeologiczne do dziejów rolnictwa w Polsce i stan ich opracowania* (Sum.: The Archaeological Sources Concerning History of Agriculture in Poland and the State of their Elaboration), SDGW, vol. 3, p. 7-122.
- 1969 *Kontynuacja badań wykopaliskowych w dorzeczu Liswarty (Rybno, Żabiniec, Opatów)*, (Sum.: Continued Excavations in the Liswarta Basin <Rybno, Żabiniec, Opatów>), SA, vol. 21, p. 135-152.
- Gród  
1938 *Gród prasłowiański w Biskupinie w powiecie żnińskim. Sprawozdania z prac wykopaliskowych w latach 1936-1938 z uwzględnieniem wyników z lat 1934-1935*, Poznań.
- HANČAR F.  
1956 *Das Pferd in prähistorischer und früher historischer Zeit*, Wien-München.
- HENSEL W.  
1953 *Poznań w starożytności i we wczesnym średniowieczu*, "Przegląd Zachodni", vol. IX, No 6/8, p. 42-45.
- 1956 *Słowiańszczyzna wczesnośredniowieczna*, ed. II, Warszawa.
- 1957 *Próba periodyzacji rozwoju rolnictwa na ziemiach Polski w starożytności i na początku wczesnego średniowiecza* (Sum.: An Essay of Periodisation of the Agriculture through its Stages of Evolution in Polish Lands during Antiquity and the Early Middle Ages), AP, vol. 1, p. 11-18.
- 1958 *Poznań w zaraniu dziejów* (Rés.: Poznań à l'aube de l'histoire), Wrocław.
- 1970 *Remarques sur les origines des villes en Europe centrale*, [in:] *Atti del Convegno di Studi sulla Città etrusca e italica preromane*, Imola, p. 323-328 (offprint).
- 1971 *Początki państwa polskiego i jego kultury*, Wrocław—Warszawa—Kraków—Gdańsk.
- 1972 *Z badań nad początkami miast w Europie środkowej* (Sum.: From Studies on the Origins of Towns in Central Europe), "Pomorania Antiqua", vol. 3, p. 9-19.
- HENSLOWA M.  
1962 *Rośliny dziko rosnące w kulturze ludu polskiego*, Wrocław.
- HJELMQUIST H.  
1955 *Die älteste Geschichte der Kulturpflanzen in Schweden*, Stockholm.
- HOŁUBOWICZ W.  
1951 *Zagadnienie dziejów społeczeństwa przedklasowego na terenie Polski* (Sum.: The Problem of Periodisation of Preclass Society's Early History of Polish Territory), Sprawozdania PMA, vol. IV, No 1/2, p. 1-15.
- 1960 *Śląsk w epoce wspólnoty pierwotnej*, [in:] *Historia Śląska*, vol. I, Wrocław, p. 33-124.
- JAROŃ B.  
1963 *Torfowisko z kulturą łużycką w Biskupinie* (Rés.: Tourbière avec les restes d'un village fortifié de la civilisation lusacienne à Biskupin), [in:] *Osada*, 1936, p. 21-27.
- 1938 *Szczątki roślinne z wczesnego okresu żelaznego w Biskupinie (Wielkopolska)*, [in:] *Gród*, 1938, p. 104-131.
- JAŹDŹEWSKI K.  
1949 *Atlas to the Prehistory of the Slavs*, Łódź.
- 1968 *Z problematyki początków Słowiańszczyzny i Polski*, cz. 1 (Sum.: The Problem of the Origin of the Slavs and of Poland, part 1), Acta Archaeologica Lodzienia, No 16.
- KAJ J.  
1950 *Szcątki ryb w materiale wykopaliskowym z grodziska kultury łużyckiej i wczesnohistorycznej w Biskupinie, pow. Żnin*; (Rés.: Les restes de poissons dans le matériel d'ossements provenant des fouilles dans l'enceinte fortifiée de culture lasacienne et dans le bourg fortifié protohistorique de Biskupin distr. de Żnin), [in:] *Trzecie sprawozdanie*, 1950, p. 72-77.
- KAŹMIERCZYK J.  
1964 *Z badań wykopaliskowych w Niemczy Śląskiej w 1962 r.* (Sum.: On the Excavations at Niemcza Śląska in 1962), SA, vol. XVI, s. 243-253.
- KLICHOWSKA M.  
1958 *Wyniki badań materiałów botanicznych z badań na grodzisku kultury łużyckiej w Słupcy* (Rés.: Les matériaux botaniques trouvés en 1954 dans l'ancienne fortifiée de Słupca), FAP, vol. VIII/IX, p. 144-145.
- 1962 *Odciski zbóż i roślin strączkowych na ceramice kultury pomorskiej* (Rés.: Empreintes de grains et de légumineux sur la poterie de la civilisation poméranienne), PA, vol. XIV, p. 142-151.
- 1967a *Możliwości konsumpcyjne zbóż i motylkowych w północno-zachodniej Polsce od neolitu do końca XII wieku* (Rés.: Les possibilités de consommation des céréales et de papilionacées en Pologne du Nord-ouest depuis le Néolithique jusqu'à la fin du XII<sup>e</sup> siècle), SDGW, vol. 9, No 3, p. 31-47.
- 1967b *Wzgórze Wisielców w Wolinie Pomorskim w świetle badań botanicznych* (Zus.: Der Galgenberg in Wolin im Lichte botanischer Forschungen), MZP, vol. XI, p. 571-576.
- 1967c *Szcątki roślinne ze stanowiska archeologicznego Wolin-Młynówka* (Zus.: Pflanzenreste aus der Archäologischen Fundstelle Wolin-Mühlenberg), MZP, vol. XI, p. 577-579.
- 1968 *Wyniki badań odcisków na polepie pochodzącej z osiedla obronnego kultury łużyckiej we Wrocławiu-Osobowicach* (Sum.: The Analysis of Impressions on Daub from a Lausatian Fortified site at Wrocław-Osobowice), SA, vol. XIX, p. 453-455.
- 1969 *Odciski roślin na polepie ze stan. 1 w Kotlinie, pow. Jarocin, z lat 1963-1964* (Sum.: Plants Impressions

