

The Settlement of Bodaki – a Tripolian-Culture Centre of Flint Exploitation in Volhynia

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Abstract: During the early metal periods, flint continued to be used widely in many regions of Europe as the main raw material for tools. The deposits of large Cretaceous flint nodules start being exploited at this time. Their mining was carried out in open pits as well as in mines and adits. Studies of Tripolian-culture sites in the northwest of Ukraine showed that workshop settlements focused on production and exploitation of these raw materials were situated near the Volhynian flint deposits. The settlement in Bodaki, Ternopol district, is one of these sites. A complex study of flint materials from this site has provided interesting results. Use-wear and planigraphy analyses showed that the pre-processing of raw materials was undertaken outside the settlement. Flint knapping was done in a special workshop and on an open working platform where the majority of tools found was connected with flint knapping. There were cores, spherical hammerstones, punches, retouchers and ridge blades. In dwellings, on the contrary, the majority of tools were connected with the processing and production of final products. These are scrapers and borers for processing skins, saws, burins, drills, knives for planing wood, bone and antler, and knives for cutting meat. Other finds included tools used in agriculture, such as sickle inserts and grinding stones. These results testify that Tripolian-culture communities had specialized workshop settlements for flint processing, and at the same time, within the site, the complete cycle of economic activity, characteristic for the economy of this time, was carried out. In the Eneolithic period in Bulgaria, in the Dobrudja district, workshop settlements that completely provided flint products to settlements in others areas, for example the Black Sea area, were also registered. Specialized objects related to flint mining were examined in England, Belgium, France and Poland (Małecka-Kukawka 2011, 2014; Małecka-Kukawka and Werra 2011; Werra and Małecka-Kukawka 2017), but a lack of use-wear analysis of the assemblages from those sites precludes presently the characterization of their economic features.

Keywords: Eneolithic, Tripolian culture, flint deposits, tool functions, experiments

In many archaeological cultures of the Eneolithic epoch in Eurasia flint continued to remain the most common raw material used for tools, despite the discovery of copper. Even on such front lines – from the point of view of social and economic development – as the Ancient East and different regions of Europe, flint tools were used everywhere. In many branches they were successfully competing with metal (Păunescu 1970; Gurina 1976; Balcer 1983; Mallet 1992; Kaczanowska *et al.* 1993; Rosen 1997; Pélegrin 2002; Skakun 2006; Lech 2008, 2011; Budziszewski 2006; Capote *et al.* 2011; Skakun *et al.* 2014; Bostyn and Giligny 2014, etc.).

Unfortunately, the analysis of this group of archaeological materials has not always received sufficient attention. Flint artifacts were often regarded as archaic finds, associated with the preceding Neolithic period. It is impossible to tell that researchers of the Tripolian culture did not consider the facts with the production of flint products to a greater or lesser extent.

Articles and monographs have referred to sources of raw materials and separate workshops, and there are observations on the technology of tool production and tool typology, however, not much systematic work was done in this direction (Bogaevskiy 1937; Bibikov 1965, 1966; Passek 1950; Chernish 1951, 1967; Popova 1980, 2003; Konoplya 1982; Engovatova 1993; Skakun 2004; Tsvek 2005; Tsvek *et al.* 2012; etc.). Even the discovery of the outstanding Tripolian site of Bodaki (Ternopol district, north-western Ukraine), made by Aleksandr Cynkałowski before the Second World War, was not followed up with systematic excavation work, although some limited archaeological excavations yielded unusually numerous flint artifacts on the site (Cynkałowski 1969; Popova and Chernish 1967; Peleschishin 1990). This situation did not change until the end of the 20th century, when the complex study of this site began. The site is situated at Volhyn', on the left bank of the Goryn' River (Fig. 1), in the extreme northwest limits of the Tripolian culture in the Middle

