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Bronze Age and Early Iron Age sickles in the evolution of the prehistoric agricultural toolkit from Bulgaria

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ABSTRACT

Use-wear studies have identified a long-lasting system of agricultural practices (harvesting) from the very beginning of the Early Neolithic in Bulgaria. For almost two millennia during the Neolithic and Chalcolithic (6th and 5th millennia BC), the archaeological evidence suggests the use of sickle elements based on blade segments and tools on blades inserted obliquely in a curved handle – the well-known Karanovo type of sickle.

Post-Chalcolithic times are marked by a shift in the harvesting toolkit. This paper focuses on agricultural toolkits from three recently discovered and excavated sites in north Bulgaria: Oreshets near Belogradchik, Rasovo near Montana, and Chavdartsi in Lovech district. The sites are multilayered, the flint assemblages presented here belong to the LBA (Oreshets and Chavdartsi) and LBA/EIA (Rasovo). No structures or features directly associated with the flint artefacts were identified, but the assemblages exhibit most (if not all) of the characteristics of the BA and post-BA agricultural repertoire. This repertoire includes varieties of denticulates (mainly blades) which from the beginning of the BA became diagnostic finds and marked a momentous shift from the preceding style of sickle. During the BA sickle inserts and blades were increasingly shaped through truncation and backing, both of which aided the accommodation of the implements in grooved handles and handheld tool manipulation. As an innovation, the emergence of which is difficult to fix chronologically within the BA, large, curved blades (ca 15 cm) appear in the agricultural toolkit during the LBA, with reminiscent use in the EIA as well.

KEYWORDS

Cereal polish, agricultural toolkit (sickles), flint assemblages, denticulates, truncated and backed tools, Prehistory, Bronze Age, Early Iron Age

Introduction

Prehistoric agriculture and related flint toolkits represent a crucial topic in prehistoric studies. For decades, the subsistence economy of pre- and protohistoric populations has been the focus of multidisciplinary research which progressively increases on empirical and theoretical levels. Here, we could cite such internationally regarded books as ‘Prehistory of agriculture: new experimental and ethnographic approaches’ (Anderson 1999) and three volumes of the series ‘Early agricultural

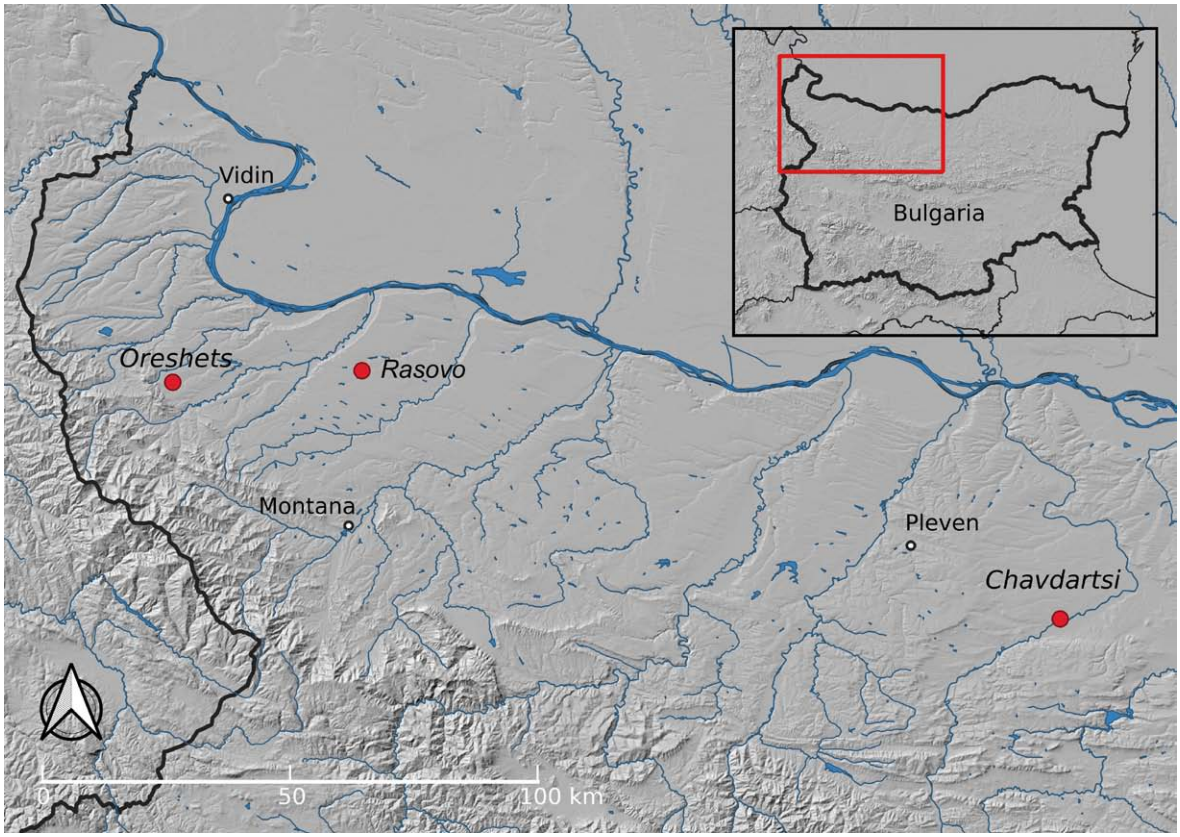

Fig. 1. Map of Bulgaria with the location of the sites mentioned in the paper (by G. Ivanov)
Обр. 1. Карта на България с местоположението на споменатите в текста обекти (автор Г. Иванов)

remnants and technical heritage (EARTH): 8,000 years of resilience and innovation' (ed. by P.C. Anderson and L. Peña-Chocarro), which contain: 'Exploring and explaining diversity in agricultural technology' (Van Gijn et al. 2014); 'Plants and people. Choices and diversity through time' (Chevalier et al. 2015) and 'Agricultural and pastoral landscapes in pre-Industrial societies. Choices, stability and change.' (Retamero et al. 2016). The volumes represent a crucial contribution to the study of pre-industrial agriculture via an enormous corpus of information based on archaeological, historical, ethnographical and experimental sources and datasets. The second volume is particularly focused on the technological aspects of prehistoric agriculture: Exploring and explaining diversity in agricultural technology (Van Gijn et al. 2014).

The first author (MG) has dedicated a significant part of her long-lasting research on Holocene flint assemblages to investigate the development of prehistoric agriculture in Bulgaria, identifying and distinguishing between the harvesting and threshing tools among the studied flint assemblages (Gurova 2005; 2008c; 2013; 2014c). The agricultural toolkits have been subjected to morpho-metrical, technological and typological analyses and additionally to traceological (use-wear) analysis, thus demonstrating their functional coherence on the micro level of utilisation (Gurova 2001a, 2006, 2014a). Recently, with the advance of reliable studies on prehistoric flint raw materials and their network distribution, raw material characterisation and provenancing were incorporated as a proxy to the general study of toolkits (Gurova 2012; Gurova, Ivanov, in press). Last but not least – a diachronic perspective on the agricultural toolkits (from the Neolithic to the Bronze Age) has been emphasized, thus showing the evolutionary parameters and trends in the development of this peculiar set of tools (Gurova 2014b, 2018).

This paper focuses on the protohistoric sickles from Bulgaria, seen in a brief local retrospective and transregional comparative perspective. The focus on BA and post-BA evidence has been stimulated by the fact that recent large-scale infrastructure projects and rescue excavations in Bulgaria have allowed the discovery of big sites, usually agglomerations with long cultural sequences. These sites have yielded rich evidence of various finds, including flint assemblages. Particularly interesting are the agricultural toolkits from three recently excavated sites in northern Bulgaria, which will be presented here – Oreshets, Rasovo and Chavdartsi (figs 1–2).

It is well documented that sickles are one of the most reliable and resilient components of the subsistence economy of the past. Their preliminary identification is possible visually, but their detailed analysis requires meticulous microscopic observation for adequate micro-wear trace consideration.

It is useful to provide here a general chronological framework of the above-mentioned periods from late prehistory and protohistory to place in an adequate temporal context the following data and reasoning. The cultural periodization of the prehistoric periods can be presented in terms of absolute chronology (conventional ^{14}C dating) as follows:

– Neolithic (4 phases): 6300/6200 – 4900/4850 cal BC;

– Chalcolithic (3 phases): 4900/4850 – 4100/3800 cal BC;

– Transitional period: 3850/3750 – 3200/3150 cal BC;

– Bronze Age (3 phases): 3200/3150 – 1100/1000 cal BC (Boyadziev 1995, 179).

There are some debatable features (going beyond the focus of the paper) of this conventional scheme, but it presents the most general relation of the periods concerned: Neolithic – VI mill. cal BC; Chalcolithic – V mill. cal BC; Bronze Age – IV–II mill. cal BC.

Neolithic and Chalcolithic harvesting equipment

From the very beginning of the Neolithic an evolved ‘Neolithic package’ emerged in Bulgaria, containing fully developed Neolithic cultigens with clear connections to Near Eastern crop assemblages. Bulgarian palaeobotanical evidence displays great crop diversity compared to other regions of the Balkans (College, Connoly 2007; Marinova 2007; Popova 2010; Marinova, Valamoti 2014). As for Neolithic sickle inserts – their frequency and utilisation stigmata strongly support the evidence of well-developed and intensive agricultural practices, in particular cereal harvesting. There is no morphometric standardization of the sickle inserts/elements. They consist of virgin and variably retouched blades (rarely flakes) 2–5 cm in length and 1–3 cm in width. Almost all pieces have an angular shiny cereal polish (from slightly oblique to diagonal) indicative of the oblique insertion of the flint elements into a curved antler handle – the most characteristic feature of the Karanovo type of sickle, which is widely known as one of the most efficient prehistoric agricultural tools, tracing its origin from the Fertile Crescent with very close parallels at Neolithic Hacilar (in the Lake District of Anatolia) and similar sickle inserts in the Marmara region (Gurova 2008b; 2008c; 2018) (fig. 3). Among the sickle inserts, a particular category is represented by those made from the so-called ‘Balkan flint’ and belonging to the formal toolkit of the Early Neolithic cultures (Karanovo I and II in Bulgaria) and beyond in the frame of the supra-regional Karanovo I–Starčevo–Criş–Körös complex (Gurova 2008a; 2012; Gurova et al. 2016). The Balkan flint sickle inserts represent a prominent part of the formal toolkits made of Balkan flint, which became a diagnostic feature of the Early Neolithic culture. They usually exhibit durable use (obviously preferential) and shiny angular polishes, which were resharpened (sometimes continuously) until the working edges became abruptly retouched (fig. 3.3, 4). The curved handles of the Karanovo type of sickles are known from some Early Neolithic sites (especially those belonging to the Karanovo I–II cultural milieu) (Gurova 2012; 2016).