- on the Daub from Site 1 at Kotlin Jarocin District), SA, vol. XX, p. 419-421.
- 1971 *Z dalszych badań paleobotanicznych* (Sum.: Notes on Palaeobotanicae Investigations) SA, vol. XXIII, p. 239-257.
- 1972a *Rośliny naczyniowe w znaleziskach kulturowych Polski północno-zachodniej* (Sum.: Vascular Plants in Archaeological Excavations of North-Western Poland from the Neolithic to the Early Middle Ages), Poznań.
- 1972b *Rośliny uprawne i dziko rosnące z grodziska kultury łużyckiej w Smuszewie, pow. Wągrowiec*, FAP (in print).
- KOŁODZIEJSKI A.
- 1971 *Kultura łużycka na Ziemi Lubuskiej*, [in:] *Materiały*, vol. IV: *Epoka brązu*, p. 49-110.
- KOSTRZEWSKI J.
- 1946 *Prasłowiańszczyzna*, Poznań.
- 1949 *Pradzieje Polski*, Poznań.
- 1958 *Kultura łużycka na Pomorzu* (Zus.: Die Lausitzer Kultur in Pommern), Poznań.
- KRYSIAK K.
- 1950 *Szczątki zwierzęce z Biskupina wydobyte z warstw kultury łużyckiej w sezonie wykopaliskowym w 1948* (Rés.: Restes d'animaux retrouvés entre les couches de culture lusacienne au cours des fouilles de 1948), [in:] *Trzecie sprawozdanie*, 1950, p. 39-71.
- 1957 *Wartości poznawcze badań zoologicznych dla archeologii*, (Sum.: Animal Remains in the Archaeological Record), AP, vol. 1, p. 103-115.
- 1958 *Charakterystyka materiału zwierzęcego na stanowisku w Jeziorku, pow. Giżycko* (Sum.: Animal Remains Found at Jeziorko, the Giżycko District), MS, vol.3, p. 71-74.
- KUBASIEWICZ M.
- 1960 *Z badań nad szczątkami zwierzęcymi z zamku szczecińskiego*, (Zus.: Aus den Untersuchungen der Tierknochenreste aus dem Schloss in Szczecin), MZP, vol. VI, p. 265--270.
- 1962 *Szczątki zwierzęce z badań ratowniczych na stanowisku przy ul. Grodzkiej w Szczecinie* (Zus.: Tierüberreste aus den Rettungsforschungen auf Fundplatz an der Grodzkastrasse in Szczecin), MZP, vol. VIII, p. 207-221.
- 1963 *Zwierzęce szczątki kostne z grodziska kultury łużyckiej w Tolkmicku, pow. Elbląg*, „Rocznik Elbląski”, vol. II, p. 287-298.
- 1964 *Szczątki zwierzęce z osiedla obronnego kultury łużyckiej w Sobiejuchach, pow. Żnin* (Sum.: Animal Remains from a Fortified Settlement of the Lusatian Culture at Sobiejuchy, Żnin District), MS, vol. X, p. 145-168.
- KULA W.
- 1963 *Problemy i metody historii gospodarczej*, Warszawa.
- KURNATOWSKI S.
- 1966 *Przemiany techniki uprawy w czasie między epoką brązu a wczesnym średniowieczem*, SDGW, vol. 8, p. 92-102.
- 1971 *Rozwój zaludnienia Wielkopolski zachodniej we wczesnym średniowieczu i jego aspekty gospodarcze* (Rés.: Le développement du peuplement de la Grande Pologne occidentale au haut Moyen-Age et ses aspects économiques), AP, vol. XVI, No 1/2, p. 465-482.