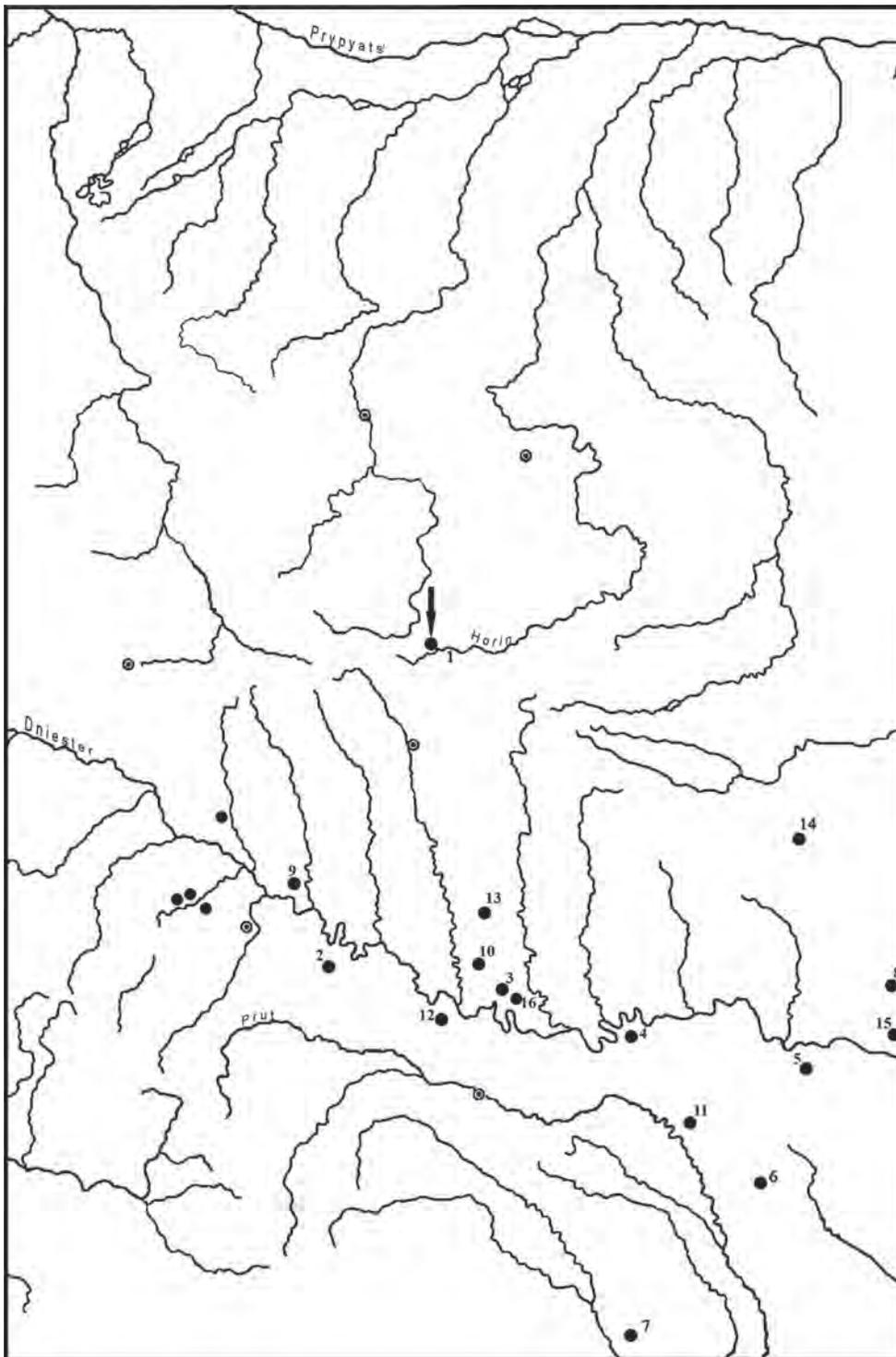


Fig. 1. Map showing the location of Bodaki, Ternopol dist., and coeval settlements of the BII stage: 1 – Bodaki, Ternopol dist., Ukraine; 2 – Neszvisko, Ivano-Frankovsk dist., Ukraine; 3 – Kudrintsy, Ternopol dist., Ukraine; 4 – Polivanov Yar II, Chernovtsy dist., Ukraine; 5 – Mererșeuca-Cețățuie III, Oknitsa dist., Moldova; 6 – Yablona, Glodyanskiy dist., Moldova; 7 – Kukuteni-Cețățuie, Yassy dist., Romania; 8 – Krinichki, Ivano-Frankovsk dist., Ukraine; 9 – Buchach, Ternopol dist., Ukraine; 10 – Gorodnitsa, Ternopol dist., Ukraine; 11 – Brynzeny VIII, Glodyanskiy dist., Moldova; 12 – Zaleschiki, Ternopol dist., Ukraine; 13 – Bil'che-Zolotoje, Ternopol dist., Ukraine; 14 – Nemirov, Vinnitsa dist., Ukraine; 15 – Rakovets, Ivano-Frankovsk dist., Ukraine; 16 – Zbruchanskoje, Ternopol dist., Ukraine. Drawn: E. G. Starkova.