Fig. 2. Aerial photographs of the rescue excavation of the sites: 1. Oreshets; 2. Rasovo; 3. Chavdartsi (photos G. Ivanov, I. Cholakov)
Обр. 2. Аерофотографии на спасителните разкопки на обектите: 1. Орешец; 2; Расово. 3. Чавдарци (снимки Г. Иванов и И. Чолаков)

The Chalcolithic period marks significant changes in raw material supply and technological characteristics of the flint industry. The very high-quality Ludogorie flints reached a peak in supply and network distribution, which correspondingly played a predetermining role in technological choices in knapping techniques. Big, regular blades became the most common products of the domestic and specialized knapping know-how (Manolakakis 2002; 2011; Andreeva et al. 2014). Numerous sickle inserts are reported from the sites in northeast Bulgaria – the core zone of flint knapping achievement studied by the Russian specialist, N. Skakun and the French scholar L. Manolakakis (Skakun 1993; 1999; 2006; Manolakakis 2005).

Agricultural growth and development continued during the Chalcolithic period when, in general, the same Karanovo type of composite sickle was used. They were probably made mainly with wooden hafts because antler handles have survived from that period. The general observations on sickle inserts by the first author (MG), based on the numerous studied Chalcolithic assemblages, can be summarized as follows: they became more standardized in morphometric parameters, they were normally made on fragmented regular blades (with or without retouch) as well as on other tool types. Endscrapers on regular blades and retouched and truncated blades become dominant in the tool repertoire (fig. 4). There is a balanced ratio of unretouched blades and typological tools used as sickle inserts. It is worth mentioning that often unretouched blades used as sickles were re-used for lateral scraping of hide. This reutilisation created a distinct and diagnostic eroded and opaque aspect of the cereal polish (Gurova 2011, 281, fig. 4b; 2018, 198).

Bronze Age innovation in the agricultural toolkit

The study by one of the authors (MG) of BA flint assemblages comprises techno-typological and use-wear analyses of inventories from Bulgaria, southwest and west Anatolia and the southern Levant. More details of the sites and their trans-regional comparison can be found in three publications (Gurova 2018, 198–202; 2020a, b). As an unavoidable synopsis, the following points should be listed. The BA harvesting equipment is significantly different compared with the preceding periods. By itself, it is variable in its typological repertoire, morphometric parameters and overall style, including hafting. Traditional sickle inserts were first partially and later seemingly entirely replaced by a new and distinctive category of the flint tool repertoire – denticulates (mainly blades) with parallel cereal polish on the working edge. Denticulated implements appear sporadically in some assemblages belonging to the late Chalcolithic and later during the Transitional period (see for ex. Sirakov, Tsonev 1995). During the Bronze Age, they became a characteristic feature of the flint industry and could be regarded as ‘diagnostic tools’ of this period. The BA harvesting toolkit changes diachronically displaying traits/trends of i) retardation – the continuous sporadic use of ordinary and retouched blades as sickle inserts in the traditional sense as seen in the assemblages of Michalich and Tell Yunatsite (Gurova 2001b, 2014d); and ii) innovation represented by the frequent use of denticulates, combined with various additional fashioning for accommodation. The denticulates are made mostly on blades and comprise various (uni- and bilateral, uni- and bifacial, from fine to deep) retouch. In some cases, the edges opposite to the denticulations are backed. Truncations on transverse parts are sometimes present. The lateral backing and transverse truncations could be interpreted as facilitating features for parallel hafting or handholding. It is noteworthy that Bronze Age denticulates were recognized as efficient sickles by the founder of use-wear analysis (traceology), S. A. Semenov, and published in his major work Prehistoric Technology (Semenov 1957, 148–9). Unfortunately, there are still lithic specialists who simplistically interpret denticulates as wood saws based purely on visual impressions of the retouched edges of the artefacts.

The process is known and recognized as a shift in sickle style and mode of use. However,

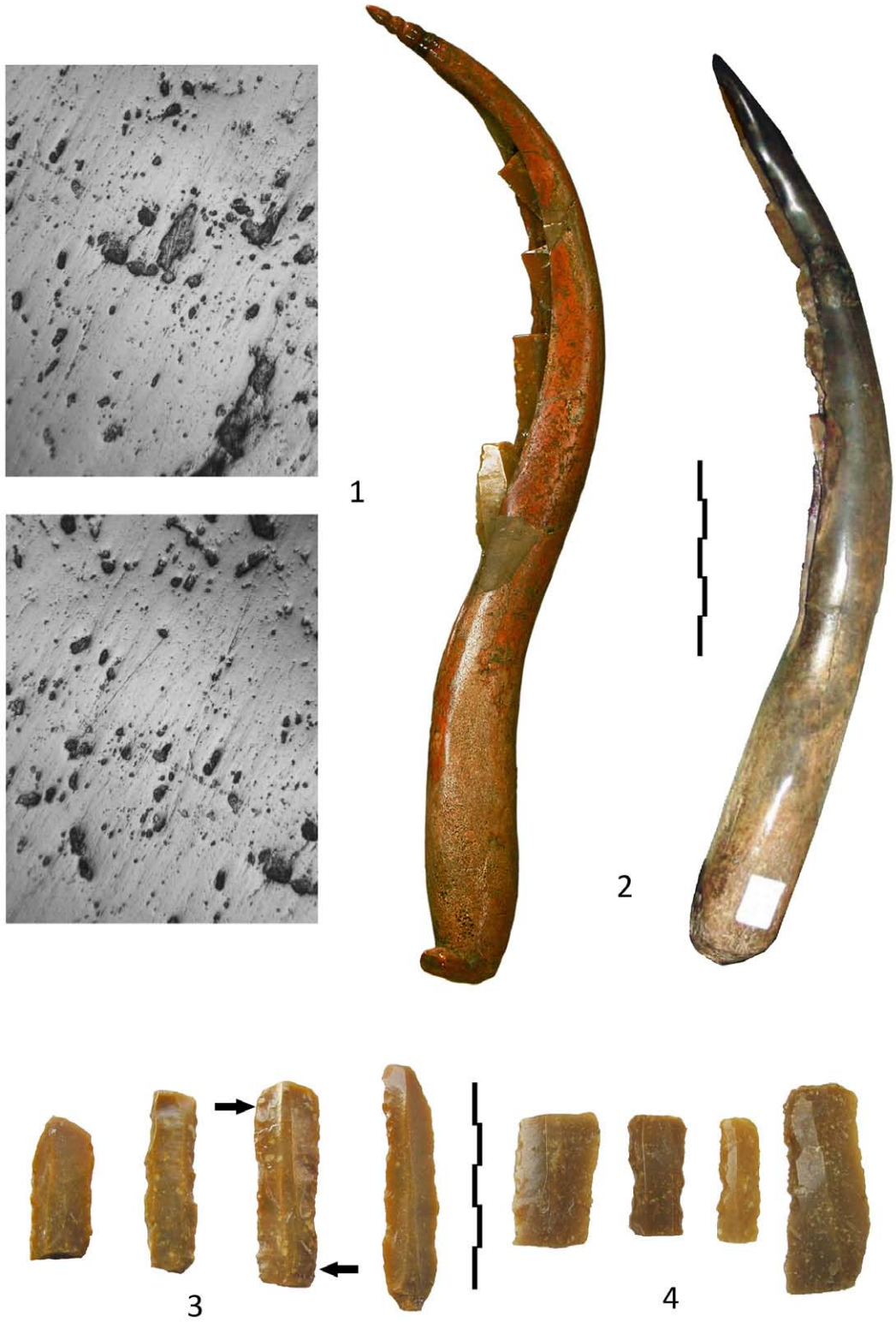

Fig. 3. Early Neolithic sickles: 1. Microphotographs (x100) of typical cereal polish – artefact from Kovachevo; 2. Sickles from Tell Karanovo; 3. Sickle inserts from Kovachevo; 4. Sickle inserts from Yabalkovo (after Gurova 2018, fig. 11.3)

Обр. 3. Раннонеолитни сърпове: 1. Микрофотографии (x100) на типично излъскване от жътва – артефакт от Ковачево; 2. Сърпове от с. мог. Карановo; 3. Елементи от сърп от Ковачево; 4. Елементи от сърп от Ябълково (по Gurova 2018, fig. 11.3)