- KURNATOWSKI S., URBAŃSKA A.
- 1967 *Rozwój terenów osadniczych w północnej części województwa zielonogórskiego od I do XII w.* (Sum.: Study on the Origin and Layout of Towns on the Middle Odra and the Lower Warta), [in:] *Studia nad początkami i rozplanowaniem miast nad środkową Odrą*, Zielona Góra.
- LA BAUME W.
- 1961 *Frühgeschichte der Kulturpflanzen*, Giessen.
- LANGE O.
- 1959 *Ekonomia polityczna*, vol. 1, Warszawa.
- LEPIKSAAR J.
- 1962 *Die vor- und frühgeschichtlichen Haustiere Südschwedens*, “Zeitschrift für Tierzüchtung und Züchtungsbiologie”, vol. 77, No 1, p. 115-123.
- LUBICZ-NIEZABITOWSKI E.
- 1936 *Szcątki zwierzęce i ludzkie z osady przedhistorycznej w Biskupinie* (Rés.: Les restes d'animaux trouvés dans la station préhistorique de Biskupin), [in:] *Osada*, 1936, p. 27-38.
- 1938 *Szcątki zwierzęce i ludzkie z osady przedhistorycznej w Biskupinie*, [in:] *Gród prasłowiański*, 1938, p. 92-103.
- ŁOŚIŃSKI W.
- 1970 *Z badań nad strukturą gospodarstwa wiejskiego w późnej starożytności i na początku wczesnego średniowiecza na ziemiach polskich* (Sum.: From Researches on the Structure of Peasant Farms in Late Antiquity and the Beginning of the Early Middle Ages in Polish Territories), AP, vol. XV, No 2, z. 519-538.
- 1971 *Z badań nad przemianami gospodarczymi w starszych fazach wczesnego średniowiecza na Pomorzu Zachodnim* (Zus.: Wirtschaftliche Wandlungen in den älteren Phasen des Frühmittelalters in Westpommern), AP, vol. XVI, No 1/2, p. 431-444.
- ŁOWMIAŃSKI H.
- 1953 *Podstawy gospodarcze formowania się państw słowiańskich*, Warszawa.
- MAURITIO A.
- 1926 *Pożywienie roślinne i rolnictwo w rozwoju dziejowym*, Warszawa.
- MISKIEWICZ J.
- 1968 *Kultura łużycka w międzyrzeczu Pilicy i środkowej Wisły* (Sum.: The Lusatian Culture on the Areas between the Pilica and the Middle Vistule Rivers), MS, vol. XI, p. 129-208.
- MOLDENHAWER K.
- 1950 *Szcątki roślinne z wczesnego okresu żelaznego w Biskupinie* (Rés.: Vestiges végétaux du premier âge du Fer à Biskupin d'après les indications de B. Jaroń et K. Moldenhawer faites en 1936-1939 et 1947, 1949), [in:] *Trzecie Sprawozdanie*, 1950, p. 79-87.
- 1958 *Wyniki badań materiałów botanicznych z 1955 r. na grodzisku i w osadzie kultury łużyckiej w Słupcy* (Rés.: Analyse des matériaux botaniques recueillis en 1955 dans l'enceinte fortifiée et dans l'établissement ouvert de la civilisation lusacienne à Słupca), FAP, vol. VIII/IX, p. 146-149.
- 1964 *Szcątki roślinne ze stanowiska kultury łużyckiej w Szczecinie* (Sum.: Plants Remains from a Lusatian Site at Szczecin), SA, vol. XVI, p. 309-394.