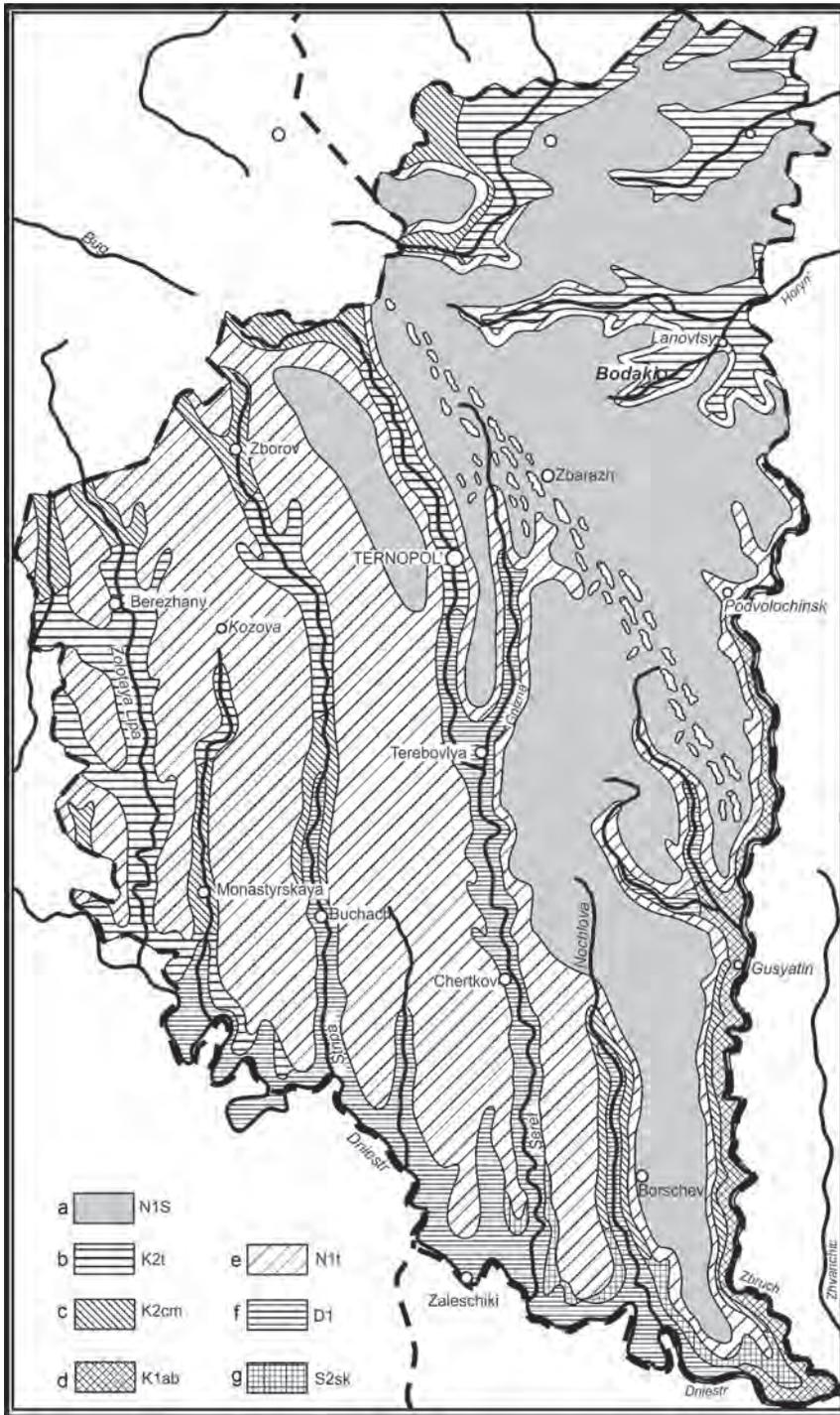


Fig. 2. Schematic geological map of the Ternopol Region (after Gerenchuk ed. 1979): a – Sarmatian circle; b – Turonian circle; c – Cenomanian circle, lower chalk; d – Albian circle; e – Tartonsky circle, upper chalk; f – Lower Devon; g – Upper Silur. Drawn: V. V. Terekhina.

period of BII is dated 4th millennium BC (Skakaun 1996a, 2004, 2005).

The unusual appearance of this settlement at such a distance from the center of the culture was caused by the demand for the high-quality Volhynian flint abundant in this area. Several outcrops, with the flint occurring in Cretaceous layers close to the modern surface (Fig. 2), are present on the bank slope, about 1km west of the site (Fig. 9). A number of funnel-shaped pits (1.8–2m deep and 3–3.5m in diameter), overgrown

with small trees and shrubs, were found there. During the excavations a fragment of the Tripolian pottery was found on the bottom of one of them. It is possible that these pits are the remains of a prehistoric flint mine. They are similar to pits from Krzemionki Opatowskie, Ostrowiec Świętokrzyski district (Poland; Krukowski 1939; Podkowska 1962; Sałaciński and Michniak 1992; Bąbel 2014, 2015; Piotrowska *et al.* 2014).

The areas where the primary flaking was carried out are situated beyond the settlement, close to its western