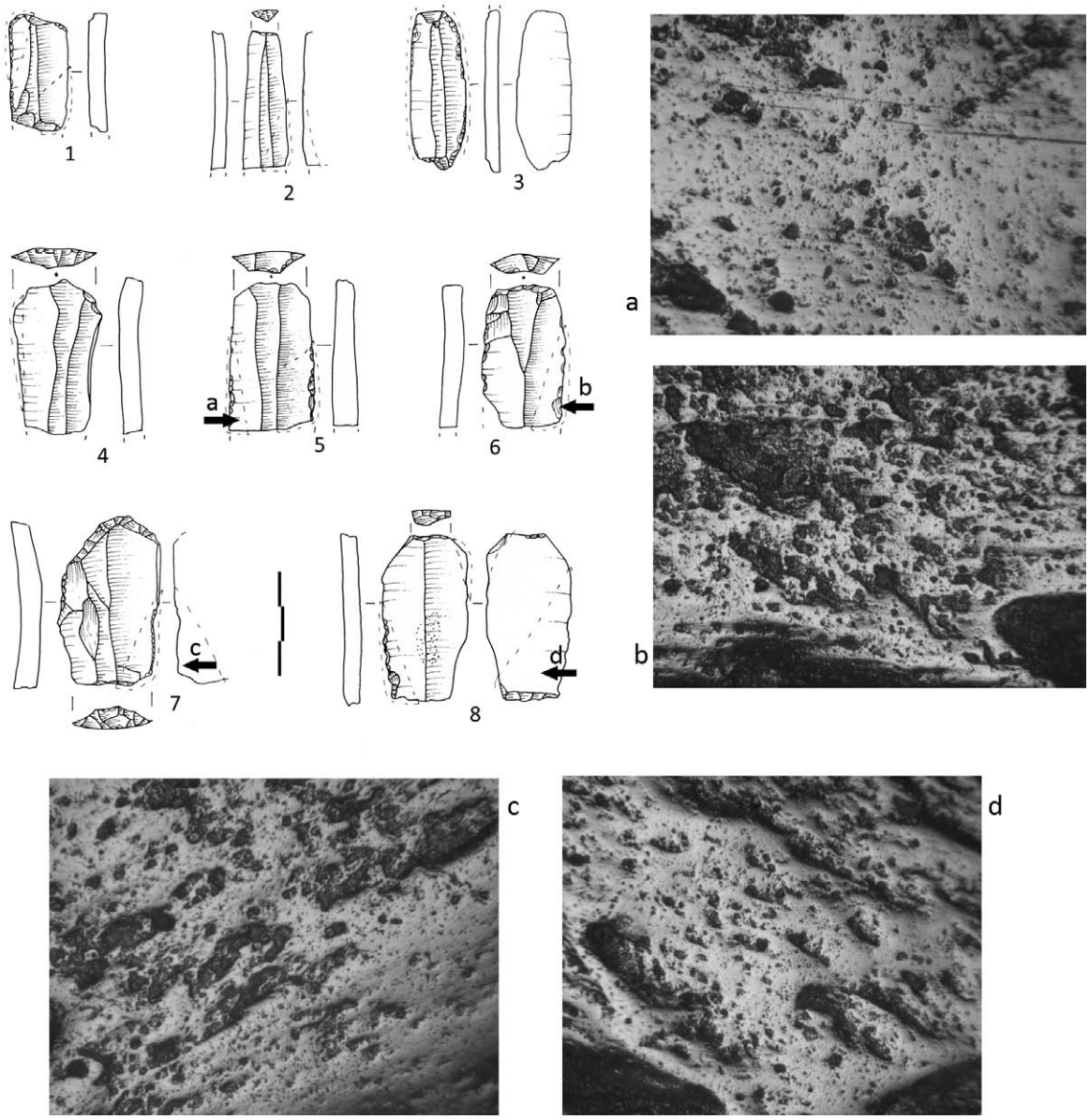

Fig. 4. Flint artefacts from the Chalcolithic site of Karnobat with sickle inserts (5–8) and microphotographs (x100) of cereal polish on the marked points of the artefacts (after Gurova 2018, fig. 11.5)
Обр. 4. Кремъчни артефакти от халколитното селище при Карнобат с елементи от сърп (5–8) и микрофотографии (x100) на излъскването на посочените върху артефактите места (по Gurova 2018, fig. 11.5)

in terms of the micro-wear patterns, the same characteristics of sickle/cereal polish are observed – smooth and bright with many, differently-shaped pits and depressions, and very often with pronounced linear striations (fig. 5). The polish starts at the teeth of the denticulation and invades the rest of the microtopography of the working edge.

The most heterogeneous are the sickle inserts of the EBA. Apart from the retardation and innovation mentioned above, i.e. traditional use of blades with angular polishes (Gurova 2001b, 201, fig. 1) *vs* the use of massive denticulates with parallel polish (fig. 5.1), there is a peculiar cultural facies identified among EBA pit inventories from the site of Yazdach (Hristov et al. in press). It is

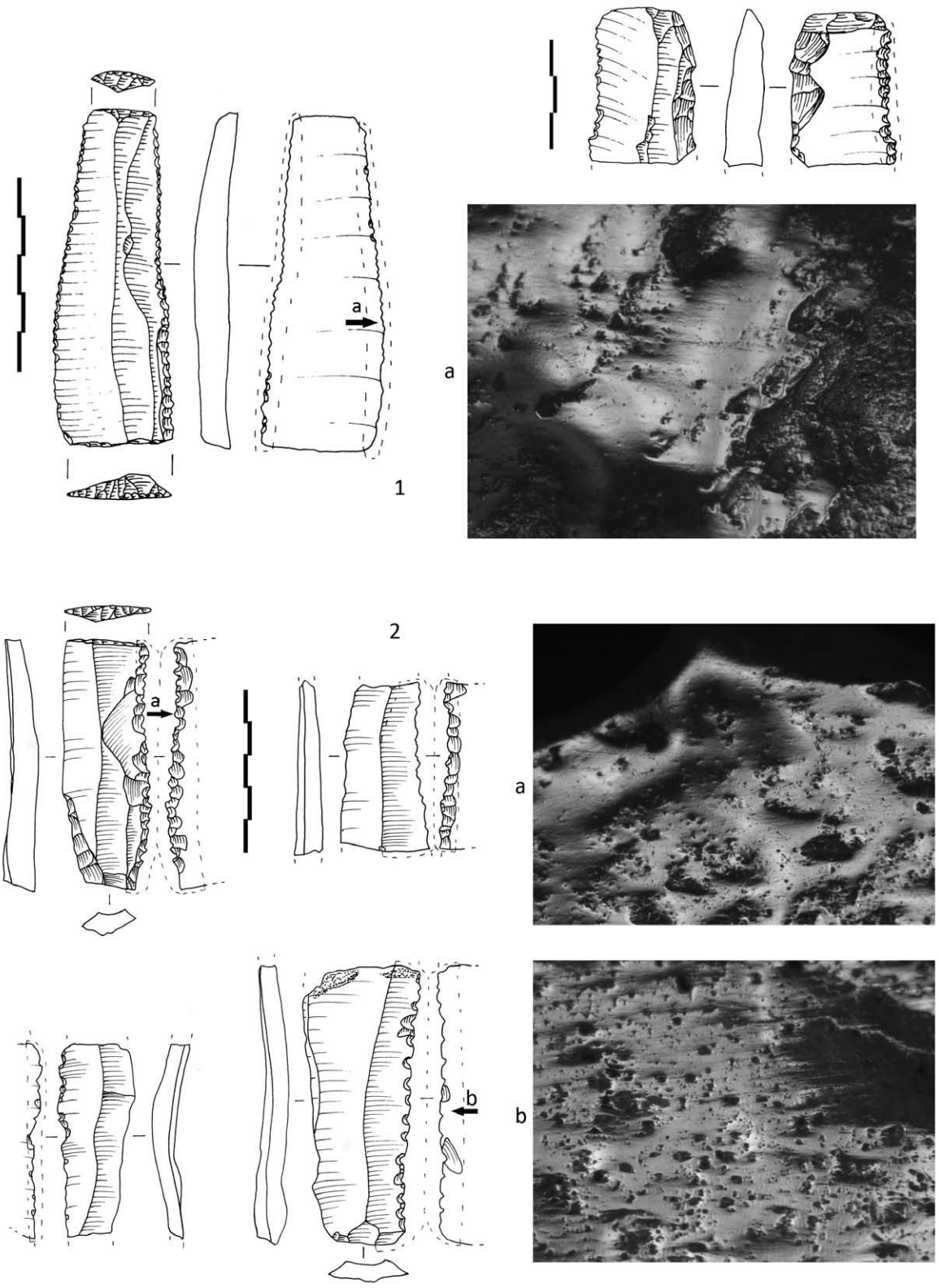

Fig. 5. Flint artefacts (sickles) from: 1. EBA site of Lepitsa; 2. LBA site of Aul Kaya; microphotographs (x100) of cereal polish on the marked points of the artefacts (after Gurova 2018, fig. 11.8)

Обр. 5. Кремъчни оръдия за жътва от: 1. Ранннобронзовото селище Лепица; 2. Къснобронзовото селище Аул Кая; микрофотографии (x100) на излъскването на посочените върху артефактите места (по Gurova 2018, fig. 11.8)