- MOSKWA K.  
1971 *Grupa tarnobrzeńska kultury lużyckiej*, [in:] *Materiały*, vol. IV: *Epoka brązu*, p. 7-48.
- OKULICZOWA Ł.  
1970 *Kultura kurhanów zachodniobałtyjskich we wczesnej epoce żelaza* (Sum.: The West Balt Barrow Culture in the Early Iron Age), Wrocław-Warszawa-Kraków.
- OLSZEWSKI T.  
1971 *Człowiek i jego środowisko*, Warszawa.
- Osada  
1936 *Osada bagienna w Biskupinie w pow. żnińskim. Tymczasowe sprawozdanie z prac wykopaliskowych Instytutu Prehistorycznego U. P. w latach 1934 i 1935*, Poznań.
- PAAVER K., KULIKAUSKAS P.  
1965 *Znaleziska kości zwierzęcych z grodzisk i osad okresu wczesnożelaznego i rzymskiego na Litwie* (Sum.: Bone Remains of the Early Iron Age and Roman Period Found in Lithuania), "Acta Baltico-Slavica", vol. 2, p. 261-279.
- PLESL E.  
1961 *Lužická kultura v severozápadních Čechach*, Praha.
- PYRGALA J.  
1970 *Gospodarka rolno-hodowlana i eksploatacja zasobów naturalnych w pierwszej połowie I tys. p. n. e. na Mazowszu Płockim* (Résumé: L'agriculture, l'élevage et l'exploitation des richesses naturelles en Masovie de Płock dans la première moitié du I<sup>er</sup> millénaire de n. e.), SDGW, vol. 12, z. 2, p. 5-52.
- RAJEWSKI Z.  
1957 *Osadnictwo w czasach pierwotnych w Biskupinie i okolicy* (Sum.: The Primary Settlement of Biskupin and its Environs), WA, vol. 24, No 3, p. 165-188.  
1958 *Osadnictwo ludności kultury lużyckiej z wczesnej epoki żelaznej w Biskupinie i okolicy* (Zus.: Ansiedlung der Bevölkerung mit "Lausitzer" Kultur in der frühen Periode der Eisenzeit in Biskupin und Umgebung), AP, vol. II, No 1, p. 7-32.
- RALSKA-JASIEWICZOWA M.  
1966 *Osady denne Jeziora Mikołajskiego na Pojezierzu Mazurskim w świetle badań paleobotanicznych* (Sum.: Bottom Sediments of the Mikołajki Lake < Mazurian Lake District > in the Light of Palaeobotanicae Investigations), "Acta Palaeobotanica", vol. VII, 2.  
1968 *Ślady osadnictwa prehistorycznego w diagramach pyłkowych z obszaru Polski* (Sum.: Traces of Prehistoric Settlement in Pollen Diagrams from the Polish Territory), "Folia Quaternaria", vol. 29, p. 163-182.
- SCHRAMM Z.  
1965 *Szczątki kostne zwierząt z okresu halszackiego wydobyte w Kotlinie, pow. Jarocin*, (Sum.: Animal Bone Remains from the Hallstatt Period excavated at Kotlin, District Jarocin), Roczniki Wyższej Szkoły Rolniczej w Poznaniu, vol. XXV, p. 175-184.
- SOBOCIŃSKI M.  
1971a *Wstępne opracowanie kostnego materiału zwierzęcego z wykopalisk w Jankowie, pow. Inowrocław* (typewritten), Poznań.  