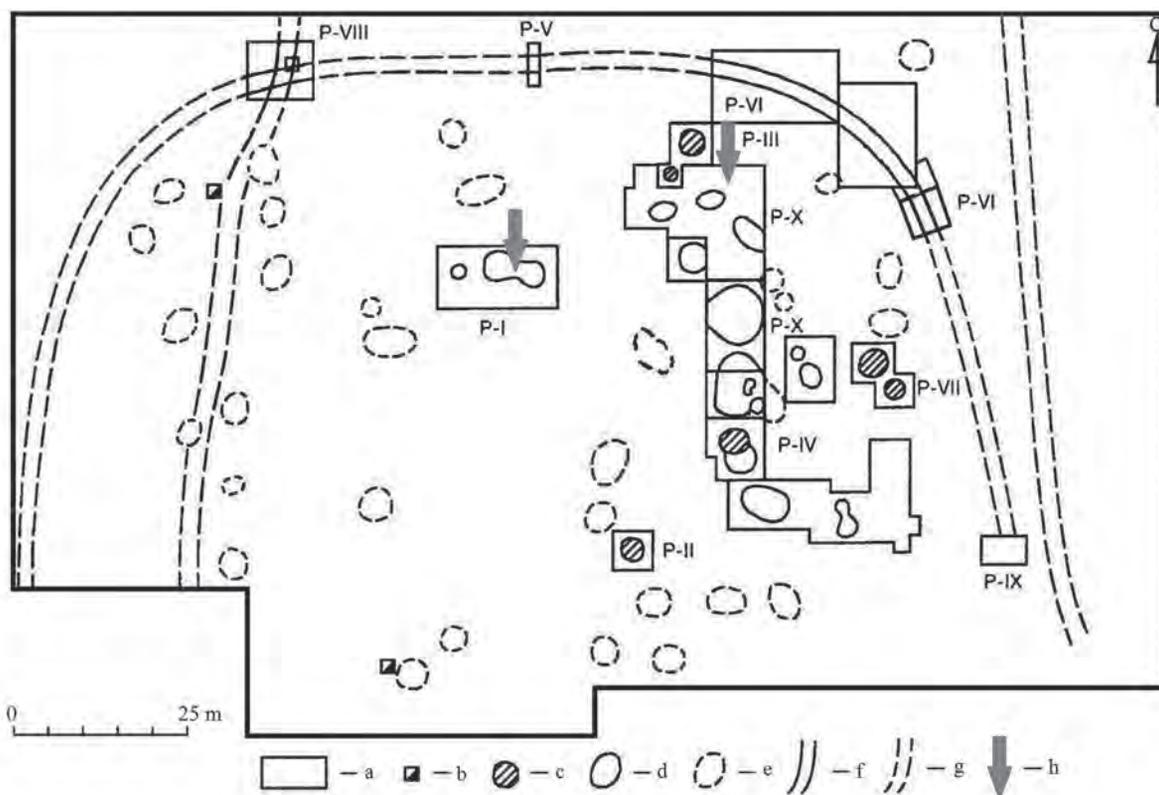


Fig. 3. Spatial distribution of archaeological objects at the Bodaki settlement, Ternopol dist.: a – excavations; b – trenches; c – remains of pise buildings; d – excavated pit-dwellings and domestic pits; e – supposed pit-dwellings and domestic pits; f – excavated parts of the ditch; g – unexcavated parts of the ditch and objects of unknown function; h – on-site flint workshop. Drawn: V. A. Tarasov and N. N. Skakun.

boundary, near the ravine. The lower levels and slopes in this area are rich in flint nodules. The nodules have diverse shapes (Fig. 12), with the largest reaching 50cm in length. The accumulations contain unworked flint pebbles, pebbles with traces of initial flaking, pre-cores, as well as numerous primary flakes and flakes retaining parts of pebble cortex.

The settlement itself represents a complex of dwellings and household structures, surrounded on three sides by a horseshoe-shaped ditch (Fig. 3). A large (c. 20m²) sunglasses-shaped semi-subterranean building in the central part of the settlement served as a workshop for preparing flint tools. Adjacent to one of its walls was a sub-rectangular hearth with well-calcined walls – a unique find at the settlement. The building had two occupation floors which yielded over 1500 flint objects, including 52 cores, 11 globular flint hammerstones, two antler punch (pressure retouchers), three retouchers on blade fragments (Fig. 4), large blades and their fragments, numerous flakes of various dimensions, including cortex pieces, as well as finished tools (end-scrapers, burins, borers, perforators, a ‘dagger’-blade with retouch on its distal end). Traceological analysis has shown that the majority of tools found at the workshop, except those that were used for knapping,

had no traces of utilization. The workshop adjoined two pits containing large amounts of waste products: core trimming flakes, core platform rejuvenation flakes, chips from retouching, etc. It should be noted that irregular flint blades and flakes were too massive to be utilized, but they were perfectly suitable for pressure retouch use. These implements may represent retouch testing samples or training aids. The majority of the wedge-shaped unifacial cores were relatively large (20–12 × 15–10 × 8–6cm). Judging by the flake scars and rare finds of intact blades, their exploitation was aimed exclusively for the production of maximally long blades (not less than 15cm) with widths between 1.5–3cm (Fig. 5). The quality of these blades suggests that they were prepared by qualified flintknappers.

The flint analysis from the Bodaki settlement complex indicates that the technology of knapping large flint nodules for the production of long, large, regular blades, demanded a good understanding of the physical properties of the raw material and the ability to apply specific knapping techniques (Skakun 2002).

Reconstruction of methods for obtaining large flint blades, so characteristic for inventories of many early metal period sites in Eurasia, despite the large

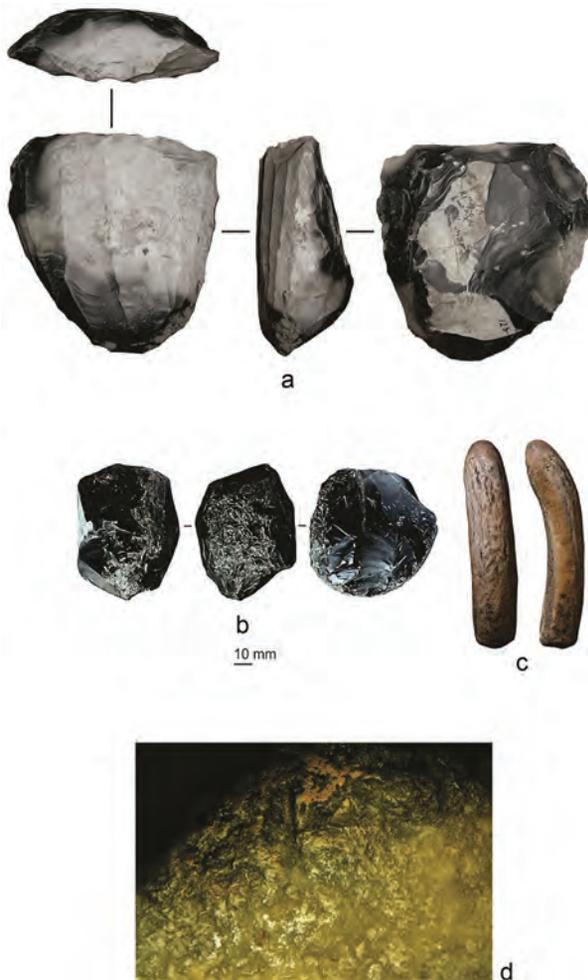


Fig. 4. Flint artifacts from the workshop at Bodaki, Ternopol dist.: a) core; b) hammerstone; c) punch; d) use-wear traces from stone retoucher ($\times 100$). Photo: V. V. Terekhina.

