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Editor's Foreword

The 'western borderland' of the Tripolye culture, appearing in the title of this volume of the 'Baltic-Pontic Studies', refers to the cyrcle of neighbouring cultural systems of the Upper Tisza and Vistula drainages. As neighbours of the Tripolye culture such groups are discussed as Lengyel-Polgár, Funnel Beaker and, albeit to a much narrower extent, the Globular Amphora (cf. B-PS vol. 8) and the Corded Ware cultures. The papers discuss the reception of 'western' traditions by Tripolye communities as well as the 'western borderland' mentioned in the title.

Defined in this way, these questions have been only cursorily treated in the literature. The consequences of accumulated omissions in the study of the cultural surroundings of 'Tripolye' have been felt by us when we worked on this issue. Thus, we submit a greatly limited work as far as its subject matter is concerned hoping that it will open a sequence of necessary studies. Such studies should, in the first place, focus on the co-ordination of the 'languages' of taxonomy and then they should investigate different aspects of the mechanisms of the outlined processes of the 'cultural contact'.

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Janusz Budziszewski

FLINT WORKING OF THE SOUTH-EASTERN GROUP OF THE FUNNEL BEAKER CULTURE: EXEMPLARY RECEPTION OF CHALCOLITHIC SOCIO-ECONOMIC PATTERNS OF THE PONTIC ZONE

Already the first modern analyses of Neolithic flint inventories, carried out in the early 1960s by A. Dzieduszycka-Machnikowa [1961], revealed that the beginning of the Chalcolithic period in many Central European cultural traditions coincided with significant changes in blade production technology. These were most apparent in morphometry, namely in a considerable macrolithization of blades. This development was described as a' metrical breakthrough' and recognized as an important chronological marker.

At the time interpretations of these facts in prehistoric terms seemed pretty straightforward. It was assumed that the characteristic features of the Chalcolithic include [Kozłowski 1975:134].

(a) the emergence of specialized flint working relying on mining exploitation of this raw material;

(b) the related fundamental change of the raw materials use structure, brought about by intensifying exchange involving distinct flint production centers; (c) analogies between the developing exchange of flint raw materials and the roughly contemporaneous intensification of copper artifacts proliferation.

The first full publication of the flint industry of Funnel Beaker culture (FBC) communities from the loess uplands of south-eastern Poland was written in this vein [Balcer 1975]. It featured a detailed system for describing the flint inventories of this culture and contained also an analysis of flint raw materials economy emphasizing the role of group specialization in production and the significance of long-range distribution of artifacts. The author interpreted his observations relying on his personal convictions rather than on material evidence. He concluded that, "the booming exploitation of deposits of high-quality raw materials and mass-scale production of macrolithic tools (. . .) was due mainly to the demand for tools used to further develop the production economy, and vegetable production in particular. The basic role here was played by flint axes and sickles fitted with inserts made from maximally long blades, forming a monolithic cutting edge. Only the best raw material could be used to produce such implements, and this was to be found only in certain areas. This was the reason for the increasing significance of exchange and

the development of specialization in the production of implements that were the object of exchange" [Balcer 1975:210-211].

The early 1980s saw a series of publications promoting these views [Balcer 1980; 1981; 1981b]. Regrettably, instead of qualitatively new explanations, they only brought propositions increasingly valuating in character. The period of macrolithic flint industries was finally interpreted as, "marking the culmination of the role of flint working in production economy development" [Balcer 1983:293-294]. An important contribution to our understanding of the flint industry of FBC communities in south-eastern Poland was the demonstration of its strong ties to the Tripolye industry [Balcer 1981a].

During the past decade significant progress was made in determining the development dynamics and chronology of the FBC in Małopolska, the south-eastern province of the country [Kruk, Milisauskas 1983, 1990; Jastrzębski 1991; Burchard *et al.* 1991]. However, there were only modest additions to the existing flint material evidence. None of the major sites were described in full and reliably, and the only publications that were brought out dealt with scant materials from several small settlements [Libera 1982; Jastrzębski, Ślusarska 1982; Bronicki, Kadrow 1987; Czopek, Kadrow 1988] and with a number of depots and cult deposits of macrolithic blades [Kadrow 1989a; Bronicki 1993; Zakościelna 1997a]. Valuable results were produced by extensive surface surveys of the surroundings of deposits of the basic flint raw materials [Budziszewski, Michniak 1984; Budziszewski 1996; Libera, Zakościelna 1987; Bargieł, Florek 1987; Kopacz, Pelisiak 1991]. Important additions were also made to our knowledge about long-range distribution of Little-Poland raw materials [Prinke, Rachmajda 1989; Wojciechowski 1988; Bronowicki, Wojciechowski 1993].

More and more publications from those years began questioning the conception of FBC flint working which emerged in the' 70s, both as regards evidence material analysis and prehistoric interpretation. To begin with, S. Sałaciński [1983/1989, 1987] demonstrated the inadequacy of the existing classification system when applied to retouched blades, one of the most important tool groups, which turned out to be highly polymorphous and inhomogeneous, probably comprising several morphologically distinct tool categories. This analysis was followed slightly later by a series of publications casting new light on flint distribution among FBC communities in Małopolska [Kruk, Milisauskas 1989; Midgley 1992]. The entire issue is yet to be reexamined in full, however.

Interpretations of Chalcolithic flint working in the broader Central European context proceeded at an entirely different pace. The 1980s saw a number of publications verifying the views on the nature of flint working of that period mentioned above. It turned out that flint mining probably began already in the Middle Palaeolithic [Vermeersch *et al.* 1997] and that the development of this activity throughout the Neolithic is well documented [Lech 1981; Schild *et al.* 1985]. Moreover, it was demonstrated that the technologies of copper and flint mining were entirely unrelated [Weisgerber 1987]. Another discovery was that many of the early agricultural communities operated systems of long-range distribution of flint artifacts over distances greater than covered by the distribution systems

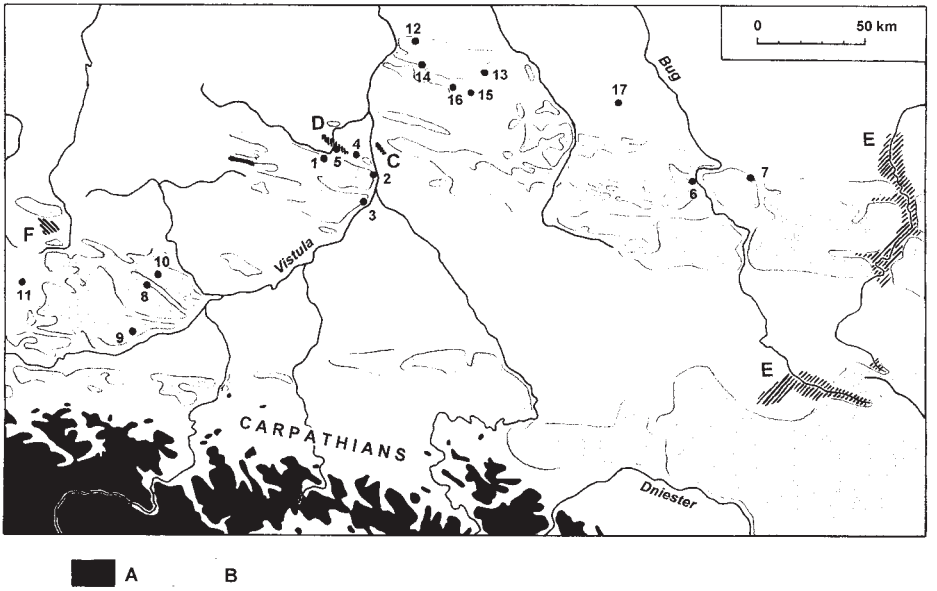
of most Chalcolithic communities [Lech 1987; Sherratt 1987]. The situation emerging from the new findings was reviewed some years ago by J. Lech [1991] who laid bare our interpretational impotency by presenting meticulously accumulated data from across Europe. It became clear that the impasse required a new look at the data in hand, focusing in particular on the specific regional and chronological character thereof. The first attempt of this kind was M. E. T. de Grooth's [1991] analysis of the Limburg flint production center.

The beginnings of FBC settlement in Małopolska date to the first centuries of the 4th millennium BC. Materials from those times are so scarce and poorly analyzed that the origins of the FBC in the area are still a matter for discussion [Burchard *et al.* 1991]. The flint materials from the period are yet to be published, and so do nothing to contribute to this discussion.

The Małopolska FBC is known well in its developed form (phases II and III in the Bronocice settlement) [Kruk, Milisauskas 1983, 1990] dating to 3650-3350-3100 BC, a time coinciding with one of the coldest (Rotmoos 2 = Piora 2) and most humid (Chalain) periods of the Holocene [Magny 1995]. The FBC settlement extends over loess uplands, forming four large regions: the Kraków, Sandomierz, Volhynia and Lublin (Fig. 1). In all but the last of these the basic element of the settlement network were large, homogeneous microregions with a hierarchical structure, formed around sprawling central settlements, several hectares in area, which were ringed by a network of smaller permanent settlements and campsites. The FBC settlement in the Lublin region was equally intense but apparently lacking the huge central settlements. The traces of settlement beyond the loess concentrations and in the Carpathian foothills are entirely different, being less permanent in character. The clear hierarchy apparent in the settlement structure on the loess uplands additionally hinders the analysis of some aspects of flint working, with some of the observed differences possibly being due to different positions of the studied settlements within the settlement structure.

None of the Małopolska FBC sites explored on a large scale have been comprehensively published, and the best known flint materials are those from the Sandomierz settlement region. Inventories from three central settlements – Gawroniec in Ćmielów, Pieczyska in Zawichost, and Skała in Kamień Łukawski – were analyzed in detail [Balcer 1975].