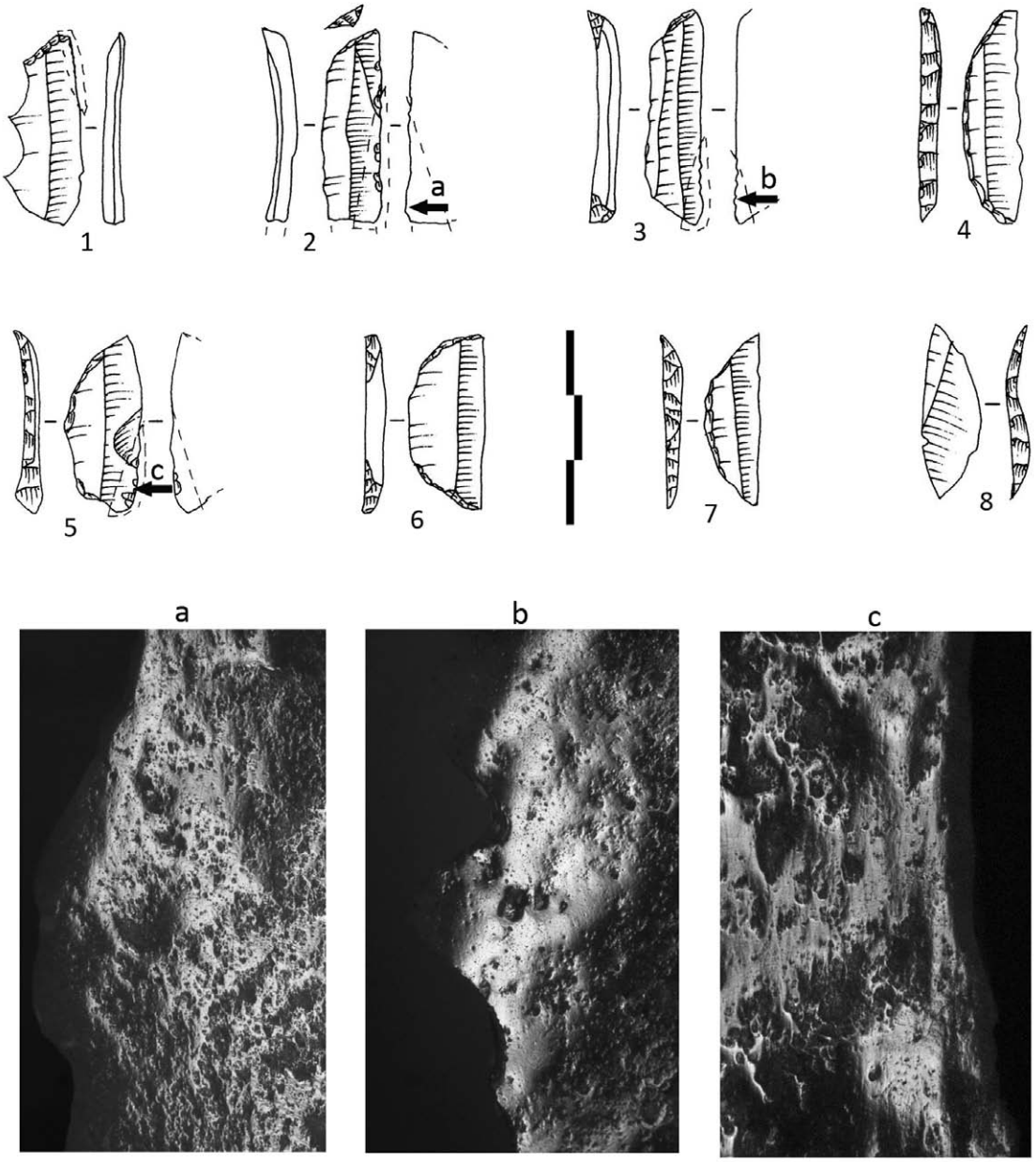

Fig. 6. Flint artefacts (1–8) from the EBA site of Yazdach (near Chirpan in south Bulgaria) and microphotographs (a–c) (x100) of cereal polish on the marked points of the artefacts (sickle inserts) (drawings and photos M. Gurova)

Обр. 6. Кремъчни артефакти (1–8) от ранннобронзовия обект Яздач (община Чирпан) и микрофотографии (a–c) (x100) на излъскването на посочените върху артефактите (елементи от сърп) места (рисунки и снимки М. Гюрова)

worth mentioning a small but considerable series of geometric segments, some of which were used as sickle inserts (fig. 6). No parallels have been found among Bulgarian assemblages. On the other hand, there is a direct correlation with the series of segments/lunates used as sickle inserts from the EBA in the southern Levant – Uvda Valley (Gurova 2013, 191–192, fig. 12) (fig. 7). It is noteworthy that in the Levantine assemblages, there is a coexistence of large (Canaanean type) sickle blades with small blades and lunates used as inserts in curved hafts. Unavoidably, the question arises of the eventual pathways and spread of this technological feature and its know-how, but the scarcity of

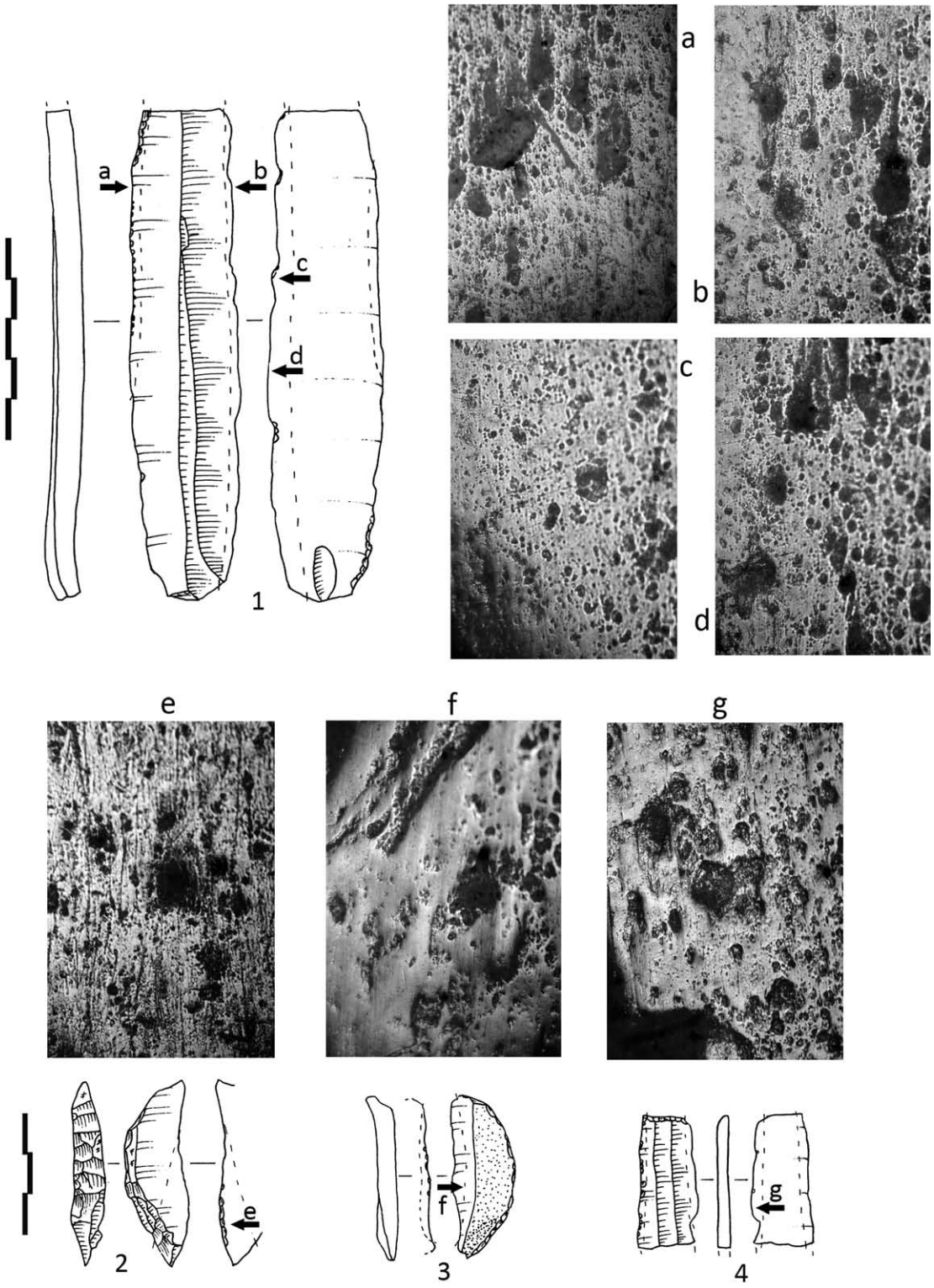

Fig. 7. Flint artefacts from Uvda Valley (Israel) with cereal polish: 1. Canaanean blade; 2–3. Segments; 4. Truncation. Microphotographs (a–g) (x100) of cereal polish on the marked points of the artefacts (adapted from Gurova 2013, fig. 12)

Обр. 7. Кремъчни артефакти от Uvda Valley (Израел) с излъскване от зърнени култури: 1. Пластина тип ханаанска; 2–3. Сегменти; 4. Пластина с напречно затъпяване. Микрофотографии (a–g) (x100) на излъскването на посочените върху артефактите места (адаптиран вариант по Gurova 2013, fig. 12)

these artefacts and the huge lacuna in knowledge of the EBA flint toolkits of the intervening territories hinder the resolution of this problem. An alternative 'monocentric' explanatory proxy could be a revival of Late Neolithic technology of geometric microliths (some of which were also used as sickle inserts – cf. Gurova 2017, 176), but there are no real arguments for such technological retardation/revitalization.

Unfortunately, there are no strictly defined MBA flint assemblages that have been studied from a functional point of view indicating sickle use. On the other hand, there is significant evidence of LBA sickles, showing variability in dimensions, typology and mode of use (Gurova 2020b,) (fig. 5.2).

LBA and post-BA sickle variability

For the LBA, a full repertoire of sickle inserts and blades is revealed. Apart from the intensive use of various denticulates (as seen in Gurova 2020b, 30, fig. 2), the LBA and post-BA show increasing techno-stylistic variability with a higher proportion of the backed edges opposite to denticulated edges with/or without truncations. These features are clearly illustrated among the assemblages from northern Bulgaria – Oreshets near Belogradchik, Rasovo near Montana, and Chavdartsi in Lovech district (fig. 1). The sites are published as preliminary reports (Ivanov et al. 2020; 2022; Cholakov et al. in press). There is a preliminary publication on the inventories from Oreshets and Rasovo (Gurova, Ivanov, in press) while the flint assemblage from Chavdartsi is newly studied and is presented here for the first time. The flint assemblages from these sites exhibit most (if not all) of the characteristics and peculiar features of the BA and post-BA agricultural repertoire. Some general observations related to all three case studies can be formulated as follows:

– It should be noted that all three sites were excavated in the context of large-area rescue archaeological investigations (fig. 2). All the sites reveal multilayer stratigraphies:

- Oreshets – MBA and LBA (19th–17th and 15th–12th c. BC) (Ivanov et al. 2022);
- Rasovo – LBA/EIA (14th–10th c. BC), Early Roman (1st c. AD) and Revival period (18th–19th c.) (Ivanov et al. 2020);
- Chavdartsi – Chalcolithic, BA, EIA, LIA, Late Roman (4th c. AD) and the Early Medieval periods (Cholakov et al. in press).

– The excavated features are mostly negative ones, defined as pits, pit-houses or burial pits.

– Most of the flint artefacts cannot be associated with any identified structure. Artefacts attributed to archaeological features rely mainly on their proximity to identifiable pottery sherds or other diagnostic finds.