number of theoretical and experimental studies, needs additional research. This necessity is caused by the fact that results of separate experiments are often applied to all variants of large blades, without taking into consideration their substantial morphological differences, which indicate the application of different ways of knapping (Fig. 6). The morphological characteristics of the blades from Bodaki allow us to distinguish at least two groups among them (Fig. 7: a–e; 8: a–c). One, judging by fragments and intact items, had a very regular shape: straight profile, low thickness, triangular or trapezoidal cross section, parallel sides, small ellipsoidal, smooth or slightly worked striking platform, low bulb, with dimensions from 2.5–3 cm in width and 18–25 cm in length (Fig. 7: a–e). According to technologists (flintknappers), this type of blade was probably obtained by means of the lever: specialized strengthened pressure (Fig. 7: f; Pélegrin 1991, 2006; Giryá 1997).

These blades, in terms of morphological and technological features, are similar to those from Dobrudjan flint from the Eneolithic sites of Bulgaria and Romania (Kodjadermen-Gumelnitsa-Karanovo VI, Varna cultures), and they are also close to items made from Donetsk flint found in the funeral complexes of early Novodanilovskaya-culture nomads on the left bank of the Dnieper (Skakun 1981, 1996b, 2006, 2008).

Blades of the second group are large in size (width 2–2.8 cm, length 10–15 cm), but not so regular; they have more massive striking platforms and more protruding bulbs (Fig. 8: a–c). We carried out experimental works to identify the ways of knapping and these indicated that this type of blade (Fig. 8: a–c) could be produced with the help of an antler punch and wooden hammer, or by pressure flaker with copper or antler tip (Fig. 6: a–e).

Experiments were carried out to reconstruct the knapping technology of Volhynian flint. Large nodules of this flint were used as raw materials and these were gathered from exposures near the Bodaki settlement (Fig. 9). Experimenters (modern flintknappers) carried out the primary treatment of nodules and shaped cores with the help of round flint hammerstones and antler punches, resembling those found in the archaeological workshop (Fig. 6: d), to produce blades similar in shape to the artifacts of the second group found at the site (Skakun and Plisson 2014).

The results of the technological research indicate that various techniques of flint knapping were applied at Bodaki: almost perfect long blades of the first group were made by means of the lever (Fig. 6: a, b; 7: f), and less correct blades were made by means of pressure technique (Fig. 6: c–e).

One more feature related to flint processing at the site is an open working area, prepared in the eastern part of the settlement (Fig. 10). One part of the bank slope was intentionally leveled here by means of earth banking. Some large stones, which could support a pole construction with a light roof, were found in the area. The inventory contains more than 2000 flint objects. There are 36 cores and their fragments, 250 blades (44 of them intact, the rest represented by fragments), 1576 flakes of different sizes, including 691 items with pebble cortex and 137 tools. The rest of the artifacts are unidentifiable chips and fragments.

The artifacts/tools related to flintknapping that were found in the dwelling structures were much less numerous than in specialized workshops. For example, the study of the material from one of the dwellings has shown that the collection of 211 flint artifacts includes no waste and just two cores. At the same time