The flint industry of FBC communities in the Sandomierz Upland comprised two largely non-overlapping technology cyrcles, one geared to the production of macrolithic blades, and the other turning out large, quadrangular, wedge-shaped tools, traditionally described in Polish archaeological literature as axes. The blade production relied on one kind of raw material – Świeciechów flint from deposits on the right bank of the middle Vistula (Fig. 1) [Libera, Zakościelna 1987]. The blades were struck off flat, single-platform cores with a carefully prepared striking platform and wide flaking face formed by lateral crests (Fig. 2A). Exploitation started from the crest and proceeded towards the flaking face center (Fig. 2B). Cores of a different type, featuring a rounded



F i g . 1. South-eastern group of FBC settlement. Sites mentioned in the text: Sandomierz region: 1. Ćmielów, Ostrowiec Świętokrzyski District, "Gawroniec" site; 2. Zawichost, Sandomierz District, "Pieczyska" site; 3. Kamień Łukawski, Sandomierz District, "Skała" site; 4. Lasocin, Opatów District, site 4; 5. Ruda Kościelna, Ostrowiec Świętokrzyski District, "Osiedlisko przy zrobach" site; Volhynian region: 6. Gródek Nadbużny, Hrubieszów District, site 1C; 7. Zimne, Vlodymyr Volhynskyi District (Ukraine), "Grodzisko" site; Cracow region: 8. Bronocice, Pińczów District; 9. Niedźwiedź, Kraków District; 10. Dzierążnia, Pińczów District; 11. Klucze, Olkusz District; Lublin region: 12. Klementowice, Puławy District, site B; 13. Lublin-Sławinek, Lublin District; 14. Chruszczów Kolonia, Puławy District; 15. Krężnica Jara, Lublin District; 16. Pawlin, Lublin District, site 1; 17. Weremowice, Chełm District, site 19. A. loess areas; B. Świeciechów flint deposits; C. striped flint deposits; D. Volhynian flint deposits; E. Jurassic flint (G variant) deposits.

flaking surface, extending over almost the entire circumference of the piece, are quite exceptional [Balcer 1975:Fig. 31d]. Knappers strove to produce blades exceeding 16 cm in length, with ca. 20 cm being the preferred dimension. The longest specimen known today is 30 cm long (Fig. 2D). The blades usually feature a pronounced arch in their middle (Fig. 2C) and their butts are gable roof-shaped. This suggests they were made using copper-tipped punches. Fully exploited cores were sometimes fashioned into large wedge-shaped tools (Fig. 3B, D), but in most cases they were used as hammerstones.

The wedge-shaped tools were made from both Świeciechów and striped flint. Deposits of the latter occur along the lower Kamienna River (Fig. 1) [Budziszewski, Michniak 1984]. Several kinds of these tools were produced, but all had a quadrilateral transverse section and a relatively thick, indistinct and rather carelessly executed head. Specimens belonging to two types were most frequent. One of these is represented by forms gra-

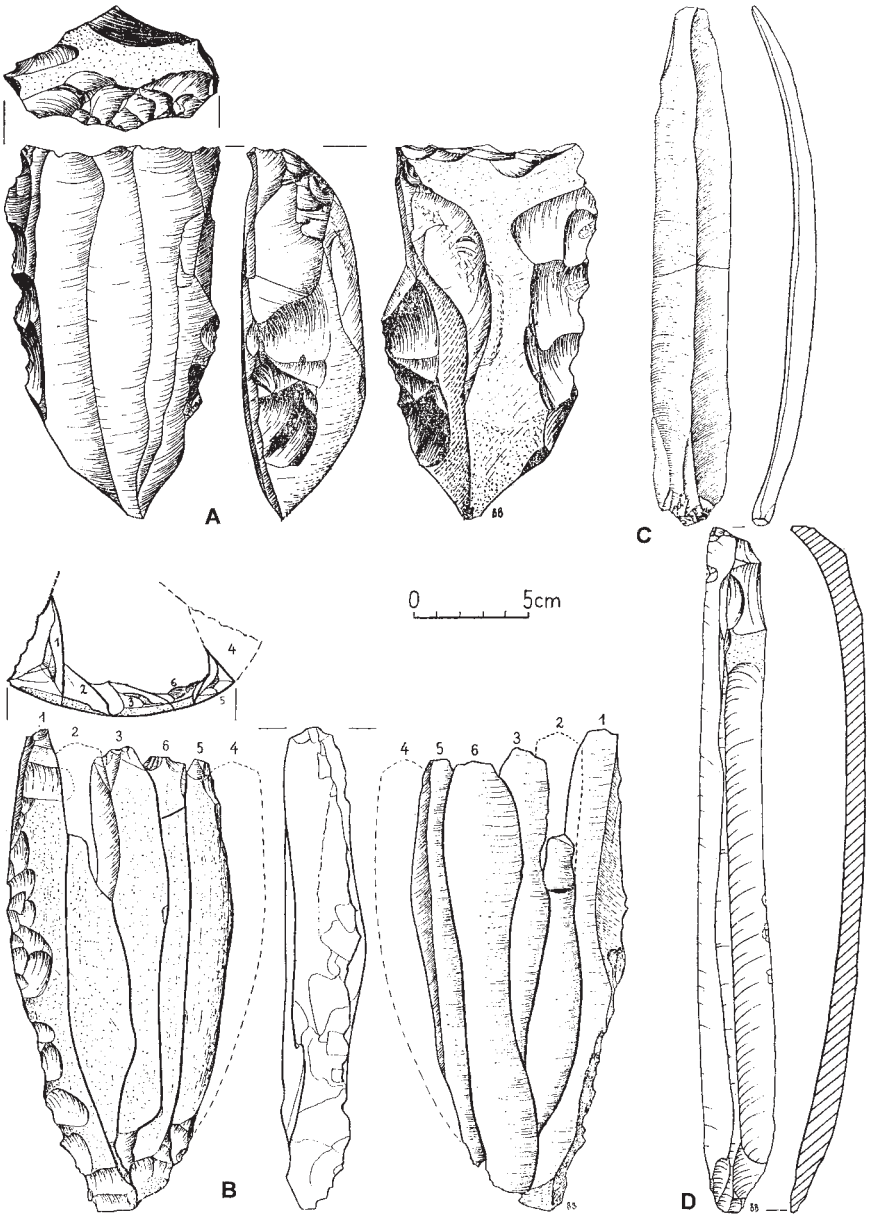
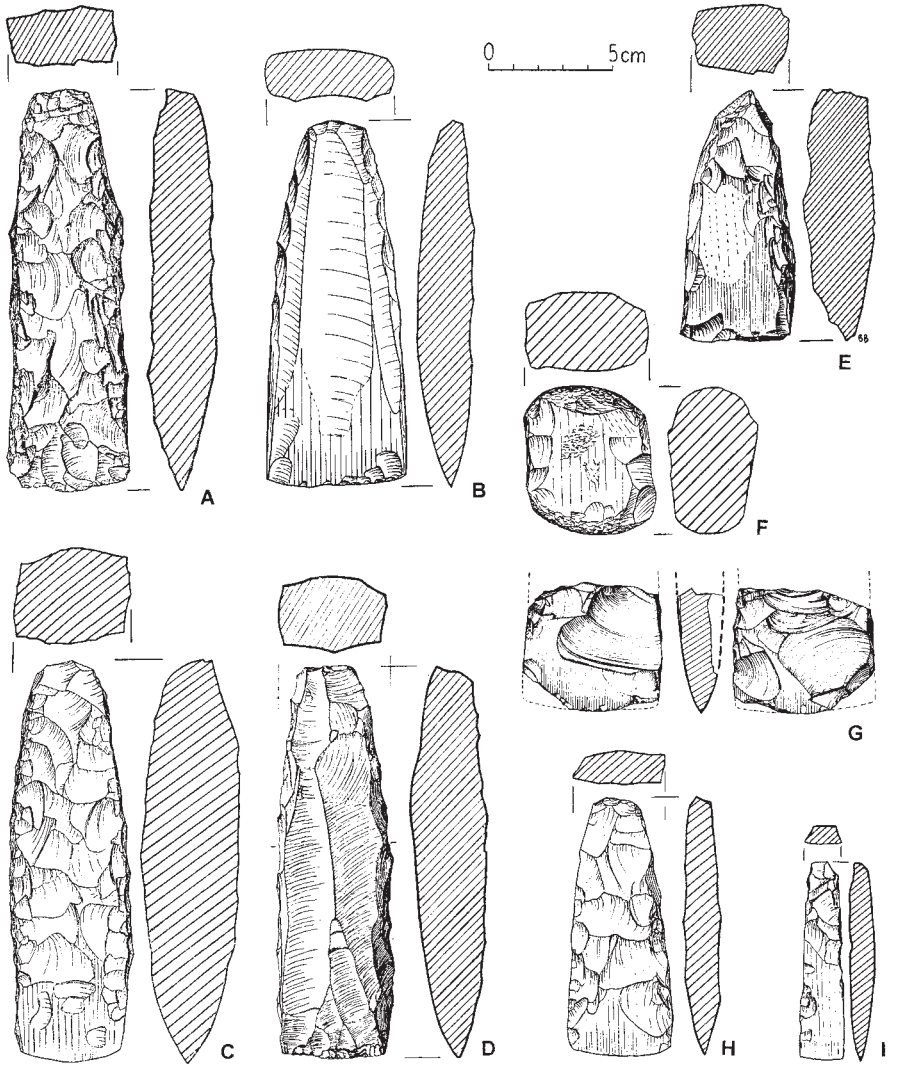


Fig. 2. Funnel Beaker culture flint industry in south-eastern Poland. A. core for blades; B. blade refitting illustrating core exploitation manner; C.-D. blades. All specimens made from Świeciechów flint. A.-B. Ćmielów; C. Gródek Nadbużny; D. Radziejów Kujawski, District loco. A-C after Balcer 1975; D after Balcer 1983.