1971b *Materiały osteologiczne z grodziska kultury lużyckiej w Gzinie, pow. Chełmno* (typewritten), Poznań.
- STRZAŁKO J., OSTOJA-ZAGÓRSKI J.  
1974 *W sprawie badań paleodemograficznych w Polsce. Uwagi polemiczne* (Résumé: Concerné des recherches paléodémographiques en Pologne. Remarques polémiques), "Slavia Antiqua", vol. 21, (in print).
- SULIMIRSKI T.  
1931 *Kultura wysocka* (Zus.: Wysocko-Kultur), Lwów.
- SZAFRAŃSKI W.  
1954 *Z badań nad epoką patriarchalną wspólnoty pierwotnej* (Sum.: Notes on the Epoch of the Patriarchal Primitive Communal Ownership), WA, vol. XX, p. 107-133.
- SZCZYGIEL A., WYSKOŃSKA Z.  
1966 *Zarys nauki o żywieniu*, Warszawa.
- TABACZYŃSKI S.  
1970 *Neolit środkowoeuropejski. Podstawy gospodarcze* (Résumé: Le Néolithique de l'Europe centrale. Structures économiques), Wrocław-Warszawa-Kraków.
- TEMPIR Z.  
1969 *Archeologické nálezy zemědělských rostlin a pleveľú na Slovensku*, "Agrikultura", vol. 8, p. 7-66.  
*Trzecie sprawozdanie*  
1950 *III sprawozdanie z prac wykopaliskowych w grodzisku kultury lużyckiej w Biskupinie w powiecie żnińskim za lata 1938-1939 i 1946-1948*, Poznań.
- TYMIENIECKI K.  
1951 *Ziemie polskie w starożytności. Ludy i kultury najdawniejsze* (Résumé: Les Origines de l'ancienne Pologne. Les peuples et les civilisations de l'Antiquité), Poznań.
- WASYLIKOWA K.  
1956 *Szczątki roślin uprawnych z grodziska halszackiego w Kamieńcu, pow. Toruń* (Sum.: Remains of Cultivated Plants from a Hallstatt Fort in Kamieniec near Toruń), "Acta Societatis Botanicorum Poloniae", vol. XXV, No 3, p. 479-511.
- WIELOPOLSKI A.  
1967 *Z problematyki udomowienia konia*, "Kwartalnik HKM", vol. 15, No 2/3, p. 603-612.
- WIELOWIEJSKI J.  
1967 *Konsumpcja żywnościowa w Polsce w okresach późno-lateńskim i rzymskim* (Résumé: La consommation alimentaire en Pologne durant les périodes de La Tène III et Romanic), SDGW, vol. 9, No 3, p. 7-30.
- WIŚLAŃSKI T.  
1969 *Podstawy gospodarcze plemion neolitycznych w Polsce północno-zachodniej* (Sum.: Economic Basis of Neolithic Tribes in North-Western Poland), Wrocław-Warszawa-Kraków.
- WOŹNIAK Z.  
1971 *Z problematyki badań zaniku kultury lużyckiej w Polsce południowej* (Zus.: Über die Erforschung des Niederganges der Lausitzer Kultur in Südpolen), AP, vol. 16, No 1/2, p. 197-210.
- WÜRGLER F. E.  
1962 *Veränderungen des Haustierbestandes während der Bronze- und Eisenzeit in zwei schweizerischen "Mehanner" Stationen, Monthingetaer und Mottate Rariosch*, "Zeitschrift für Tierzüchtung und Züchtungsbiologie", vol. 77, No 1, p. 35-46.