– From the raw material perspective, the flint assemblages are very interesting. The most heterogeneous is the assemblage from Oreshets, part of which is made on a local flint variety – grey with sporadic white inclusions (Gurova, Ivanov, in press, fig. 2). The second group of raw materials consists of yellowish-beige (with nuances) white-spotted flint, known in the specialised literature as Balkan flint with securely identified outcrops in the (chalky) limestones of the Upper Cretaceous Mezdra siliceous-carbonate Formation in the Pleven–Nikopol region based on meticulously analysed samples (Gurova et al. 2016; 2022) (fig. 8.2). According to GIS-based modelling applied to the raw material outcrops and archaeological settlements in northwest Bulgaria, the Oreshets inhabitants had close access to raw materials (where nowadays the Oreshets 1 and 2 quarries are located) and profited from high-quality Balkan flint variations with outcrops located between 150 and 200 km away (Gurova et al. 2021, 255–256, figs 18–19). The assemblage from Rasovo is homogeneous in terms of raw material (yellowish-beige with rare white inclusions) (fig. 8.1). A sample of the artefacts was subjected to a combined micro-petrographic and trace-element (LA–ICP–MS) analysis. The results

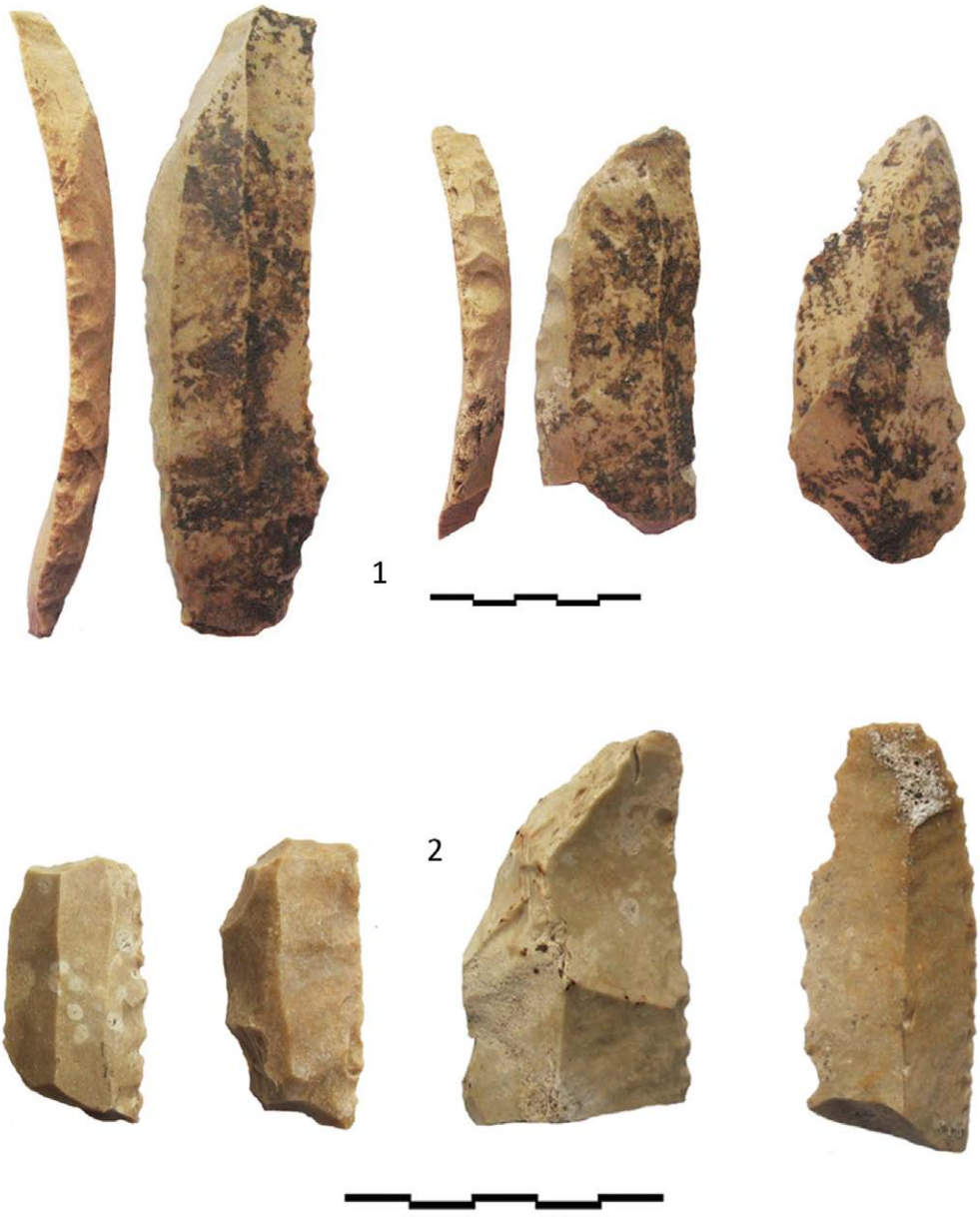

Fig. 8. Macroscopic appearance of artefacts from: 1. Rasovo; 2. Oreshets (photos M. Gurova)
Обр. 8. Макроскопки аспект на артефакти от: 1. Расово; 2. Орешец (снимки М. Гюрова)

suggest that the artefacts from Rasovo (deductively – most of the artefacts in the assemblage) show petrographic and geochemical similarities with the same Balkan flint (raw material and artefacts) from previously studied outcrops near the town of Nikopol, belonging to the Mezdra siliceous-carbonate Formation (Gurova et al. 2021, 249ff, figs 5.3; 15). The GIS-estimated distance between the site and the flint outcrops of the Nikopol cluster is 145 km, i.e. the raw material distribution could be defined as supra-regional/long-distance – over 100 km (Gurova et al. 2021, 256). The flint assemblage from Chavdartsi is homogenous macroscopically and shows strong similarity with the same varieties of Balkan flint, represented in both the Oreshets and Rasovo assemblages (fig. 9). The site is noticeably closer to the clusters of Balkan flint outcrops than the other two sites and the acquisition of the preferred flint (from the Mezdra Formation) is quite feasible. Combined micro-petrographic and geochemical analyses will be fulfilled to confirm the hypothesis of the same/or similar provenance

Fig. 9. Macroscopic appearance of artefacts from Chavdartsi (photos M. Gurova)
Обр. 9. Макроскопки аспект на артефакти от Чавдарци (снимки М. Гюрова)

sources, i.e. the same zone of supply for all three sites. There were well-established and functioning distribution networks of Mezdra Formation flint nodules and artefacts during the (MBA?), LBA and EIA in northern Bulgaria. This is notable because it suggests a revival and intensive supply, distribution and use of the Balkan flint, after its decline during the Late Neolithic and Chalcolithic.

– The flint assemblages comprise respectively: 246 artefacts from Oreshets, 22 from Rasovo and 127 from Chavdartsi. A brief overview of the agricultural toolkits from each site will be presented below.

The series of 16 artefacts from the Oreshets assemblages is very representative in completing the repertoire of the protohistoric agricultural toolkit. There are 3 tools with cereal polish made of local grey flint with small dimensions and bifacial treatment and another 13 tools that fit macroscopically with the Balkan flint type and consist of: i) a blade with marginal bilateral retouch and unilateral

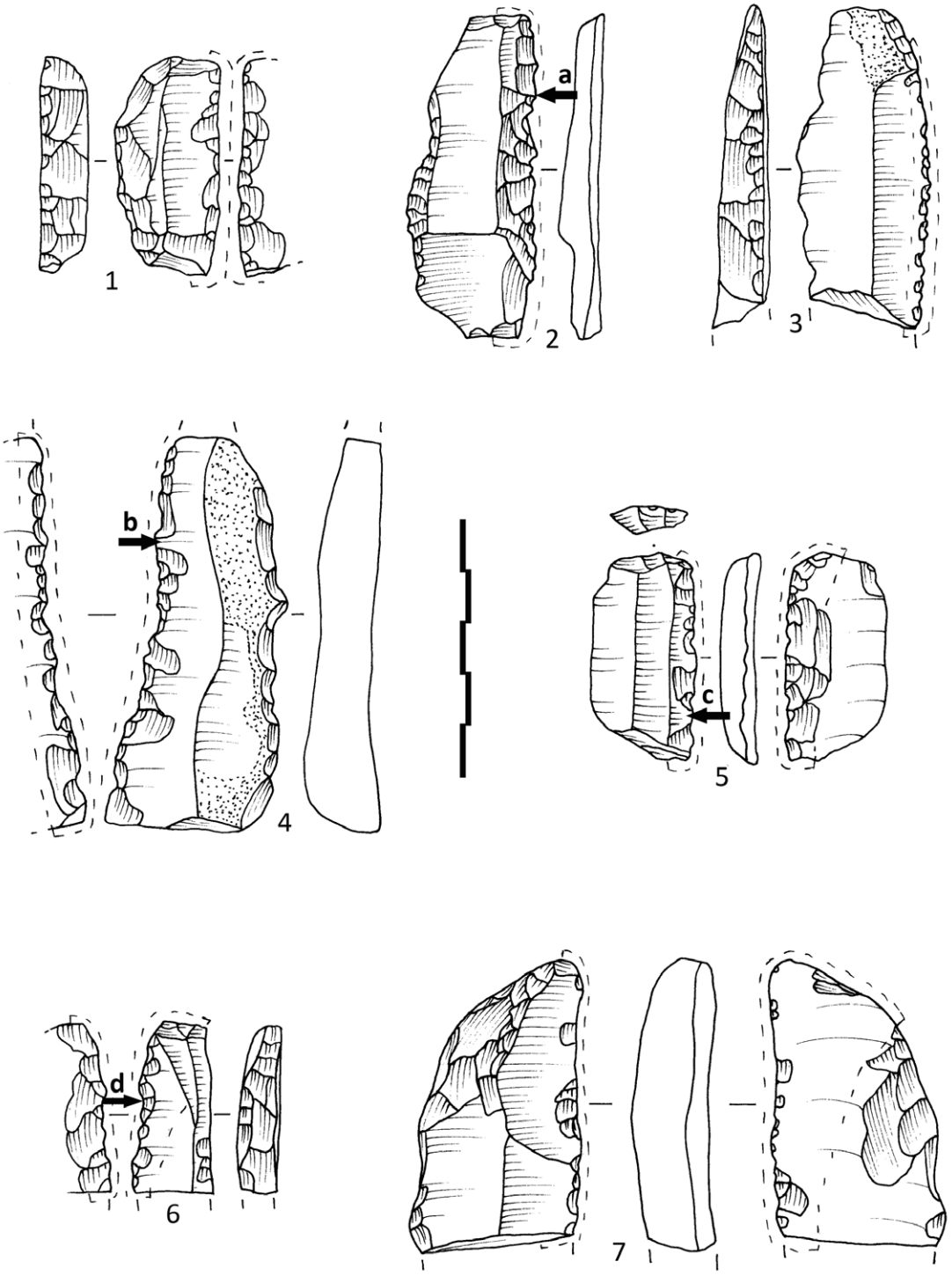

Fig. 10. Oreshets: typological tools with cereal polish; the arrows point to the locations of microphotographs (a–d) (x100) in fig. 12 (drawings M. Gurova)