F i g . 3. Funnel Beaker culture flint industry in south-eastern Poland. A.-B. type-A wedge-shaped tools; C.-D. type-B wedge-shaped tools; E. reutilized wedge-shaped tool; F. hammerstone/anvil made from a wedge-shaped tool; G. core for flakes made from a wedge-shaped tool; H. Type-C wedge-shaped tool; I. chisel. A. Klementowice; B. Zawichost; C., H.-I. Kamień Łukawski; D., F.-G. Gródek Nadbużny; E. Mydłów, Opatów District. All specimens made from Świeciechów flint, after Balcer 1975.

dually tapering from the cutting edge towards the head (Fig. 3A, B), about 16 cm long, with blades just over 5 cm long, and thickness not exceeding 3 cm [Balcer 1975:Tab. 7]. This is also the dominant form among striped flint specimens [Borkowski, Migal 1996]. The finishing process in their case involved grinding of the wider surfaces, with the lateral faces remaining unprocessed. The other copiously produced type of wedge--shaped tool featured cutting edges narrower than or equal to the maximum width of the tool, occurring at a point one-third down the length of the specimen (Fig. 3C, D). These implements are usually slightly thicker than the previous type, and they have slightly narrower cutting edges. It seems they are the slightly more numerous category among the Świeciechów flint finds [Balcer 1975]. Grinding of the specimens made from this raw material was confined to parts of their wider surfaces next to the cutting edge. Damaged tools were repeatedly repaired (Fig. 3E) and then converted into flake cores (Fig. 3G), hammerstones (Fig. 3F), pressers (Fig. 5I) or splintered pieces. A type much less frequent than the two just described is represented by small wedge-shaped implements (ca. 10 cm long, ca. 1.5 cm thick, with cutting edges less than 4 cm in length), described as small axes (Fig. 3H) or chisels (Fig. 3I).

Only one type of blade tool utilized the maximum parameters of unprocessed specimens, namely ordinary blade knives used as monolithic sickle inserts. The Polish archaeological literature sometimes describes them as 'sierpiec'. The first stage of their processing was limited to reshaping their distal and/or proximal end to make them fit better in a handle (Fig. 4A, B). During use, their corn gloss-blunted cutting edge was rejuvenated several times, initially with fine denticulated retouch (Fig. 4C), and subsequently with regular simple retouch (Fig. 4D). Worn-out specimens were reshaped into other tools. In many cases these were knives of similar form with massive edges formed with abrupt retouch, intended for different purposes (Fig. 4E, F), as well as tools of a different type, featuring a long, symmetric point, sometimes described as daggers (Fig. 4G, H). The latter implements also occur as implements originally produced in this forms, and in this case they are usually made from shorter blades (Fig. 4I). Short blades or even flakes were used to make asymmetric knives (Fig. 4J, K), while massive, thick crested blades became specific lateral pressers (Fig. 4L, M). There are also extremely rare blade tools bearing the oblique covering parallel retouch typical for the Tripolye culture.

The most numerous morphological category of tools were end-scrapers. Detailed analyses of specimens recovered from the Ćmielów settlement revealed a very high degree of morphometric features standardization, a fact enabling a precise definition of the tool's typical form [Sałaciński 1983/1989; 1987]. The average width of the end-scrapers was 30.6 mm, and their length-to-width ratio was 1.8 to 1.9. These metric characteristics indicate that it was not important for tool makers whether they were fashioning their end-scrapers from used-up blade tools (Fig. 5A, B), broken-off blade fragments, or even flakes (Fig. 5C). About a third of the end-scrapers were made on flakes. Waste of all kind was likewise used to make other small tools, including borers (Fig. 5D-F), pressers (Fig. 5G-I), splintered pieces (Fig. 5L-N), as well as micro-axes (Fig. 5J) and micro-chisels

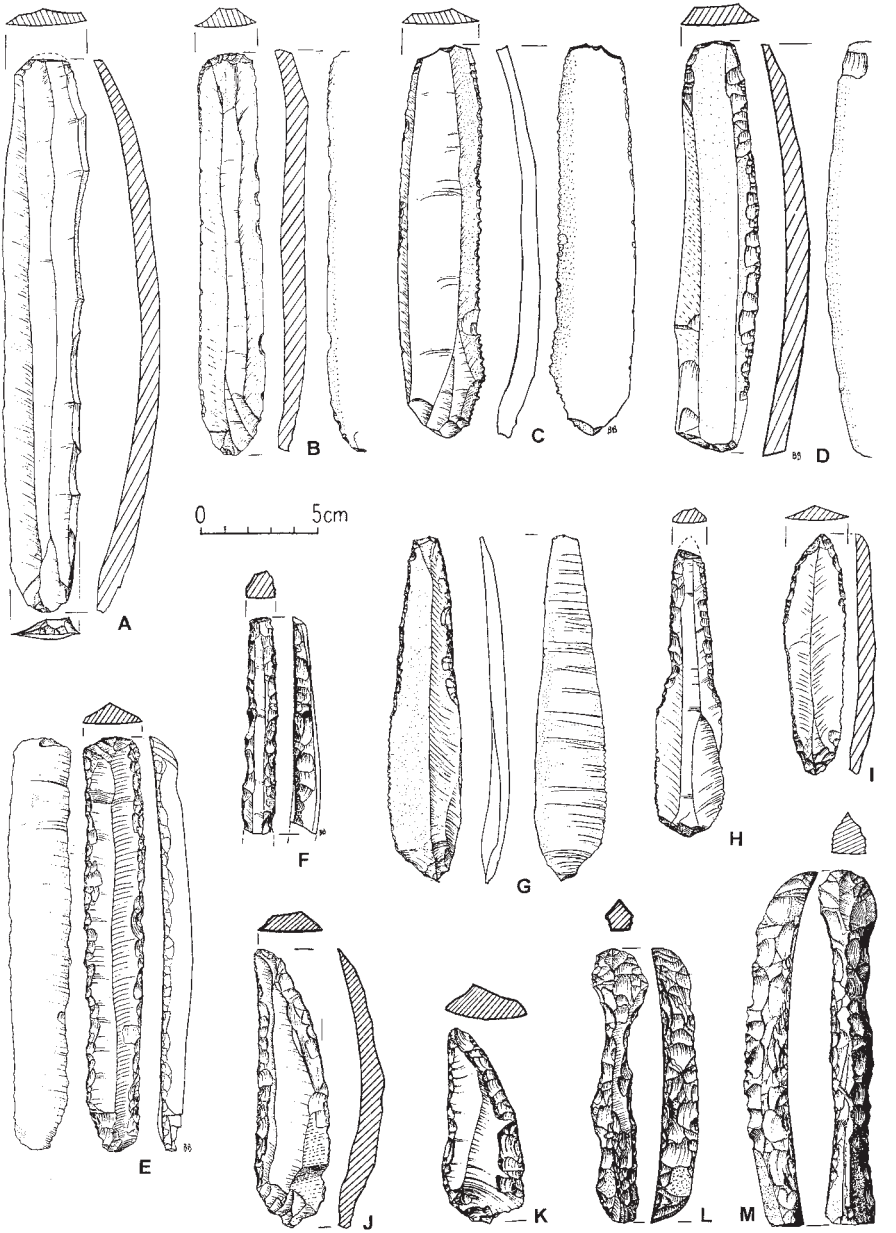


Fig. 4. FBC flint industry in south-eastern Poland. A.-D. type-A blade knives (sickle inserts); E.-F. type-B blade knives; G.-I. daggers; J.-K. asymmetric knives; L.-M. type-B pressers. A.-C., F., H.-I. Kamień Łukawski; D. Klucze; E. Klementowice; G. Zawichost; J.-K. Ćmielów; L.-M. Stryczowice, Ostrowiec Świętokrzyski District. All specimens made from Świeciechów flint. K. after Sałaciński 1983/1989; all other after Balcer 1975.

(Fig. 5K). A peculiar feature of inventories from the Sandomierz loess area is the large number of workshop implements: denticulated tools (Fig. 5O), bifacial tools (Fig. 5P), hammerstones and anvils.

The organization of flint production is usually analyzed by looking at differences in the structure of inventories from various assemblages. A comparison of this kind for the principal sites in the Sandomierz loess area was already made by B. Balcer [1975:Tab. 19-24]. Using his information together with reports from explorations of the individual settlement sites, we can give numerical data illustrating the tools-to-production waste ratios not only for inventories from entire sites, but also from various parts thereof (Fig. 6A-F). This reveals clear differences between the various settlement parts featuring copious flint production evidence. It would be worthwhile to examine this picture by comparing the absolute volumes of inventories. The best way of doing this would be to determine the number and weight of artifacts made from the various raw materials per unit volume of the explored cultural layer. Regrettably, we lack sufficient data to perform this analysis. The only approximate indicator we can have at this stage is the number of artifacts per area unit of the studied surface (number of flint artifacts per are). Suitably processed data from B. Balcer [1975, 1995] show that differences in absolute numbers of flint artifacts between various parts of workshop settlements are much greater than the same differences between settlements (Fig. 7). Given that the analyzed settlement fragments do not differ with regard to the kind or abundance of permanent features [e.g. Balcer 1989], we must conclude that the mass-scale flint production in FBC communities inhabiting the Sandomierz loess area was characterized by universal individual specialization (of individual households). A comparison of the diagrams in Fig. 6 and 7 shows a fairly close dependence between the number of artifacts from the various central settlements and the proportion of production waste in their respective inventories (Fig. 8). If we accept that the scale of local flint production is precisely indicated by the number of artifacts comprising the recovered assemblages, it would be interesting to know if this scale affects the numbers of tools of the various categories. Estimates for the three principal tool forms – large wedge-shaped artifacts, blade knives and end-scrapers – show that their numbers are completely unrelated to production scale (Fig. 9). In fact, we may say that their respective numbers are practically identical in all the analyzed settlements, although we must not forget about the unreliability of the estimates involved.