## Z BADAŃ NAD STRUKTURĄ GOSPODARCZĄ SCHYŁKU EPOKI BRĄZU I OKRESU HALSZTACKIEGO W PÓŁNOCNEJ I ZACHODNIEJ STREFIE DORZECZA ODRY I WISŁY

### Streszczenie

Podjęcie problematyki gospodarczej czy tylko niektórych zagadnień z nią związanych napotyka znaczne trudności. Powodowane są one z jednej strony zarówno zakresem przestrzennym, jak i chronologicznym samej kultury „łużyckiej”, z drugiej zaś szeregiem jeszcze nie przebadanych wystarczająco procesów osadniczych.

Dawniejsze poszukiwania archeologiczne, preferujące głównie cmentarzyska, nie stworzyły pełniejszej możliwości powiększenia bazy materiałowej, głównie o źródła związane bezpośrednio z działalnością gospodarczą. Jednym ze źródeł, które nam mogą dostarczyć interesujących danych w tym zakresie są materiały paleobotaniczne i archeo-zoologiczne. Były już one wykorzystywane w studiach tego typu prowadzonych głównie nad neolitem, okresem wpływów rzymskich czy ostatnio wreszcie nad wczesnym średniowieczem. Dla omawianego jednak odcinka pradziejów nie były szerzej wykorzystywane. Opierając się zatem na zebranych materiałach podjęliśmy próbę włączenia się do dyskusji na temat przeobrażeń, jakie dokonywały się w strukturze gospodarczej plemion kultury „łużyckiej”. Włączając się do tej toczącej się od dawna dyskusji zdajemy sobie sprawę, iż dyscyplina nasza podziela w pełni los innych nauk humanistycznych, w których pytanie o rzeczywisty postęp w ramach skonkretyzowanego zagadnienia pociąga za sobą bardzo kontrowersyjne oceny, a nawet budzi pesymistyczne nastroje. Specyfika bowiem wszystkich dyscyplin humanistycznych, najogólniej scharakteryzowana, utrudnia ogromnie, a niekiedy wręcz uniemożliwia pełną weryfikację wszystkich hipotez, przyzwala też niejako w bardzo szerokim zresztą zakresie na współistnienie szeregu uzupełniających się, a nawet przeciwstawnych różnoaspektowych interpretacji. Stąd też roboczy, na pewno nie wystarczający i nie ostateczny charakter naszych rozważań.

Dla schyłku epoki brązu i okresu halsztackiego nie dysponujemy ogólniejszymi zestawieniami materiałów paleobotanicznych i archeo-zoologicznych. Wykorzystano więc tutaj głównie szczegółowe opracowania materiałowe z różnych stanowisk z północnej i zachodniej strefy dorzecza Odry i Wisły (ryc. 2,\* tabl. 1 i 2). Na wszystkich zbadanych w tym aspekcie

stanowiskach zwraca uwagę stosunkowo znaczny udział zbóż, zwłaszcza pszenicy i jęczmienia. Ten ostatni dominuje przy tym zdecydowanie na osadach otwartych, gdzie udział jego waha się w granicach od 93 do 98,2% (Kotlin, pow. Jarocin, Wolin — Wzgórze Wisielców). W warstwach kulturowych grodzisk udział szczątków jęczmienia jest o wiele mniejszy i wynosi od 9 do 22%. Pośród różnych odmian pszenicy dominuje zdecydowanie płaskurka i tak w Biskupinie, pow. Żnin, stanowi 58,2% wszystkich oznaczonych tam szczątków roślin zbożowych, w Smuszewie, pow. Wągrowiec, 94,4%, a w Kamieńcu, pow. Toruń, 60,2%. Udział pozostałych zbóż (owsa, prosa, żyta) był znacznie mniejszy. Istnieją jednak przesłanki świadczące o wzroście udziału prosa w zestawach konsumowanych i uprawianych roślin, jeżeli nie na całym obszarze to przynajmniej w określonych jego regionach. Świadczą o tym między innymi znaczne ilości prosa ujawnione w Smuszewie, gdzie udział jego ziaren wynosi około 37,5%.

Na czoło listy jadalnych roślin strączkowych wysuwa się zdecydowanie groch. Udział jego w warstwach kulturowych różnych obiektów jest wyraźnie zróżnicowany. W osadach otwartych ilość jego waha się w granicach 76,6-99,2%, w grodach natomiast od 28,1% (Smuszewo) do 55,6% (Biskupin). Wyjątek stanowi tu gród w Słupcy, gdzie jest on jedyną rośliną strączkową.

W strukturze pożywienia roślinnego znaczną rolę odgrywają chwasty (komosa biała, rdest, lnicznik, poziewnik szorstki i szczawik). Mogą być one dowodem, że niektóre chwasty celowo zbierano w celach konsumpcyjnych.

Na podstawie materiałów archeo-zoologicznych wskazać możemy na kierunki przemian w hodowli zwierząt. W schyłkowej fazie okresu halsztackiego w rejonie koncentracji osadnictwa grodowego (północno-wschodnia Wielkopolska) stwierdzono znaczny odsetek szczątków bydła rogatego (60-50%). Udział pozostałych gatunków zwierząt domowych układał się w tym rejonie następująco: pozostałości trzody chlewnej wahały się w granicach 14,3-34,8%, natomiast drobnych przeżuwaczy 8,3-24,6%. Procentowy udział szczątków konia był w tym okresie nieznaczny (średnio do 10%). Odmienne proporcje kształtowały się na terenie Pomorza Zachodniego, gdzie udział szczątków

\* Wszystkie ilustracje wykonał Alojzy Wawrzyński

kosznych krowy był znacznie niższy i nie przekraczał 35%. Równolegle obserwujemy progresywny wzrost trzody chlewnej do blisko 50%. Wyniki te zdają się wskazywać na stosunkowo znaczną, powodowaną zapewne warunkami środowiskowymi, rejonizację w zakresie gatunkowego doboru hodowanych stad. Świadczą o tym również nieco odmienne proporcje w zakresie wysiewanych gatunków roślin zbożowych (przeważa jęczmienia).