Обр. 10. Орешец: типологически оръдия с излъскване от зърнени култури; стрелките посочват местата на снимките (a–d) (x100) от обр. 12 (рисунки М. Гюрова)

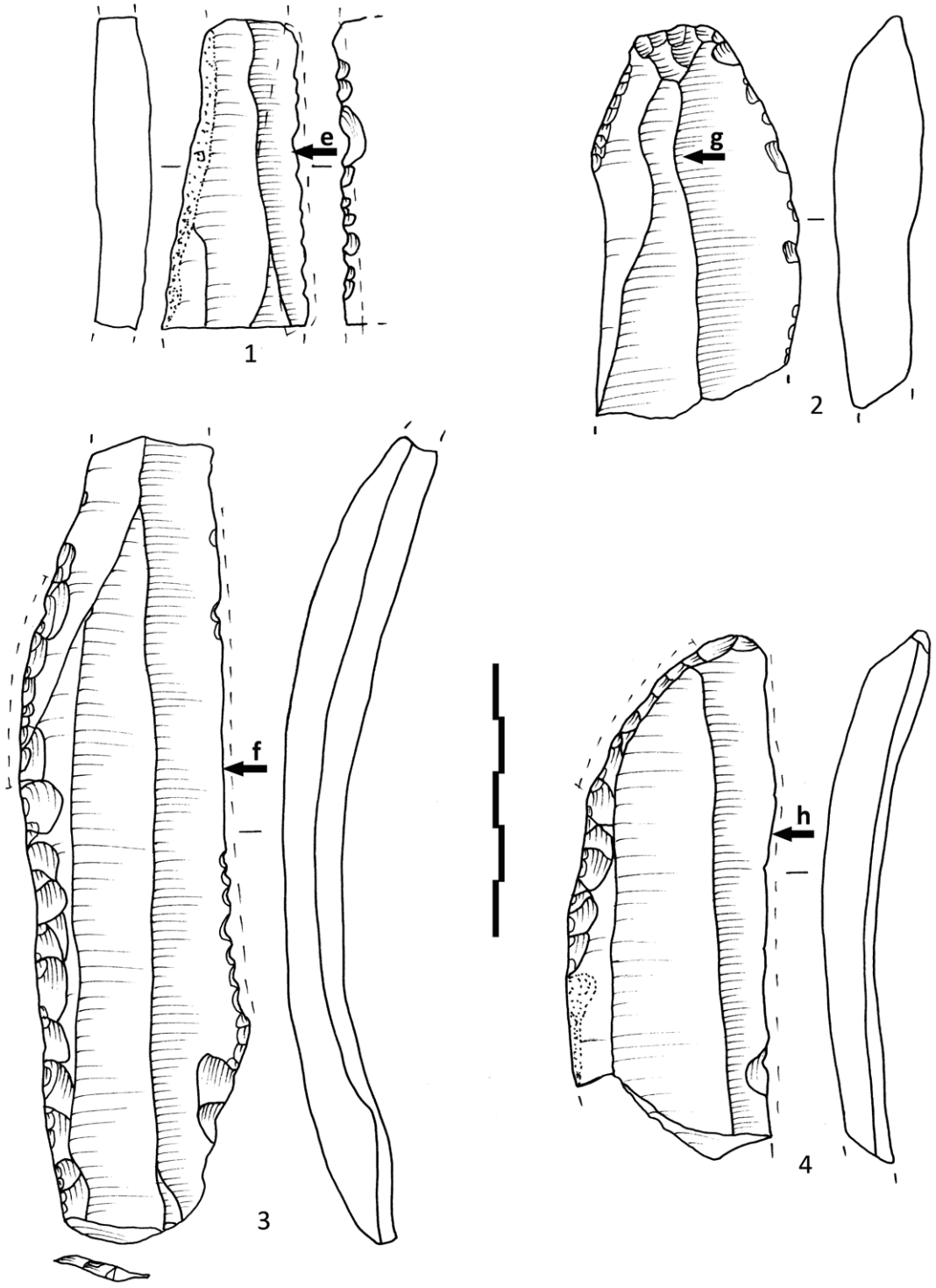

Fig. 11. Rasovo: typological tools with cereal polish; the arrows point to the locations of microphotographs (e–h) (x100) in fig. 12 (drawings M. Gurova)

Обр. 11. Расово: типологически оръдия с излъскване от зърнени култури; стрелките посочват местата на снимките (e–h) (x100) от обр. 12 (рисунки М. Гюрова)

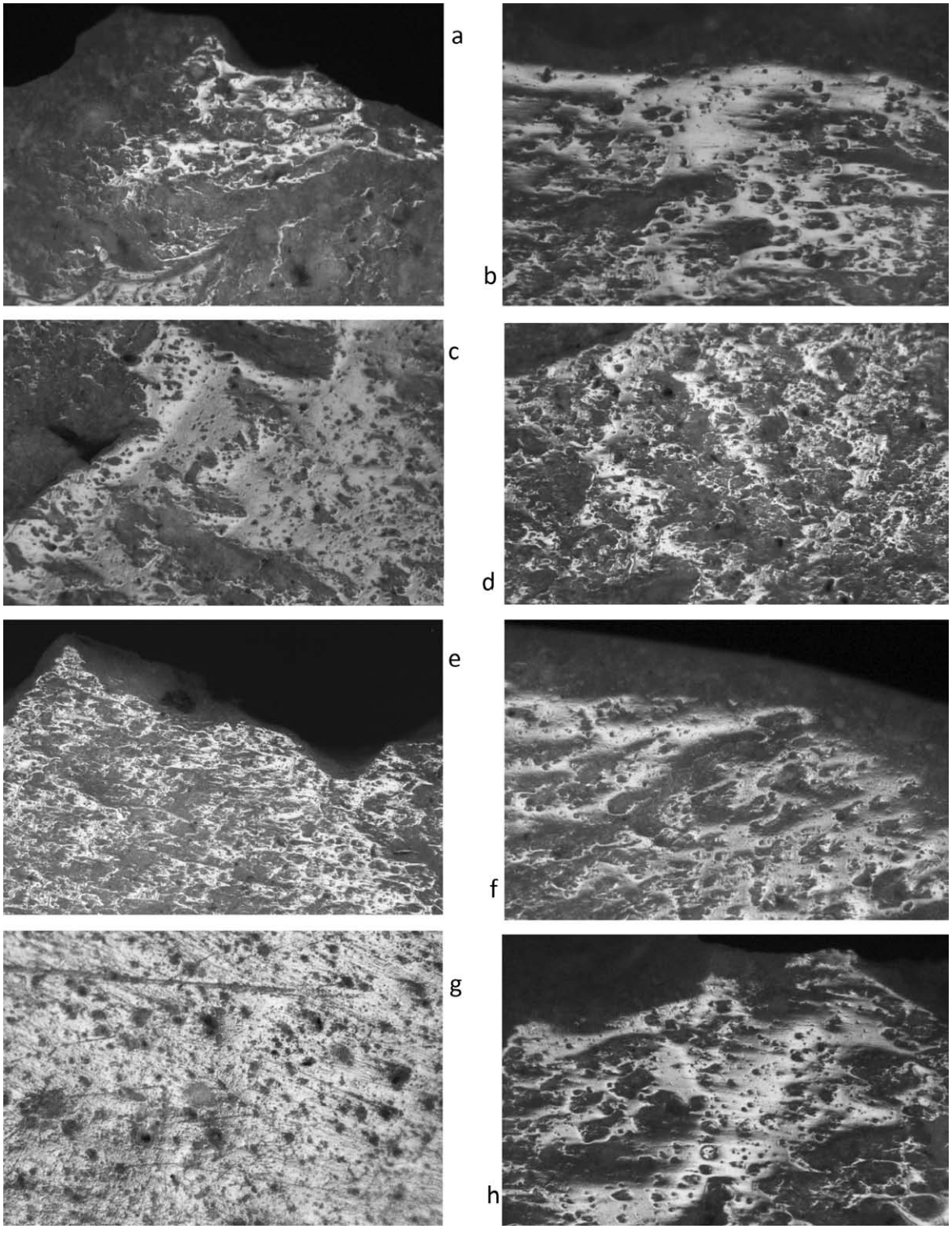

Fig. 12. Microphotographs (x 100) of artefacts in figs 10 and 11. Cereal polishes of artefacts used as sickle inserts and (g) ambiguous polish with atypical location on the artefact in fig. 11 (microphotographs M. Gurova)

Обр. 12. Микрофотографии (x100) на артефакти от обр. 10 и 11. Излъсквания на изделия, използвани за жътва, (g) – излъскване с неоднозначна интерпретация и разположение върху артефакт от обр. 11 (снимки М. Гюрова)

parallel cereal polish; ii) 4 blades combining backed edges with opposed denticulated used edges (figs 10.3–4; 12.b). These blades are robust with variously fashioned backed parts. In one case, the 'backed' zone is large at the distal end of the edge, combined with partially alternating retouch on the same edge (fig. 10.7); iii) 8 truncated blades with the following variations:

• distal truncation, bilateral retouch and unilateral cereal polish – 1;

• distal truncation, unilateral retouch and cereal polish on the unretouched edge, with utilization scars – 1;

• truncation/double truncation, backed edge and a retouched, slightly denticulated working edge) – 2 (figs 10.1, 6; 12.d);

• truncation with bifacial denticulation and cereal polish – 4 (figs 10.2, 5; 12.a, c).

All 16 artefacts that were briefly described possess detectable cereal polish with typical microwear characteristics (fig. 12.a–d). On the other hand, as has been repeatedly mentioned and demonstrated, the cereal polish displays various aspects owing to the variability of the harvesting tools (in raw material, shape, size, working edge fashioning and hafting), as well as the diversity of the crop taxa, maturity of cereals, mode and duration of harvesting, silica particles (provoking striations), and even the place of the insert in the handle of the composite tools (shortest selection of instructive papers: Korobkova 1996; Unger-Hamilton 1999; Ibáñez et al. 2008; Gurova 2014a, Mazzucco et al. 2022).