Artifacts numbers and inventory structures illustrate differences in flint production among individual settlements or parts thereof. However, a wider context is needed to reconstruct the organization of this production. Studies of areas around deposits of the used raw materials are of key importance here. Surface surveys in the vicinity of Świechów flint exploitation points (performed by the author and researchers from the Lublin center) [Libera, Zakościelna 1987; Bargieł, Florek 1987] led to discoveries of a number of sites displaying a specific inventory structure within about 15 kilometers from the outcrops. A good example is provided by materials from site 4 in Lasocin, covering an area exceeding one hectare. More than 200 flint artifacts were recovered from the sur-

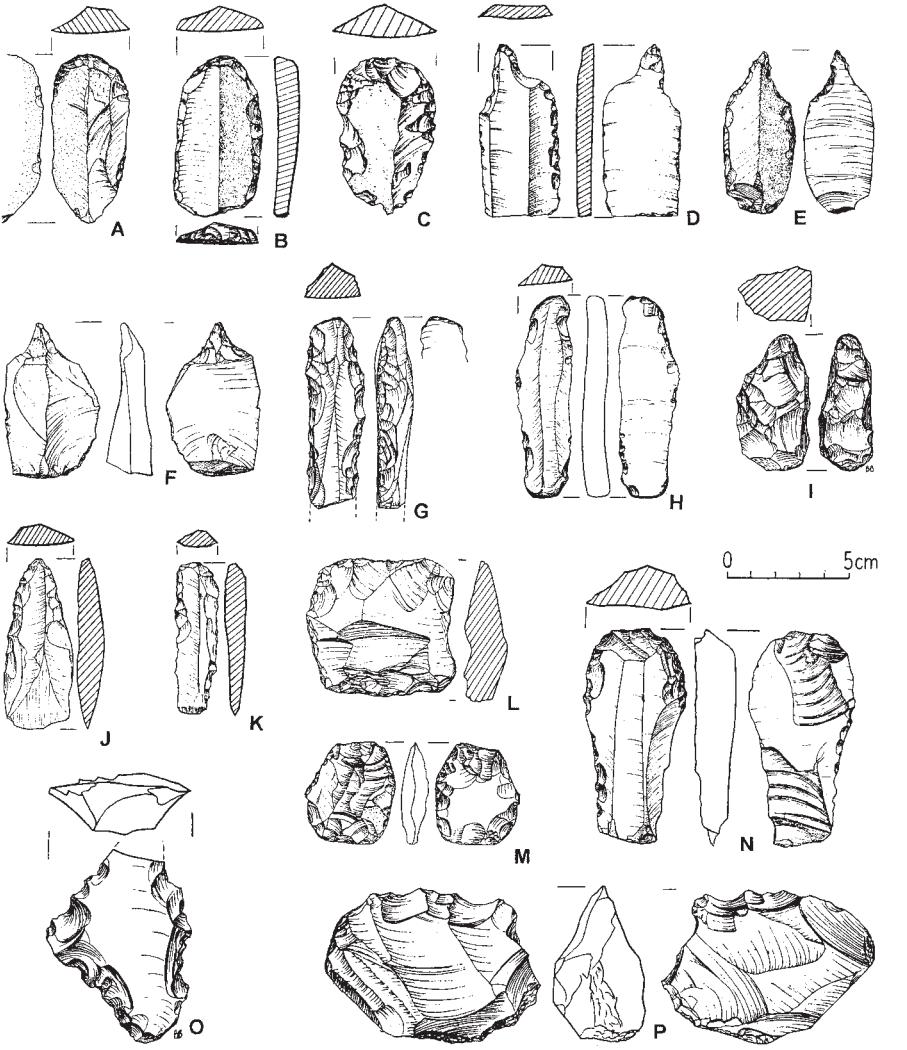


Fig. 5. FBC flint industry in south-eastern Poland. A.-C. end-scrapers; D.-F. borers; G.-I. type-A pressers (strikers?); J. micro-axe; K. micro-chisel; L.-N. splintered pieces; O. denticulated tool; P. bifacial tool. A., E. Kamień Łukawski; B. Gródek Nadbużny; C.-D., M., O. Ćmielów; F., H.-L., N., P. Zawichost; G. Ptkanów, Opatów District. C. striped flint; all other ? Świeciechów flint. C.-D. after Sałaciński 1983/1989; all other after Balcer 1975.

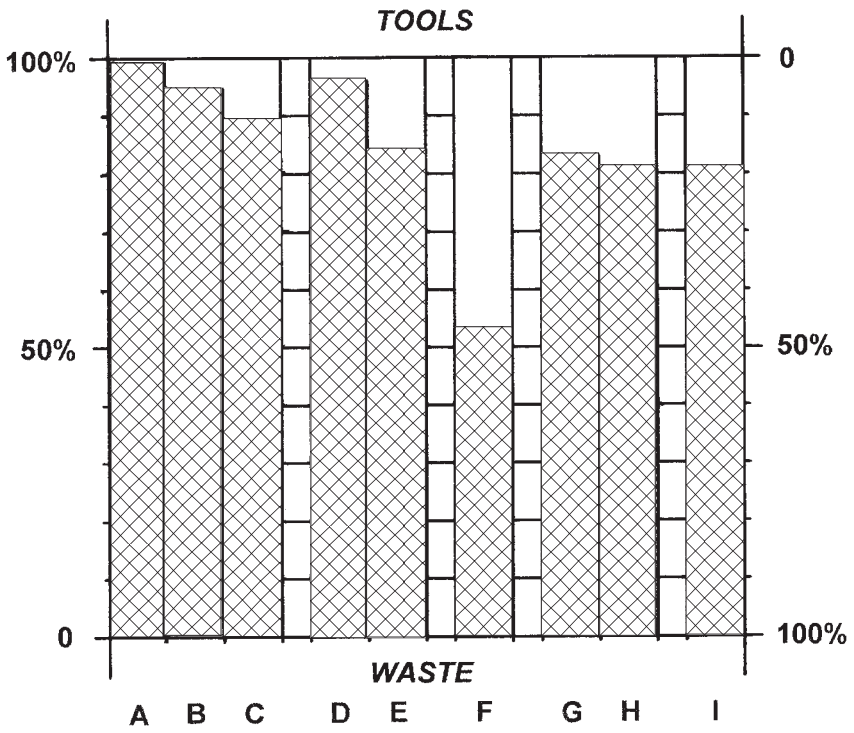
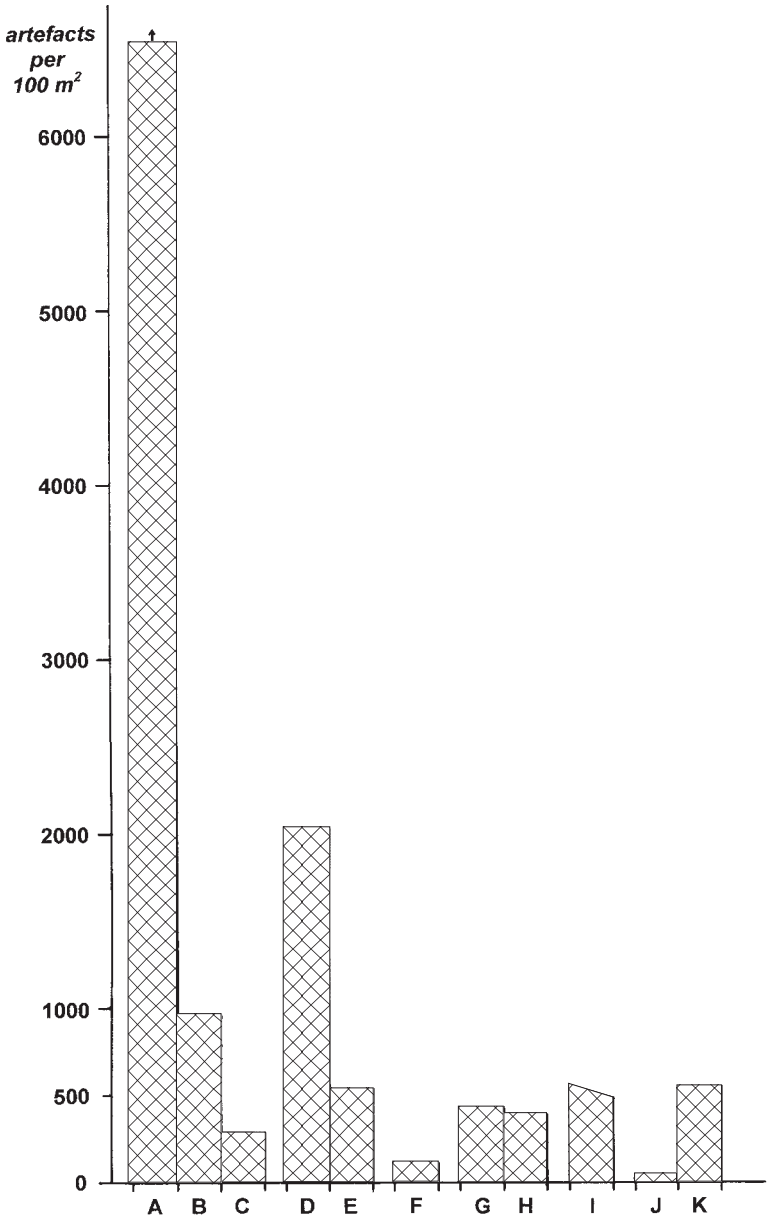


Fig. 6. Tools-to-production waste ratio in individual FBC settlements or parts thereof. See Fig. 7 for letter code of sites.

face of this site, along with just 15 pottery fragments. More than 90% of the flint finds were made from Świeciechów flint, a few percent from local raw materials of inferior quality, and less than 1% from striped flint. Upwards of 90% of the inventory are flakes which were accompanied by a relatively large number of workshop tools, including hammerstones. Only trace quantities of home tools were in evidence: four blade tools, two fragments of destroyed wedge-shaped forms, and two splintered pieces. Although none of the sites discussed here were excavated, their surface inventories are characteristic enough to warrant interpretation. Both the ratio of pottery shards to flint artifacts and the flint inventory structure indicate that these are not traces of dwelling sites. What we have here are probably remains of a succession of numerous flint workshops that were transitory processing facilities. The existence of such workshops casts new light on inventories from the excavated central settlements, suggesting that dwellers from all



F i g . 7. Relative quantities of flint artefacts recovered from individual FBC sites or parts thereof. A. Ćmielów, "Gawroniec" site, northern part; B. Ćmielów, "Gawroniec" site, central part; C. Ćmielów, "Gawroniec" site, southern part; D. Zawichost, "Pieczyska" site, excavation IV; E. Zawichost, "Pieczyska" site, excavations I and II; F. Kamień Łukawski, "Skała" site; G. Gródek Nadbużny, site 1C, part of excavation I; H. Gródek Nadbużny, site 1C, excavation II; I. Zimne, "Grodzisko" site; J. Bronocice, phase II; K. Bronocice, phase III.

over the Sandomierz Upland had free access to the Świeciechów raw material, and that differences in the structure of inventories from the various settlements are due to differences in production organization. Residents of settlements close to the deposits (e.g. in Zawichost) processed their raw material in their settlements, whereas knappers from more distant places performed much of their production activities in workshops not far from the outcrops.