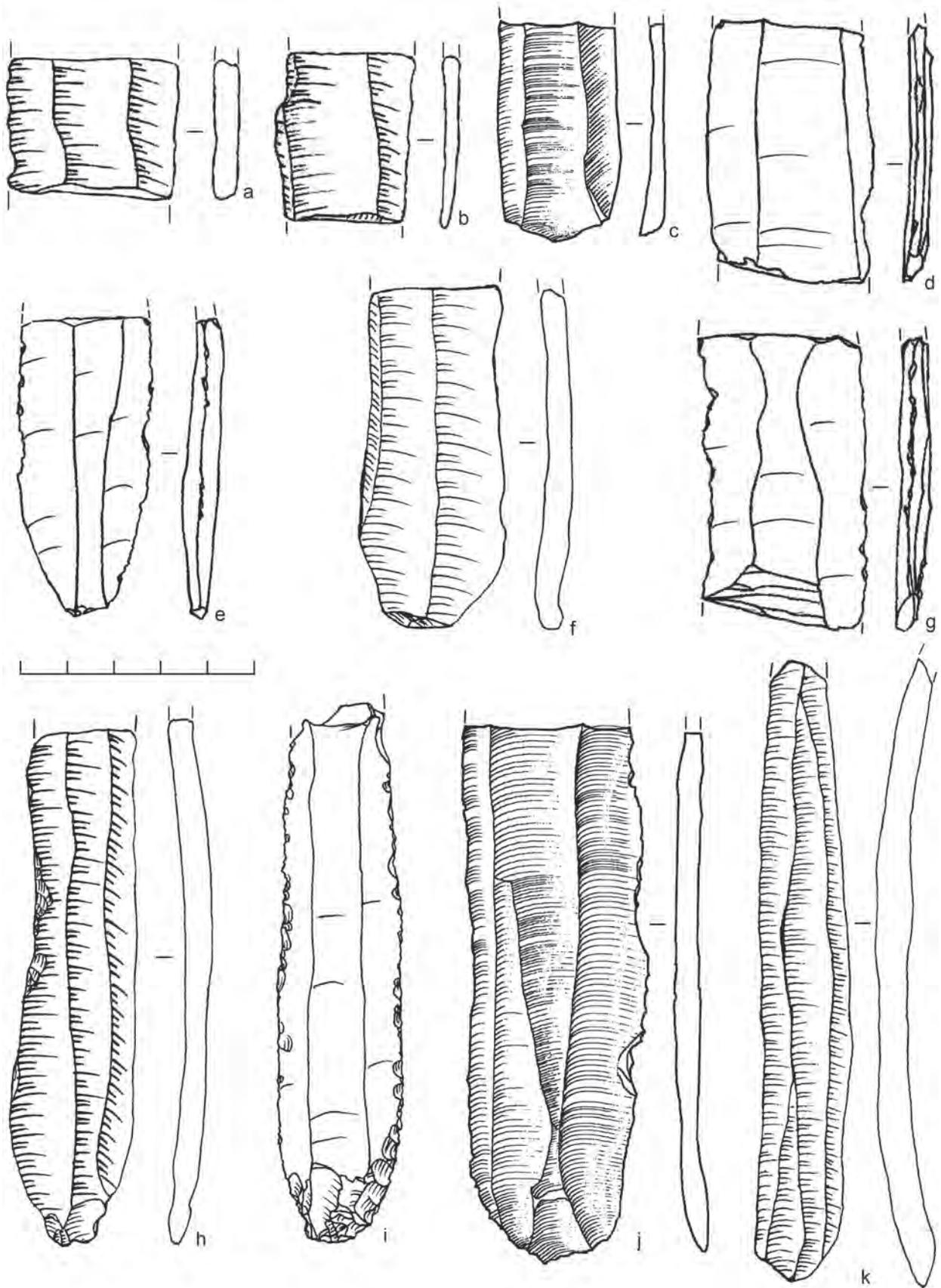


Fig. 5. Flint blanks at Bodaki, Ternopol dist. Drawn: N. N. Skakun.



Fig. 6. Experimental flint knapping: a, b) experimenters Jose Heredia (Spain) and c) Serge Maury (France); d, e) experimental flint-working tools. Photo: A. Galvez and V. V. Terekhina.

there were 63 tools, most of which, as the traceological analysis showed, had use-wear traces after performing different functions (Fig. 11). A compact accumulation of 12 blades was also registered (stored in a pouch). The other finds are flakes.

The results of archaeological investigations at Bodaki site show that the primary working of flint was carried out beyond the settlement, while core reduction and tool manufacture were mainly confined to the workshop and open working area, and less connected with the

dwelling structures. The numerous finds of cores, waste products, and tools without use/wear traces suggest that the inhabitants of Bodaki specialized in flint working, which was geared above all to the production of large blades and tools. These products were then disseminated both within the Tripolye-culture area and in the neighboring regions.

Judging by the available archaeological evidence and the rich assortment of utilized tools found in both dwellings and household constructions, the economy of Bodaki