Among tools with cereal polish, there are 15 used for harvesting comprising: 11 as sickle inserts in composite tools (fig. 10.1, 5–6); 4 more likely as single hafted tools or sickle blades with handheld use (most massive/long implements) (fig. 10.2–4, 7) and 1 – used for threshing as a *tribulum* insert.

The determination of the mode of use of flint artefacts (as composite sickle inserts or as a single sickle blade) is based on morphometrical and techno-typological parameters – tools less than or ca. 5 cm with lateral and transverse truncations are usually composite sickle elements, which additionally accommodated parts/edges, facilitating fixing of the inserts in a haft. The appearance and configuration of the cereal polish (parallel to the lateral edges) suggest axial hafting or smoothly fitted to each other elements of a slightly curved/arched handle, as known from the MBA and post-BA large geometrics in Egypt and the southern Levant (Rosen 1986, 260; 1997, 142–143, fig. 6.10; Manclossi, Rosen 2019, 10–11, fig. 3; Gurova, Ivanov, in press, fig. 11. B).

The flint assemblage from Rasovo comprises only 22 artefacts but represents a case of interesting and peculiar implements. They probably come from dwelling or dug features dated to the LBA or EIA and from squares without any structural remains. There is a series of retouched blades with impressive dimensions (around and even over 10 cm) which recall some robust blades from the workshop of Ossama (Sirakova 2006, 75–79; tabla XXIII–XXVII). These blades are irregular, with a curved profile and pronounced thickening at the distal end. In two cases there is steep high retouch on the left edge and virgin or partially denticulated working (right) edge with parallel cereal polish. Interestingly, parts of the retouched edges, opposite to the working edge, possess smoothing and ambiguous polish, which could result from tool manipulation – handholding or some tissue (leather) for the accommodation of use (figs 11.3–4; 12.f, h). On one of the massive retouched blades, instead of the lateral polish there is a cereal-like distal polish over the right negative of the dorsal surface (figs 11.2; 12.g). Its origin and interpretation remain enigmatic. Similar polish could be produced by cutting turves (van Gijn 2010, 68, fig. 4.6b), but the circumstances of solid friction with turves are difficult to envisage in this case.

The other three tools possess unilateral cereal polish: a retouched flake and a retouched blade with unilateral ventral denticulated retouch on the working edges (figs 11.1; 12.e); a double truncation with ventral semi-abrupt retouch on the left edge and a narrow band of cereal polish and

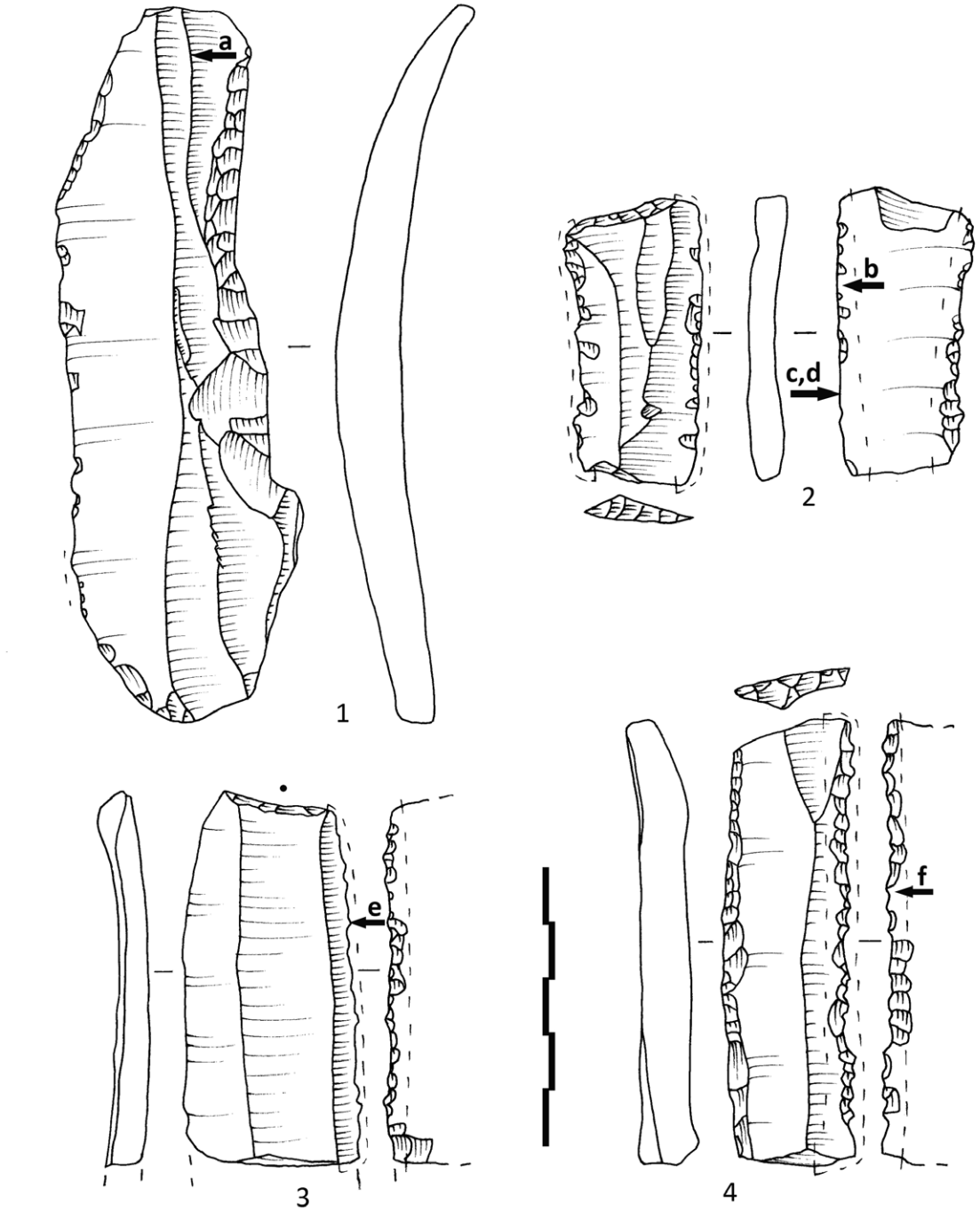

Fig. 13. Chavdartsi: typological tools with cereal polish; the arrows show microphotographs in fig. 16 (x100) (drawings M. Gurova)

Обр. 13. Чавдарци: типологически оръдия с излъскване от зърнени култури; стрелките посочват местата на снимките от обр. 16 (x100) (рисунки М. Гюрова)

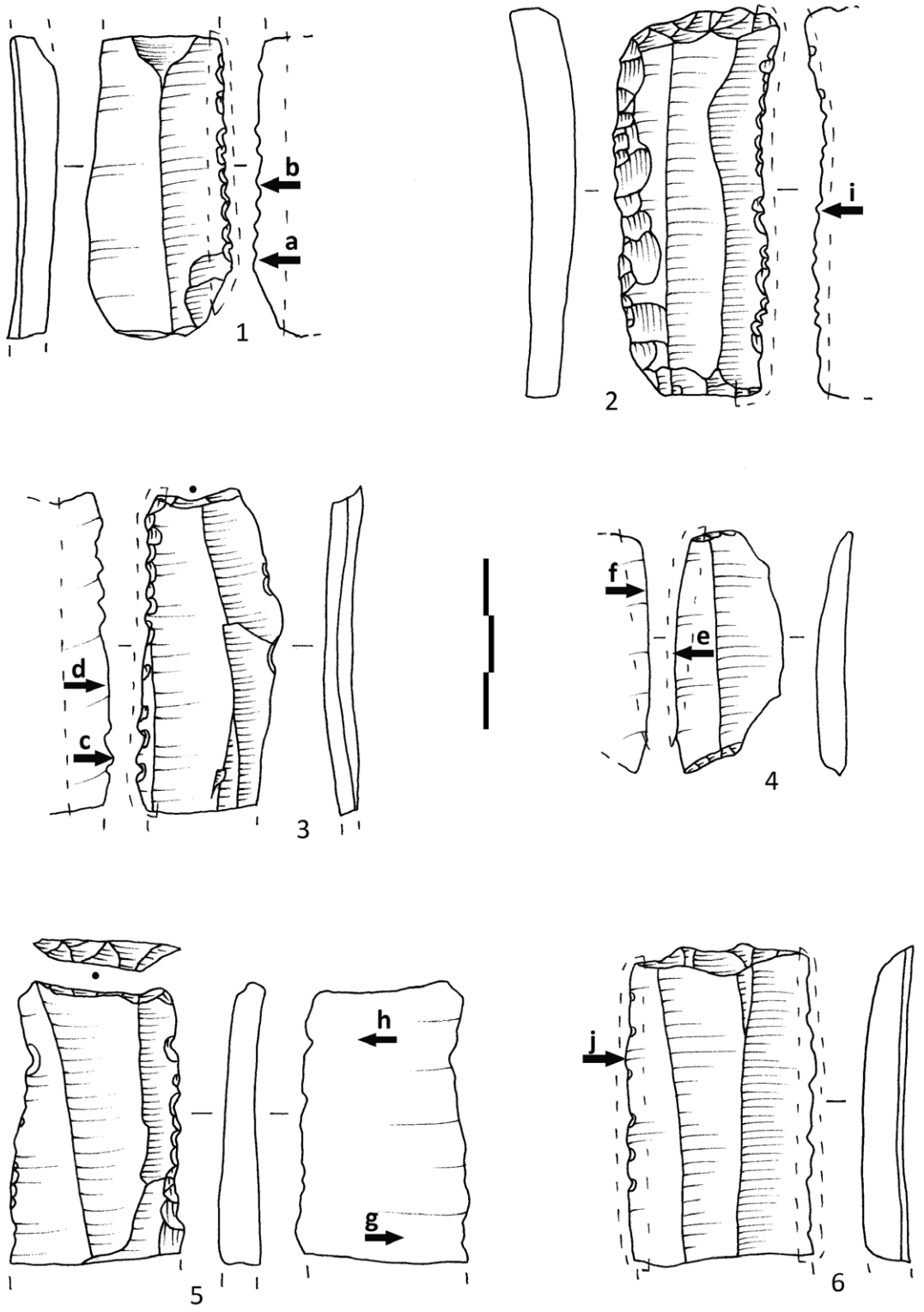

Fig. 14. Chavdartsi: typological tools with cereal polish; the arrows show microphotographs in fig. 17 (x100) (drawings M. Gurova)