Identical surface surveys carried out around striped flint outcrops by the author and the Krzemionki team of the State Archaeological Museum in Warszawa revealed an entirely different situation. There were no sites which could be interpreted as transitory flint processing facilities. Although it has been suggested in the literature that the "Osiedlisko przy zrobach" site in Ruda Kościelna was related to striped flint processing by FBC workshops [Zalewski, Borkowski 1996], the structure of the site's inventory (abundant ceramics and flint tools of home character, diverse raw materials) suggests that this was an ordinary small settlement belonging to the Ćmielów settlement microregion. The data we have today therefore suggest that striped flint processing was organized entirely differently than in the case of Świeciechów flint. Namely, it was the work of inhabitants of the Ćmielów microregion exclusively, or perhaps even of the Gawroniec settlement in Ćmielów alone.

Differences in the organization of flint production utilizing the two varieties of raw material are also illustrated by the numbers of artifacts discovered in various sites. The diagram in Fig. 10A-F also emphasizes the exceptional position of Ćmielów in the area of flint processing. The inhabitants of this settlement not only had exclusive use of striped flint, but they also left the most copious waste from Świeciechów flint processing, although the distance to the outcrops of this latter raw material exceeds 20 kilometers.

The Volhynian FBC settlement concentration is explored much more poorly. The only data comparable to the information discussed above come from the settlement in Gródek Nadbużny [Balcer 1975; Jastrzębski 1991]. Materials from another large settlement, the Grodzisko in Zimne, are currently being prepared for publication [Bronicki *et al.* 1998]. The data made available to date refer to just a small fragment of the site, and in many respects is not fit to be compared with the data discussed above [Zakościelna 1998]. Information about inventories from other settlements is still more enigmatic [Jazdowska-Król 1961; Bronicki, Kadrow 1988].

The flint industry of FBC communities being part of the Volhynian settlement concentration was similar to that known from the Sandomierz region. Here too we have macrolithic blades and quadrangular wedge-shaped tools. Raw materials came from the least distant Volhynian flint deposits (Fig. 1). It appears however that the Volhynian flint blades were obtained differently than in the Sandomierz region. The single-platform cores for blades in Volhynia carry less traces of preparation and feature more rounded flaking faces. We sometimes have two opposite-lying flaking faces, while in other cases exploitation proceeded around the perimeter of the piece. Other technological traits apparent in the production of Volhynian flint blades indicate that the Świeciechów flint specimens

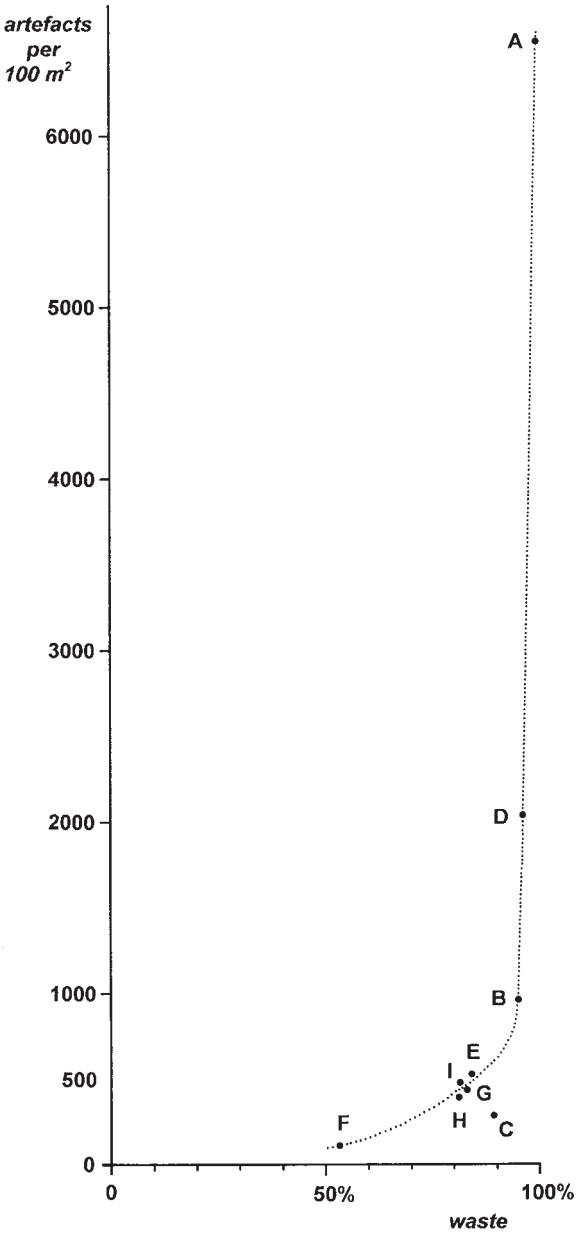


Fig. 8. Relationships between flint artefact numbers and percentage of production waste in inventories from individual FBC settlements or parts thereof. See Fig. 7 for letter code of sites.

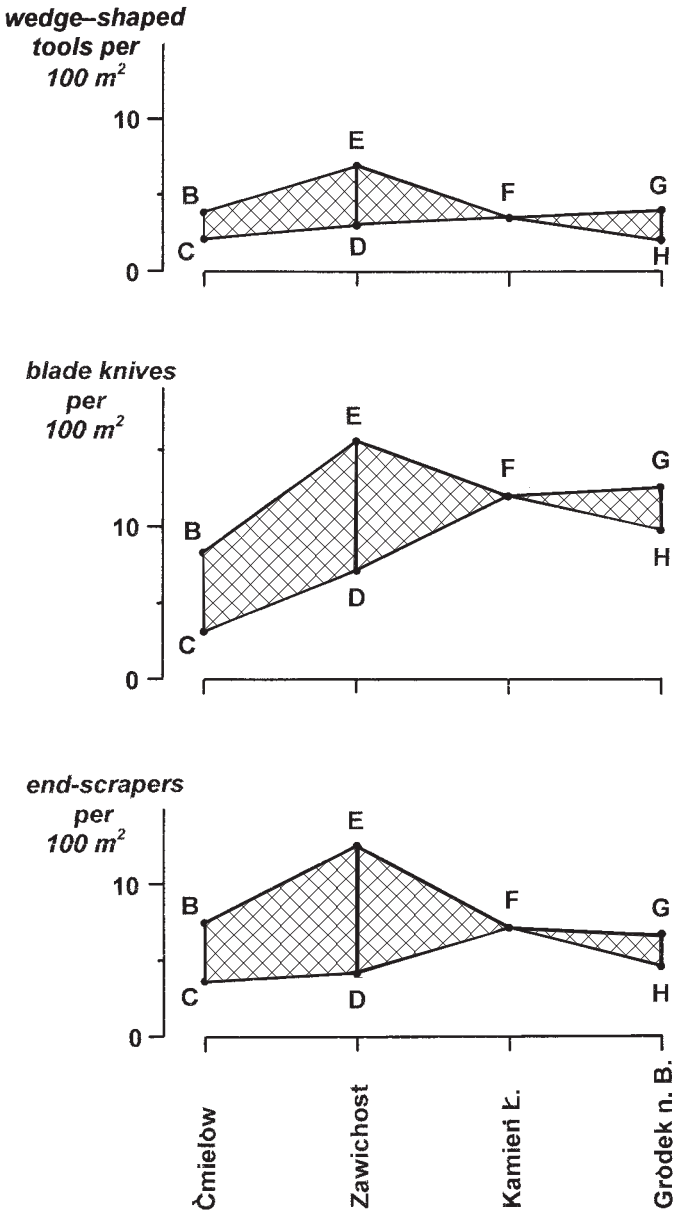


Fig. 9. Relative quantities of the basic flint tools in FBC settlements in south-eastern Poland. See Fig. 7 for letter code of sites.

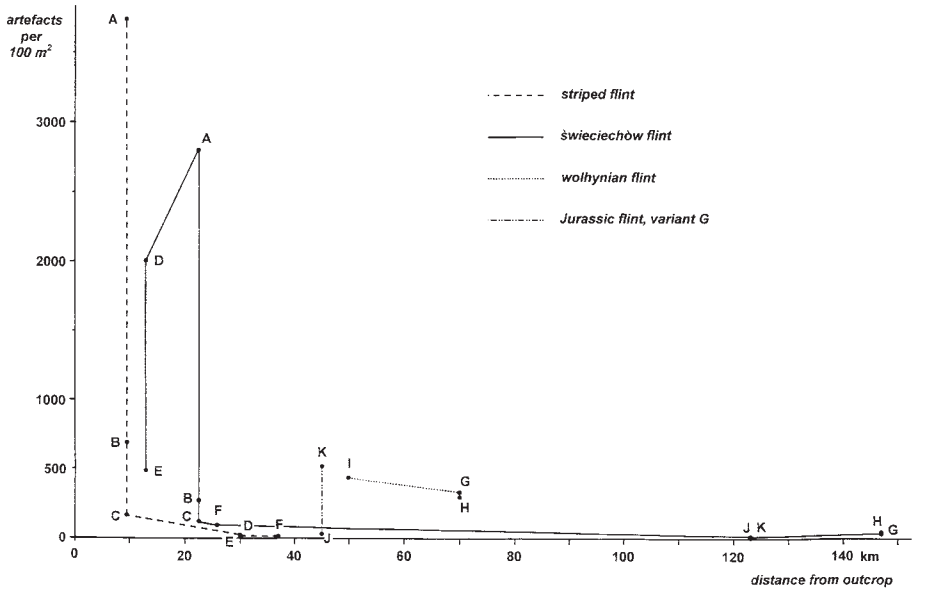


Fig. 10. Dependence between numbers of artefacts (made from the various flint varieties) recovered from FBC settlements and distances from raw material deposits. See Fig. 7 for letter code of sites.

were acquired already in finished form. The tool set in Volhynian sites also resembles that from the Sandomierz loess region (Fig. 11A-D). Needless to say, there are small differences of various nature. The Volhynian concentration appears to contain a smaller proportion of micro-axes and micro-chisels made from blades and flakes; they also yielded triangular arrowheads (Fig. 11G-I) resembling forms known from the Tripolye culture. A specifically Volhynian feature appears to be the more frequent combination of end-scraper with borer (Fig. 11E-F).