Rejestrowana w materiale archeologicznym presja demograficzna występująca w schyłkowej fazie epoki brązu i w okresie halsztackim oraz związana z nią koncentracja osadnictwa w grodach powodować musiały znaczne trudności w zabezpieczeniu niezbędnej dziennej bazy żywienia. W okresie tym liczyć się musimy z okresowo występującym, zwłaszcza w czasie klęski nieurodzajów, zjawiskiem tzw. głodu jakościowego. Wpływał on zdecydowanie na obniżenie dynamiki rozwoju fizycznego dzieci i młodzieży, zwiększając równocześnie średnio krzywą stopy zgonów ludności. Człowiek, broniąc się przed uczuciem głodu, zjadał wszystko, co było jadalne, w celu zaspokojenia zapotrzebowania energetycznego. Powodowało to, okresowo przynajmniej, nasilenie zbieractwa i związane z nim ekologiczne wyniszczenie okupowanych ekumen. Zagęszczenie demograficzne, a zwłaszcza wspomniana koncentracja ludności w grodach pozostawało zapewne w znacznej dysproporcji do ówczesnych umiejętności kontrolowania i zabezpieczenia zbiorów w okresie nieurodzajów, jak również urodzajów, oraz zapobiegania różnym chorobom, zwłaszcza epidemicznym. Przekroczony bowiem został pewien optymalnie dopuszczalny „pułap” zagęszczenia demograficznego, który doprowadzić musiał do jakiejś nagłej katastrofy. Było nią zapewne załamanie się osadnictwa, częściowe wyludnienie niektórych szczególnie wyeksploatowanych regionów, a w konsekwencji również i upadek kultury łużyckiej. Trudno nam w chwili obecnej odtworzyć strukturę gospodarczą kultury łużyckiej. Liczyć się bowiem musimy ze współwystępowaniem na

jednym obszarze grup o zróżnicowanym modelu gospodarczym. Wydaje się jednak, że na całym jej obszarze rola tradycyjnych form zdobywania pożywienia (zbieractwa, łowiectwa i rybołówstwa) musiała być o wiele większa niż się to obecnie przyjmuje.

Sumując nasze rozważania, dochodzimy do następujących konkluzji:

1. System gospodarczy plemion kultury łużyckiej był złożony i polegał na obocznym stosowaniu zarówno stacjonarnych, jak i ruchomych form wykorzystywania zasobów naturalnych.

2. Poszczególne rejony osadnicze okupowano w sposób stały, chociaż istnieją — jak wiemy — liczne dowody osadnictwa okresowego, które świadczą o istniejącym w ich obrębie cyklu rotacji terenów użytkowych.

3. Poszczególne ekumeny były mimo intensywnego cyklu rotacyjnego stale wykorzystywane.

4. Powodowało to stopniowo postępujące, a w schyłkowej fazie okresu halsztackiego (na skutek koncentracji ludności w rejonie grodów) nagłe, zachwianie równowagi ekologicznej, która spowodować musiała znaczne perturbacje w dotychczasowym systemie gospodarczym, przyczyniając się do załamania się osadnictwa grodowego i do zapoczątkowania procesu upadku kultury łużyckiej.

W wielu sygnalizowanych w trakcie powyższych rozważań kwestiach nasze postępowanie poznawcze, nie mające do dyspozycji wystarczających wyników badań (głównie specjalistycznych), musi zadowolić się wstępnym sformułowaniem prawdopodobieństwa, w którym argumentację rzeczową zastępuje często intuicja. Oczywiście nie można opierać na niej tez naukowych, nie jest ona jednak bez znaczenia dla zarysowania przedstawionych tu hipotez roboczych. Rozwiązania tej skomplikowanej problematyki szukać należy w szczegółowych badaniach archeologiczno-ekologicznych poszczególnych rejonów osadniczych (mikroregionów), znajdujących się w zdecydowanie różnych warunkach środowiskowych.

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