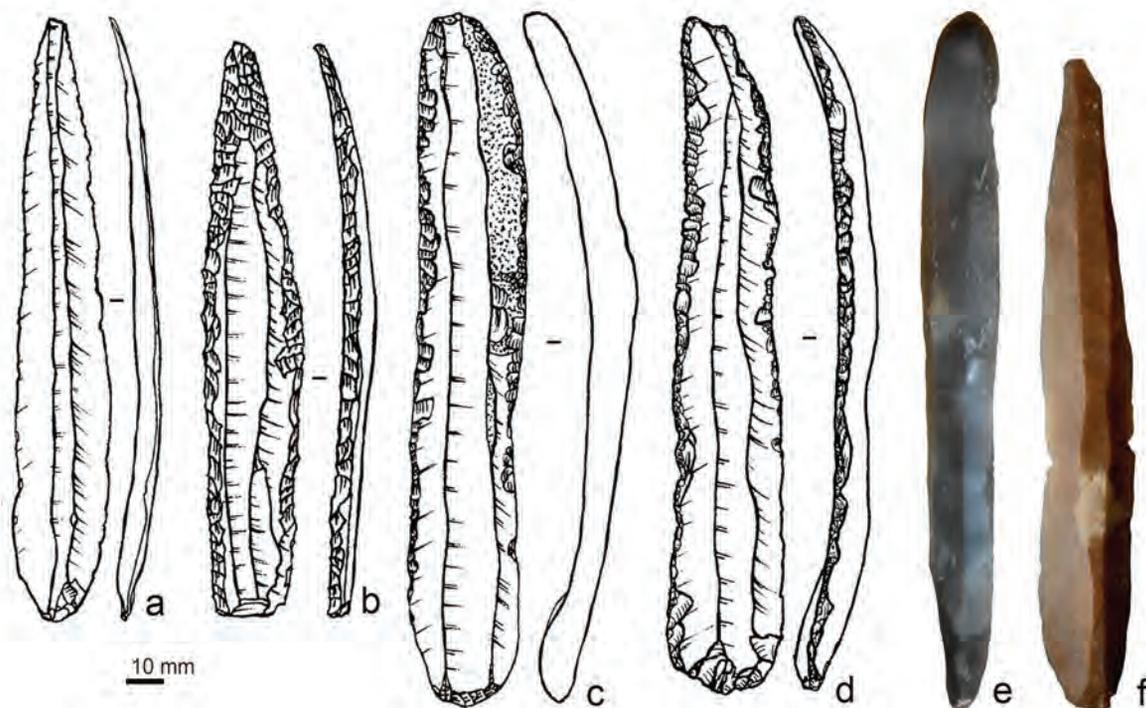


Fig. 7. Flint blades from the Bodaki settlement, Ternopol dist.: a, b, c, d, e) regular blade from the Bodaki site; f) experimental regular blade. Drawn: N. N. Skakun. Photo: V. V. Terekhina.

included specialized flint production and all other kinds of activity characteristic of the Eneolithic period. This means that the inhabitants of the settlement were able to provide themselves with all they needed. The preliminary experimental-traceological studies, based on functional analyses of the artefact assemblages collected in dwelling and household complexes of the site, showed that the majority of tools were used for activities associated with agriculture (sickle inserts of Karanovo type, mattocks for ground-processing, grain-grinding slabs) and activities which were typical for the economy of that period, i.e. treatment of wood, bone, antler and hides, weaving, preparation of mineral-based paint, and the production of pottery (Fig. 14). The pottery workshop excavated at Bodaki included a kiln and a workplace for making ceramics (Skakun and Starkova 2012).

It is interesting to note that in addition to common features in terms of the organization of flint production of Tripolye and that of the Kodjadermen-Gumelnitsa-Karanovo VI culture (specialized centers of large blade and tool production existed near to some of the Dobrudja flint outcrops), there are also certain differences that may be seen in the character of product realization. Artifacts made of Volhynian flint have been found in many Tripolian settlements and on the sites of neighboring cultures as well, but they are not numerous. Their representation within the inventories



Fig. 8. Flint blades from the Bodaki settlement: a, b, c) irregular blades from the Bodaki site. Photo: V. V. Terekhina.



Fig. 9. Volhynian flint outcrops along the bank of the Horyn' River, west of the Bodaki settlement, Ternopol dist.
Photo: V. V. Terekhina.

is less numerous than tools made of local sorts of flint. Quite the contrary, the tool assemblages of most Bulgarian sites are dominated by artifacts imported from workshops located in Dobrudja, while tools made of local flint are few in number. At some sites of the Varna culture in the Black Sea region, Dobrudja flint artifacts make up c. 90% of the inventory (Skakun 1984, 2005).

Excavations at Bodaki, apart from the discovery of workshops and dwelling complex, brought to light some interesting data concerning cults of the Eneolithic epoch. On the floor of one workshop an ochre spot was enclosed by a low clay wall, in the corners of which some heavily used hammered cores were found. On a working platform a small, burned clay site was cleared. Close to it were found blanks of flint tools painted with ochre. In one of the dwellings/households, on a floor, the interesting discovery was made of a compound model of a bull's head: a large stone, the contours of which resembled a bull's head, with curved pieces of boars' tusks imitating horns; two large, unused end-scrapers were placed between the horns. The entire 'model' was plentifully covered with ochre (Fig. 13). These observations allow us to review the existence of the rituals probably associated with flint processing, which may confirm opinions on various aspects of the mythology and beliefs of Tripolian tribes.



Fig. 10. Open flint-working area at Bodaki, Ternopol dist. Photo: V. V. Terekhina.
Photo: V.V. Terekhina and L. M. Yakovleva.