Unlike the Sandomierz loess sites, the settlements in Gródek Nadbużny and Zimne lie far from flint outcrops. The flint exploitation points in the Świętokrzyskie Mountains region are 150 to 195 kilometers away, and even the distance to the closest Volhynian flint deposits exceeds 50 kilometers (Fig. 1). Nonetheless, both sites yielded relatively abundant Volhynian flint waste (Figs. 6, 7, 10G-I), which is interesting considering that only part of the production cyrcle was being completed there. The lack of cortical flakes suggests that pre-cores or cores were being brought to the sites.

The large quantities of production waste in Gródek Nadbużny and Zimne (Fig. 10G-I) shows that flint production organization was affected by social organization factors much more than by distance from raw material deposits. Materials recovered from Gródek Nadbużny exhibit one other peculiarity: although raw materials from the Świętokrzyskie

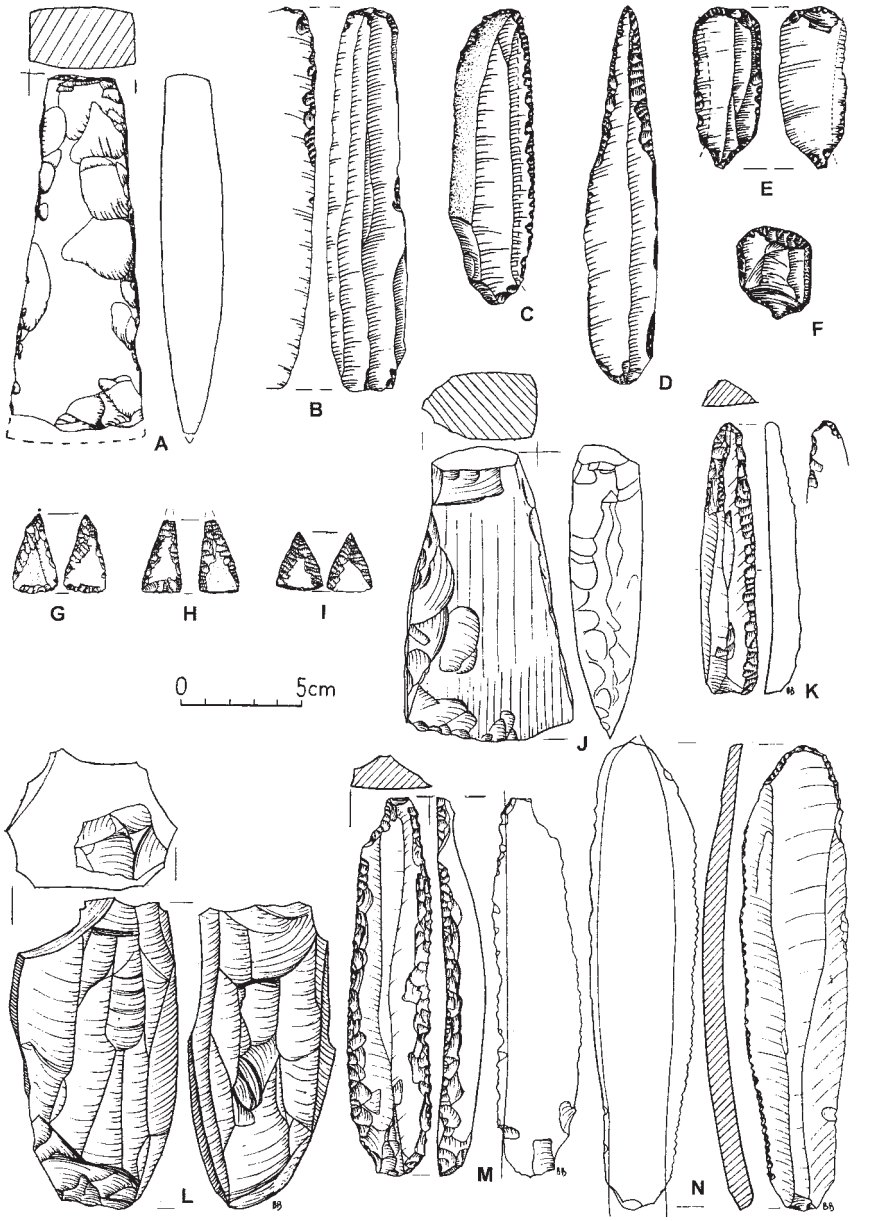


Fig. 11. Flint materials from the Volhynian and Cracow settlement regions of the FBC. A., J. wedge-shaped tools; B.-C., N. type-A blade knives; D., K. daggers; E.-F. end-scrapers with borers; G.-I. triangular arrowheads; L. core for blades; M. type-B blade knife reutilized as borer. A.-I. Gródek Nadbużny: F. Świeciechów flint, H. striped flint, all other ? Volhynian flint. (after Gumiński 1989); J.-N. Bronocice: Jurassic flint, G variant (after Balcer 1983).

Mountains region account for just a small part of the inventory there (close to 9% of Świeciechów flint and almost 1% of striped flint), they nevertheless play the leading role in the production of the principal tool forms. Of the 32 large wedge-shaped tools discovered on this site, only ten were made from Volhynian flint, with 11 representing the Świeciechów raw material, and another six the striped variety [Balcer 1975:Tab. 25]. The same is true of blade knives: as many as 55% are made from Świeciechów flint, and just 41% from the Volhynian material [Balcer 1975:Tab. 25]. The latter gains the upper hand only among the smaller tools, although more than 40% of end-scrapers continue to be made from Świeciechów flint. So, despite intense local flint processing, tools production relied mainly on imports from the Sandomierz region. Two major issues arise here. The first question is, what was happening with artifacts made from Volhynian flint? Were they being used locally in other settlements of the microregion, or were they objects of long-distance exchange? If the latter were the case, what was the export direction? Possible export destinations include the Kraków or Lublin loess regions, given that Volhynian flint implements are quite rare in the Sandomierz area. This leads to the related issue: what was being given in exchange for the Sandomierz flint? We will be coming back to this problem later.

The situation in Gródek Nadbużny today appears to be exceptional. In all the other sites in the region the percentage of the Świętokrzyskie Mountains raw materials is several times lower, with these being practically limited to Świeciechów flint. What is more, artifacts made from this flint appear to play an adequately small role in tool production. Interestingly, the distribution of the large wedge-shaped tools appears to play a larger role in the remaining settlements, in contrast to the situation in Gródek Nadbużny [Zakościelna 1998; Bronicki, Kadrow 1988; Jazdowska-Król 1961].

Research into the FBC flint industry in the Kraków loess region is even less advanced than in the case of the Volhynia industry. In addition to fragmentary information about inventories, provided by both extensive explorations and accidental finds, all that we have is a comparison of the presence of various raw materials in just one central settlement, in Bronocice [Kruk, Milisauskas 1989]. These are the only materials from Małopolska contributing to our knowledge of the chronological variability of the FBC flint industry. However, these materials were described differently than the inventories discussed above, and their comparisons would require suitable processing of data which at times would have to rely on rough estimates alone.

The FBC flint industry in the Kraków loess region is also similar to that known from the Sandomierz area. Both here and there the macrolithic blades and large wedge--shaped tools were of fundamental importance. It seems that the local blade production was reminiscent of the Volhynian traditions. The single-platform blade cores featured rounded flaking faces and were exploited around their circumference (Fig. 11L). The tool set is similar to those seen in all the previously described regions (Figs. 11J-K, M-N).

The Bronocice settlement lies far from flint outcrops: 105-125 kilometers from the Świętokrzyskie Mountains flint deposits, 300-330 kilometers from Volhynian flint

outcrops, and still some 45 kilometers from the closest Jurassic flint (G variety) deposits (Fig. 1) [Pelisiak 1987; Kopacz, Pelisiak 1991].

The concentration of flint artifacts in phase II of the Bronocice settlement is just under 40 finds per are (Fig. 7J). This is strikingly little when compared with all the sites mentioned so far, and is a good indication of just how little flint could have sufficed in the economic activity of the settlement inhabitants. The bulk of the inventory (close to 76%) is accounted for by Jurassic flint, with the Świętokrzyskie Mountains varieties also visibly present (17% of Świeciechów flint and 2.5% of striped flint). There is also a trace presence of Volhynian flint specimens, imports of which were more prominently apparent in the settlement's earlier phase. Based on quantitative data, J. Kruk and S. Milisauskas [1989] concluded that raw material imports played a minor role on this site. One cannot agree with this. As we could see in Gródek Nadbużny, even the small percentage of finds accounted for by raw materials from the Świętokrzyskie Mountains did not stop them from being the number one material in the production of the basic tool forms. The published data in fact encourage the hypothesis that, despite their modest quantity in Bronocice, the Świętokrzyskie Mountains flints nevertheless predominated in the production of the basic tools, with Jurassic flint being just a supplementary raw material.

The size of the Bronocice flint inventory goes up sharply in phase III of the settlement, with numbers of finds approaching those in the known Volhynian settlements (Fig. 7K, 10K). However, close to 80% of the artifacts come from just one flint workshop producing large wedge-shaped tools using Jurassic flints [Kruk, Milisauskas 1989:153]. This workshop marks the emergence of a distinct center of specialized flint production relying on local raw material deposits, providing still more evidence that this kind of activity involved individual specialization. The launch of local production did nothing to eliminate imports of the Sandomierz raw materials; quite the contrary in fact, the volume of these materials clearly increased. The detailed analysis of relationships between the development of local flint production and exchange mechanisms in the 'market' emerges as one of the most interesting research problems suggested by the materials from Bronocice.

The important role of Świętokrzyskie Mountains flints in the economy of FBC communities inhabiting the Kraków loess region is also confirmed by the smaller settlement in Niedźwiedź which is dated to the same period [Burchard 1991; Balcer 1975:316, 1983:151]. The role of Świeciechów flint imports is additionally documented by hoards of choice blades and blade knives discovered in Dzierążnia and Klucze [Balcer 1975:Fig. 51]. Judging by the Bronocice finds, it may be surmised that the Volhynian flint blade hoards being discovered in this region (Świątniki, Balice) date to slightly earlier times. The same may be true of the Zawarża settlement, for the same reasons [Kulczycka-Leciejewiczowa 1988a; Balcer 1983:Tab. 25].

Flint materials published to date from the Lublin region come from sites of a different type, namely settlements or camps much smaller in area. For this reason, we

cannot be sure whether differences between the Lublin region assemblages and those described above are due to regional characteristics or a different position in the settlement network structure. The problem is further complicated by the fact that the FBC occupation of the Lublin region appears to lack the vast central settlements.

Compared to all the sites discussed so far, Klementowice [Kowalczyk 1957; Balcer 1975:Tab. 28] and Lublin-Sławinek [Jastrzębski, Ślusarska 1982] yielded incommensurably fewer finds: around ten artifacts per are. The inventory from Chruszczów Kolonia [Libera 1982] is only slightly richer, but the character of the site is not entirely clear [Gurba 1957]. The paucity of inventories cannot be explained by distance to flint deposits. The region is indeed deprived of its own deposits of good-quality raw materials, but it is relatively close to outcrops of Świętokrzyskie Mountains flint (Fig. 1) and moreover lies on the same side of the Vistula that Świeciechów flint was exploited. The latter raw material predominates in most of the known sites (Chruszczów Kolonia, Krężnica Jara, Pawlin) [Libera 1982], but there are exceptions: most of the artifacts in Klementowice are made from striped flint [Balcer 1975:Tab. 28], while the Volhynian raw material prevails in Lublin-Sławinek [Jastrzębski, Ślusarska 1982]. This last case is even more surprising, considering that the distance to Volhynian flint deposits is almost three times greater than to the outcrops in Świeciechów.

Materials from the Lublin region include all the basic tools occurring in the remaining FBC settlement areas in Małopolska. However, due to the paucity of raw materials in the region, there was a lot more of reutilization and refashioning of used-up tools. The result is that the tool sets we are recovering from these sites are composed mostly of splintered pieces which usually comprise more than half of the tool forms. The flint production of FBC communities in the Lublin region generally appears to represent a different quality, both in terms of knapping skills and habitual ways of using flint in fashioning tools. Although the same forms are in use here – the large wedge-shaped tools and macrolithic blades (Fig. 3A, 4E) – they appear to have been brought to the region in finished form, while the local knapping skills were probably limited to the final shaping of blade tools and meticulous remodeling of worn-out forms into increasingly smaller implements. If the flint industry picture we are seeing here is not a result of insufficient material evidence, the Lublin region must be recognized as the farthest and borderline province of the Małopolska center. In many respects this industry is in between that of the settlement concentrations described above and the industry of FBC communities from the Lowland. Only trace quantities of the choice implements manufactured by the Świętokrzyskie Mountains and Volhynian centers were reaching the Lowland [Balcer 1975:289-291; Balcer, Kowalski 1978; Lech, Małecka-Kukawka 1987] where the local flint working was of an entirely different character [Małecka-Kukawka 1992]. The FBC communities from the Lublin region appear to be a bridge between the two provinces.

A specific characteristic of FBC tool production in Małopolska is the fact that most of the small implements were made by refashioning worn-out tools of other kinds, or using waste material from initial processing. A situation of this kind has a significant

impact on analyses, since the diagrams of individual tool class frequencies which are usually employed to compare assemblages no longer have sense. What they illustrate is the degree of frugality in raw material economy rather than the actual frequency of the diverse tool categories. It seems that descriptions of assemblages of this kind must include also precise morphometric definitions of the various tool classes [Sałaciński 1983/1989, 1987] as well as diagrams showing the place of the various forms in the refashioning cyrcle [Budziszewski 1995:Fig. 10].

A special role in industries like this must have been played by tools at the beginning of the reutilization cyrcle. In the FBC in Małopolska these were the large wedge-shaped tools and blade knives used as monolithic sickle inserts. B. Balcer [1975:210-211] assumed that these latter tools were exceptionally effective and that their emergence "was connected with the development of production economy, and of vegetable production in particular." Balcer's hypothesis is untenable. Experimental verification of the effectiveness of diverse types of sickles with lithic blades showed that the implement's efficiency depends to a considerable extent on blade length and edge preparation using fine denticulated retouch [Korobkova 1981]. Comparisons of FBC sickles with Early Neolithic implements show that although the former were fitted with macrolithic blades, their cutting edge was not necessarily longer than in the latter (Fig. 12B, C). Also, the monolithic and frequently curved insert required a handle that was more difficult to make, with the entire tool being less handy. On the whole, the FBC sickles appear to be anything but more effective. Like the other sickles utilizing monolithic inserts which were typical for the 4th and 3rd millennia BC, the FBC sickles appear to be an aberration rather than a positive development of the tool form (Fig. 12). Worth noting is that the FBC sickle inserts were sharpened with fine denticulate retouch only after the cutting edges were first blunted by corn gloss, which means that the advantage gained from a better cutting edge was valued less than longer exploitation of the blade. Considering that the sickle inserts were the only forms fully utilizing the blade parameters, we must suspect that functionality was not the only reason for their macrolithization. This in turn leads us to the surprising conclusion that blade production in the FBC flint industry cannot be treated as a production of blanks. The production of macrolithic blades was a goal in itself. This claim about their special, supra-utilitarian role is also supported by other observations: macrolithic flint blades comprised a cult bog deposit in Weremowice [Bronicki 1993]; in hoards and depots unprocessed blades are accompanied by blade knives processed in a way that did not severely alter the parameters of the unprocessed pieces.

Similar reservations may be voiced with regard to the utilitarian interpretations of wedge-shaped tools. The Polish literature treats all these forms en bloc, despite a complete lack of use wear analyses of these finds. In the context of the FBC they are believed to be axes associated with tree felling and the development of the slash-and--burn economy. This is no doubt an excessively simplistic interpretation, as indicated by both the context in which these implements made their appearance along the lower Danube some 500 years previously, and by their subsequent history. The slash-and-burn

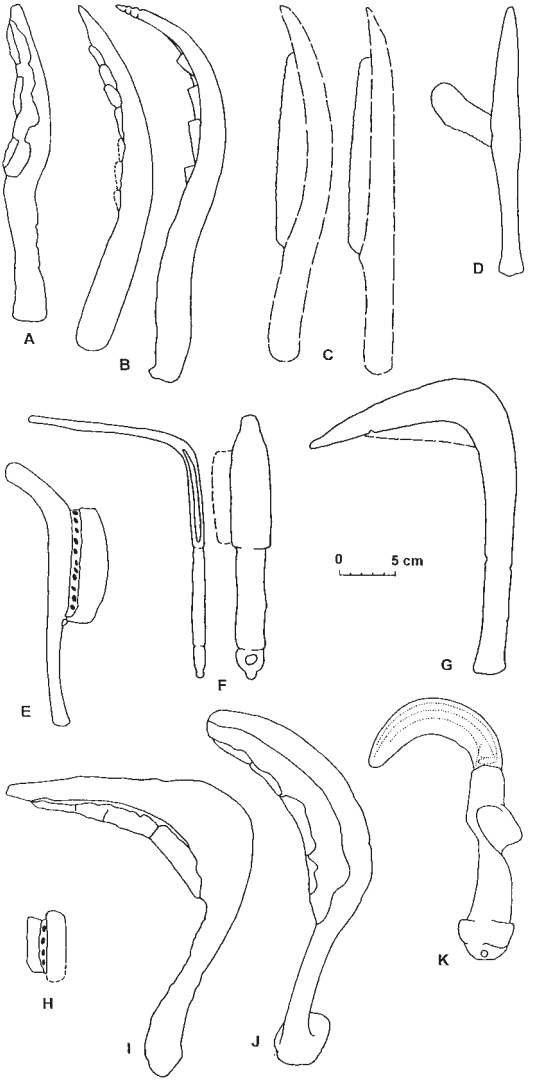


Fig. 12. Reconstruction of FBC sickles from Little Poland proposed in B. Balcer 1975 (C) compared with completely preserved Neolithic and Bronze Age sickles and sickle knives. A. Nahal Heimar cave (Israel), PPNB - 7th millennium BC (Bar - Yosef 1987); B. Karanovo (Bulgaria), Karanovo II - mid-6th millennium BC (Mikov 1939, Georgiev 1961); D. Egolzwil 3 (Switzerland), Egolzwil culture - end of 5th millennium BC (Wyss 1994); E. Egolzwil 5 (Switzerland), Cortaillod culture - first half of 4th millennium BC (Wyss 1976); F. Egolzwil 2 (Switzerland), Cortaillod culture - first half of 4th millennium BC (Müller-Beck 1965); G. Niederwill (Switzerland), Pfyn culture - first half of 4th millennium BC (Müller-Beck 1991); H. Twann (Switzerland), Horgen culture - end of 4th millennium BC (Furger 1981); I. Solferino (Italy), Early Bronze Age - first half of 2nd millennium BC (Perini 1987); J. Fiavé (Italy), Middle Bronze Age - mid-2nd millennium BC (Perini 1987); K. Auvernier (Switzerland), Final Bronze Age - bronze sickle from the early 1st millennium BC (Egloff 1984).

economy certainly played no role whatsoever in the Late Neolithic Globular Amphorae and Corded Ware cultures which produced even greater numbers of the large wedge--shaped tools. Bearing in mind the wider chronological and territorial context in which these forms occur, we may assume, like in the case of the macrolithic blades, that they had a supra-utilitarian symbolic significance – if not all of them, then at least the most impressive specimens. Their functional interpretation requires detailed morphometric and use-wear analyses leading to a reconstruction of their original formal differentiation and their no doubt complex and multi-stage usage history. Worth noting here is that the only FBC wedge-shaped tools from Małopolska whose function is well defined by the context in which they were discovered were used in a bone processing workshop [Kowalczyk 1958:315-316].

The conclusion from the above remarks is that the significance of the basic implements of the FBC flint industry in Małopolska, namely macrolithic blades and large wedge-shaped tools, was non-utilitarian. They were probably prestige goods, with symbolic considerations rather than functional needs being mostly responsible for their parameters.

The FBC flint industry in Małopolska involved a multi-level and structured system of specialization, in evidence on the various levels of regions, settlements and individual households. Specialization on regional level is well illustrated by relationships between individual settlement concentrations and local raw material deposits. Worth noting is the leading, supra-regional significance of artifacts made from Świętokrzyskie Mountains raw materials which were being distributed in quantity from the Sandomierz loess region to Volhynia, the Lublin region and the Kraków loess area. Specialization on individual settlement level is documented by the unprecedentedly copious materials from the "Gawroniec" site in Ćmielów. The clearly distinct workshop areas, seen not only in the Ćmielów settlement but also in settlements less involved in flint processing (Zawichost, Bronocice), reliably testify to the existence of individual specialization.