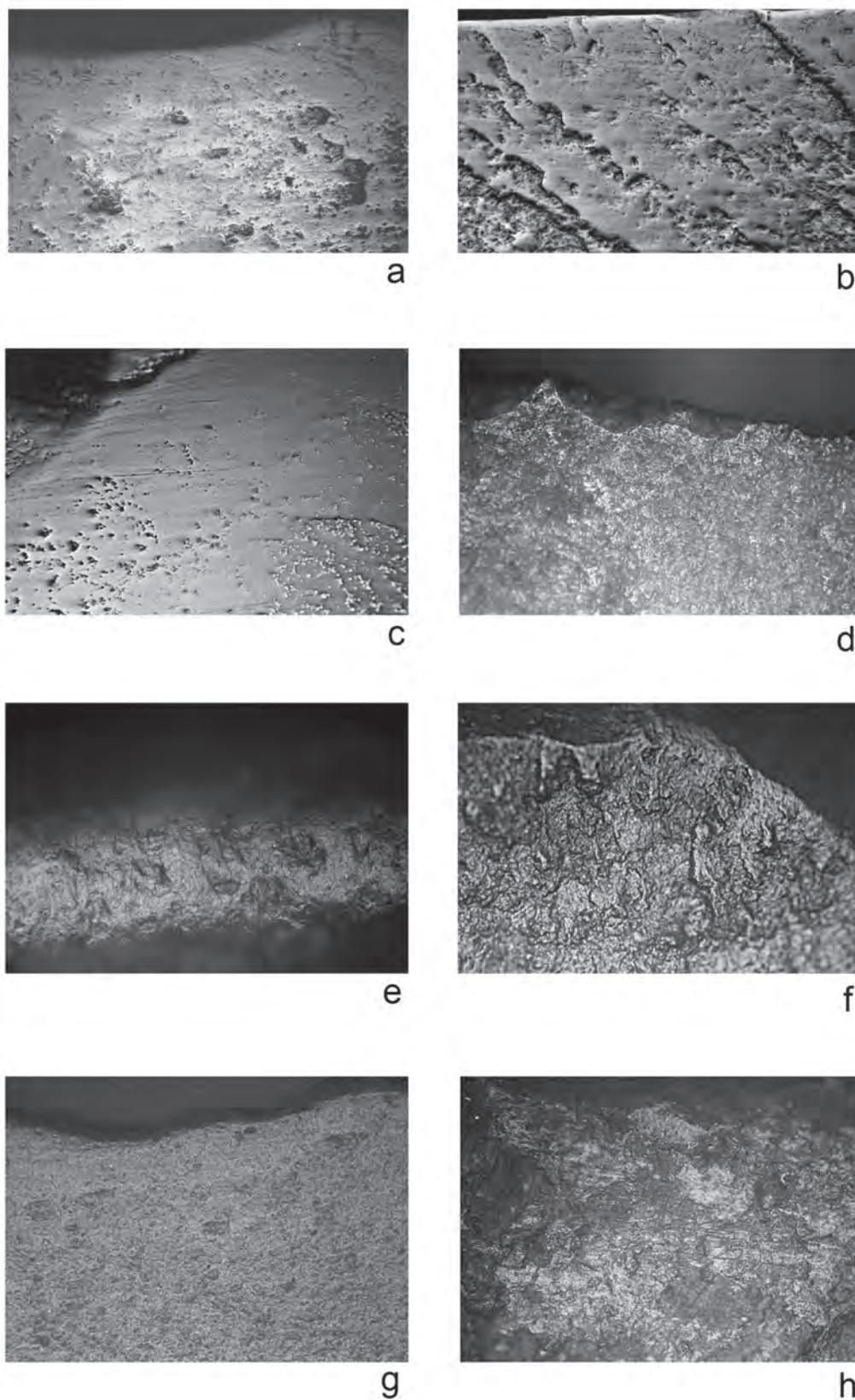


Fig. 11. Microphoto of use-wear traces from various tools at Bodaki, Ternopol dist.: a) insert of sickle ($\times 200$); b) knife for reed ($\times 200$); c) knife for grass ($\times 200$); d) knife for meat; e) scraper for skin ($\times 200$); f) scraper for wood; g) saw for wood ($\times 200$); h) saw for antler ($\times 200$). Photo: V. V. Terekhina.



Fig. 12. Volhynian flint nodules. Photo: V. V. Terekhina. Photo: V.V. Terekhina and B. Mateva.

Thus, the appearance of specialized centers of flint working with a high technological level of stone-knapping, and the presence of workshops with skilled workers and the wide distribution of their products, enable us to think that, at the developed stage of the Tripolian culture, their flint industry stretched beyond mere household craft and became one of the brightest examples indicating the emergence of early forms of communal craftsmanship.

The recent archaeological literature contains many examples of objects made of Volhynian flint and found on territories of other contemporaneous cultures in Ukraine, Poland, Hungary, Romania, and Moldova. Analyses of the typology and functions of these artifacts, as well as searches for their production sites and routes of distribution, will comprise the next stage of studies on Eneolithic flint working.

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Fig. 13. Compound model of 'bull's head'. Photo: V.V. Terekhina and L. M. Yakovleva.

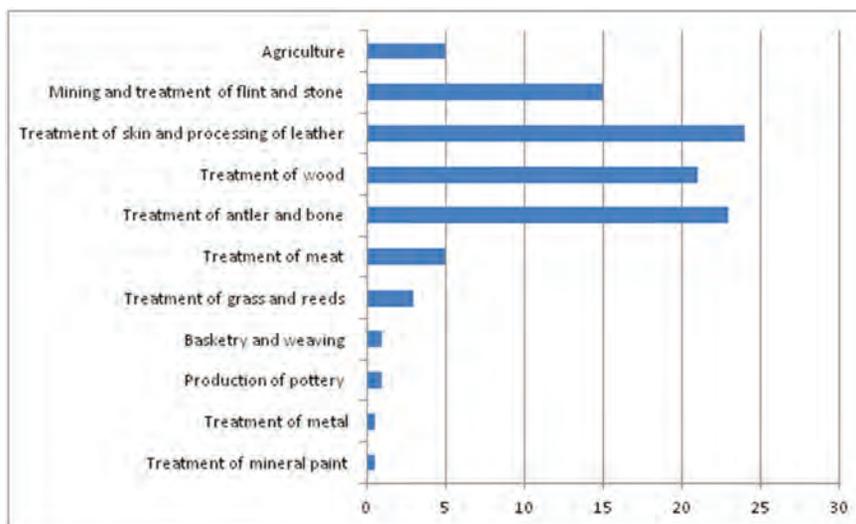


Fig. 14. Production activities in the economy of the Bodaki settlement, Ternopol dist.

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