The FBC assemblages we know from the Sandomierz region reveal the complex nature of the system of raw material procurement and processing, and of implements distribution. Not only do we see different implements being made from Świeciechów and from striped flint, but there are also differences in access to deposits and processing organization. Worth stressing once again in this context is the special significance of the Ćmielów settlement in the processing of both the local raw materials. Distribution was likewise a complex process, different not only in the case of the two raw materials but also for the various implements classes. We are still far from unraveling this complex arrangement, with our knowledge being limited to isolated observations. The most interesting of these have to do with imports of implements made from Świętokrzyskie Mountains flints to settlements in the Volhynian region. The various assemblages there not only differ in the quantities of imported artifacts, but also with regard to the kinds of implement and raw materials used to make them. Special among the settlements is Gródek Nadbużny, with its rich assemblage and unique raw material composition of the imported artifacts. This is the only site apart from Ćmielów in which the large wedge-

-shaped tools made from striped flint are almost as numerous as those made from other raw materials. Implements of this kind were most certainly distributed differently than blades. The latter are relatively frequently found comprising hoards and depots – and they are never accompanied by the large wedge-shaped tools. Another highly noteworthy observation is that the differences in core processing apparent in the various regions prove that only finished implements were being distributed – without the relevant know-how accompanying them.

An issue widely discussed in the context of flint artifacts distribution is that of exchange equivalents. The data in hand prove that this was not flint-for-flint exchange, and it also appears that standard agricultural produce could not have been involved, contrary to the usual explanations. These theories fail to account for the considerable differences in access to imported flint artifacts between settlements of like character. The most probable explanation appears to be that flint artifacts were circulating largely as part of exchanges of prestige goods. One of the equivalents in such exchanges could have been Tripolye ceramics, plentiful in Volhynian FBC settlements and found even beyond the left bank of the Vistula [Kempisty 1968]. A different possibility can be suggested for Gródek Nadbużny which yielded more copper artifacts than all the other Małopolska sites combined [Gumiński 1989:166-171]. The accumulation there of the extraordinary quantities of artifacts made from Świętokrzyskie Mountains flints could have been possible thanks to the distribution of copper obtained from the Tripolye people. This theory is supported by the fact that the only traces of copper smelting in loess areas on the left bank of the Vistula were discovered in the Ćmielów settlement [Krzak 1963]. The rich inventories in both the unusual settlements suggest that those profiting from distribution of prestige goods were mostly inhabitants of settlements playing key roles in distribution rather than dwellers of flint production settlements. The minute quantities of Małopolska artifacts reaching the Lowland suggests that the prestige goods exchange 'market' was developing mainly within the existing system. Priceless insights into rules of the system's evolution should be provided by analyses of changes occurring during the development of the Bronocice settlement.

The hypotheses discussed above appear to indicate that the FBC flint industry in Little Poland divides into two segments operating according to different principles. On the one hand we have centers producing prestigious flint artifacts, run by specialist knappers, while on the other there emerged a specific form of "home" flint working, involving meticulous, multi-stage refashioning of products supplied by the specialized workshops into implements for everyday use. Flint production would thus cease to be an important indicator of social identity, manifesting itself in considerable uniformization of flint processing methods, also among communities inhabiting extensive territories. The available data suggest that the split between the two types of flint working in FBC communities in Małopolska was not due to limitations in access to raw material deposits, but rather to restrictions in access to flint knapping skills and perhaps also to knowledge about mining techniques. The described organization of flint production has profound

implications in material evidence analysis. The concept of flint industry ascribed to a specific community – the mainstay of Stone Age prehistory – become blurred. Diverse production centers could have functioned within any given Chalcolithic community, and home industries could also have differed one from another depending on the manner of acquiring raw materials. The interpretation of all the nuances apparent in the flint industry of FBC communities in Małopolska will require much more detailed studies. In a wider context, we already know that in areas receiving tiny quantities of artifacts from the Małopolska centers, quite insufficient to satisfy the economic needs there, the flint industry adapted itself to local raw materials supplies, usually undergoing severe simplification [Małecka-Kukawka 1992]. The existing single industry was being replaced by numerous regional variants, often displaying considerable variety.

It is impossible to demonstrate a local origin of the above transformations in Little Poland. The first flint industries employing macrolithic blade technologies emerged here already at the turn of the 5th and 4th millenium BC. These are known from inventories of the Wyciąże-Złotniki group and from the younger phase of the Lublin-Volhynia culture [Kamieńska, Kozłowski 1990:79-85; Zakościelna 1996]. Materials of both these groups display a strong affinity to the Bodrogkeresztúr culture as well as to the Tripolye culture (numerous imports of Volhynian flint). Formally, their flint inventories differ radically from the FBC materials described here. They completely lack the flint wedge-shaped tools, and blade tool production is also different. Burins are most plentiful, and sickles usually feature inserts just a few centimeters long. The best described inventory from those times, recovered in Kosina (Łańcut District), suggests that a special role in the tool set, analogous to that of the monolithic sickle inserts in the FBC, was played by large blade daggers [Kadrow 1992:Fig. 2a-b]. Industries in which these implements had a special significance emerged in the second half of the 5th millenium BC in the steppes of the Black Sea lowlands [Telegin 1973, 1991; Rassamakin 1994]. Their impact becomes apparent in assemblages of the Tripolye culture [Videiko 1994] and in the Carpathian Basin towards the end of the 5th millenium BC when the first so called ochre graves horizons make their appearance [Popescu 1941; Lichardus, Lichardus-Itten 1993; Movsha, Chebotarenko 1969; Kovács 1944; Ecsedy 1973].

The formal similarity between the Małopolska FBC flint industry and that of the late groups of the Tripolye culture was noted on numerous occasions [Balcer 1981a; 1983; Budziszewski 1995]. In fact the resemblance is so great that one gets the impression that the flint industry of the FBC communities in Małopolska was more related to the Tripolye culture than to the other FBC groups. Unfortunately, the dynamics of the relationships involved here cannot be recreated today. Most of the Tripolye materials indicated till now as analogies of the Małopolska inventories, such as those from Listvin [Peleshchyshyn 1998a] or the Sofievka sites [Budziszewski 1995], turned out to be much younger than the latter. This encourages caution in formulating conclusions, and suggests that discussions of the issues involved here should be put off until the systematics of the Tripolye culture becomes based a reliable absolute age determinations. The optimistic news is that work on

these determinations has recently gained impressive momentum [Wechler 1994; Mantu 1995; Burdo, Videiko 1998; Videiko, Tripolye. . . , in this volume].

All the problems listed above notwithstanding, there is no doubt that the key to understanding the evolution of flint processing in Małopolska leading up to the emergence of the industry of south-eastern FBC group presented in detail above is the evolution of the flint industry of the Tripolye culture. Research into the issue cannot be limited to descriptions of obvious facts illustrating macrolithization in blade production or the appearance of special categories of tools, such as blade daggers, monolithic sickle inserts or the large wedge-shaped tools. The analysis must also include a broader consideration of the socio-economic aspects of the discerned evolution. An important role here will be played by studies of tool production organization and of flint artifacts distribution, as well as of the formal and organizational relationships between those systems and metallurgical production [Ryndina 1971; Klochko 1994]. No less important will be the consideration of flint industry analysis results in the wider context of the economy as a whole, among others in relation to changes in settlement systems, well discernible in archaeological evidence, leading up to striking phenomena such as the gigantic settlements [Videiko 1998].

The facts emerging from materials of the Tripolye culture cannot be fully comprehended without reference to transformations of a similar nature taking place in adjacent territories. The culture's relationships with the Sredni Stog communities belonging to the cultural tradition of the Black Sea lowland steppes are of particular significance in this context [Rassamakin 1994; Videiko 1994]. No less important appears to be the comparison of processes taking place in the Tripolye culture with similar transformations occurring slightly earlier in Eneolithic communities south of the lower Danube [Todorova 1995; Boyadžiev 1995]. The Karanovo VI-Kodžadermen-Gumelniţa-Varna-Aldeni II group of related cultures emerged there around the middle of the 5th millenium BC, and its metallurgical production was so prolific and diverse that the period is often being described as the "metal boom period" [Chernykh 1978; Gale *et al.* 1991]. Copper was used not only to produce small tools and ornaments (which were often made from gold) but also a wide range of large tools: diverse wedge-shaped forms and shaft-hole axes which were no doubt prestigious objects [Todorova 1981]. The metal production was accompanied by a dynamic development of flint processing, relying primarily on the macrolithic blade industry [Ivanov 1991]. The oldest wedge-shaped flint tools in this part of Europe coexist here with bifacial points [Marinescu-Bîlcu 1965; Lichardus, Lichardus-Itten 1995]. The exploration of mutual relationships shaping the flint economy in Chalcolithic communities inhabiting the Circum-Carpathian zone in the 5th and 4th millenia BC, as well as of the dynamics of diversities among these communities appears to be among the most attractive research tasks of our day.

Translated by Andrzej Lewandowski

ABBREVIATIONS

AP	– Archeologia Polski, Warszawa
APS	– Archeologia Polski Środkowowschodniej, Lublin
BPS	– Baltic-Pontic Studies, Poznań
KSIA	– Kratkiye soobscheniya Instituta Arkheologii, Moskva
KSIA AN USSR	– Kratkiye soobscheniya Instituta Arkheologii Akademii Nauk Ukrainskoy SSR, Kiev
KSIIMK	– Kratkie soobshcheniya Instituta Istorii Materyalnoy Kultury Akademii Nauk SSSR, Moskva.
MIA	– Materialy i issledovaniya po arkheologii SSSR, Moskva
NA IA NANU	– Naukovy Arkhiv Instituta Arkheologii Natsionalnoi Akademii Nauk Ukrainy, Kiev
SA	– Sprawozdania Archeologiczne, Kraków
SCIVA	– Studii şi Cercetări de Istorie Veche si Arheologie, Bucarest
WA	– Wiadomości Archeologiczne, Warszawa
Zapiski NTS	– Zapiski Naukovogo Tovarystva imeni T. Shevchenka, Kiev

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