Обр. 14. Чавдарци: типологически оръдия с излъскване от зърнени култури; стрелките посочват местата на снимките от обр. 17 (x100) (рисунки М. Гюрова)

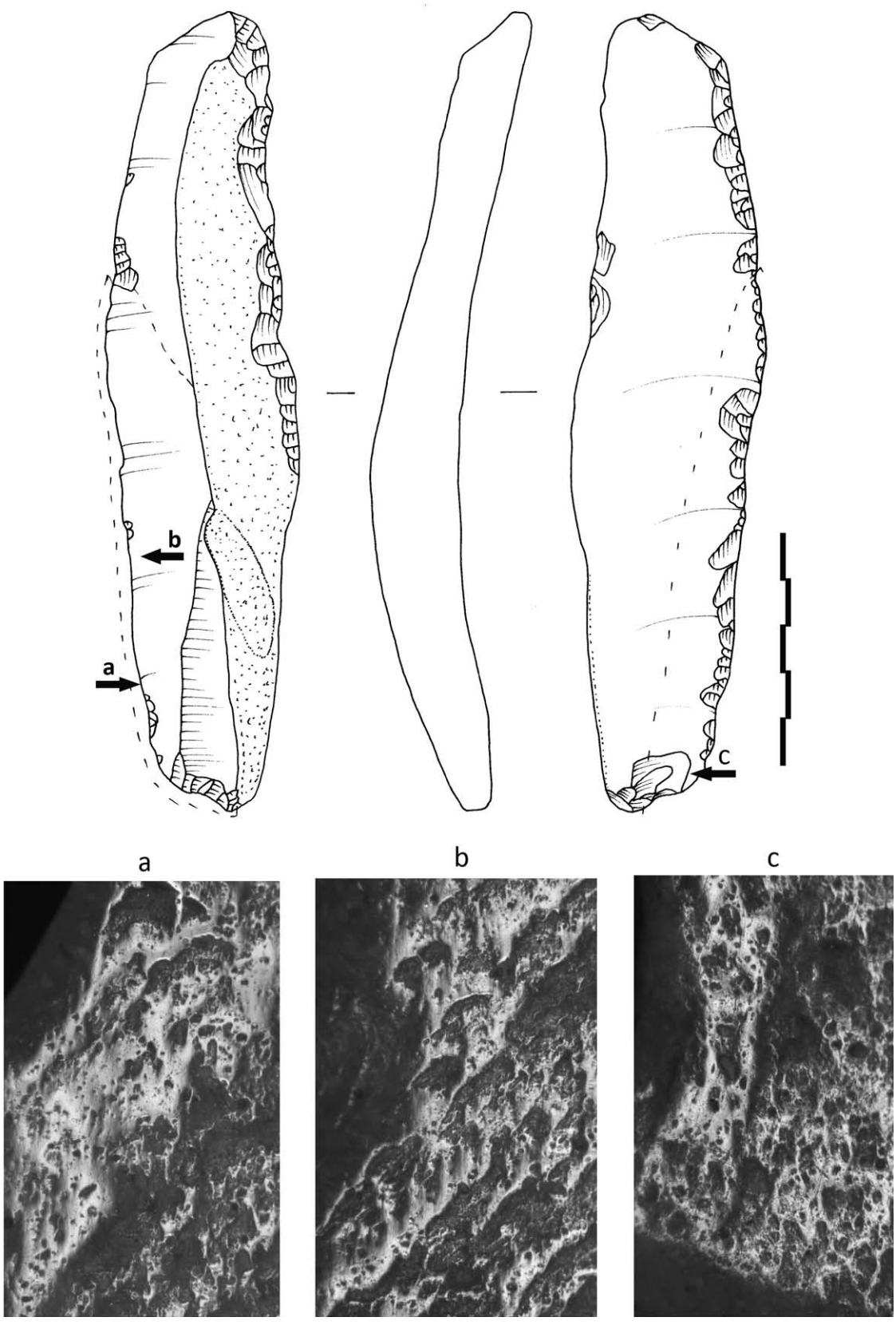

Fig. 15. Chavdartsi: big retouched blade used as sickle and microphotographs (a–c) (x100) of cereal polish on the marked points of the artefact (drawings and photos M. Gurova)

Обр. 15. Чавдарци: масивна ретуширана пластина, използвана като сърп и микрофотографии (а–с) (x100) на излъскването на посочените места (рисунки и снимки М. Гюрова)

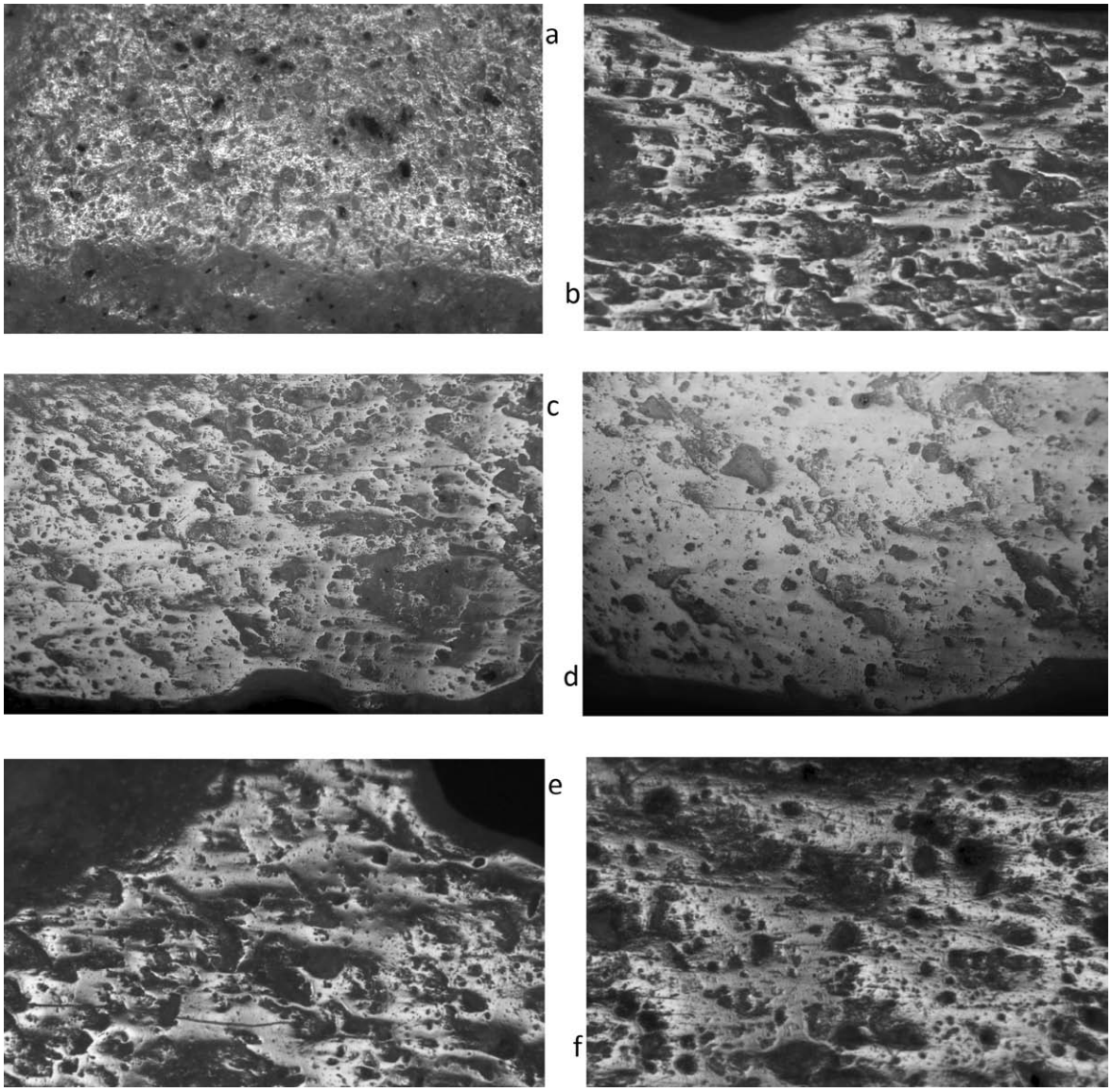

Fig. 16. Microphotographs (x100) of artefacts in fig. 13. Cereal polishes of artefacts used as sickle inserts and (a) ambiguous polish with atypical location on the artefact in fig. 13 (microphotographs M. Gurova)
Обр. 16. Микрофотографии (x100) на артефакти от обр. 13. Излъсквания на изделия, използвани за жътва, (а) – излъскване с неоднозначна интерпретация и разположение върху артефакт от обр. 13 (снимки М. Гюрова)

utilization scars on the right working edge. A middle fragment of a massive blade with recent damages (pseudo-retouch) has extensive parallel polish on the virgin left edge. The agricultural toolkit (5 artefacts with cereal polish) from the site is more heterogeneous than the toolkit from Oreshets, both in morphometrical and typological features. There are no backed pieces *sensu stricto*. The semi-abrupt retouch of the massive blades could not be interpreted as an attempt at standardization, but rather as adapting to the massive imported blanks. This blade sickle type is rare and, for now, finds correlates only in the agricultural toolkit from Chavdartsi (*vide infra*). In the context of the EIA, these peculiar harvesting blades could be interpreted as a legacy from the LBA where they emerge, or at least occur with this particular function.

The cereal polishes of the used implements are well developed and suggest prolonged use

(fig. 12.e–f, h). Two of the implements have been used as sickle blades without hafting but with accommodating retouch facilitating manual holding (fig. 11.3–4). Three items likely are inserts for a composite sickle(s), despite their variable size and shape parameters (fig. 11.1).

The flint assemblage from Chavdartsi reveals a representative typological tool spectrum of 51 items with the prevailing role of truncations (20) followed by retouched blades (18), endscrapers (8), retouched flakes (4) and a splintered piece (1). The agricultural toolkit contains 20 sickles (sickle inserts) of which 16 are typological tools. The latter include the following types:

• truncations (incl. double) – 2. One of the truncations is simple with bilateral parallel cereal polish (fig. 14.6). The second one is double (fig. 14. 4), on a blade, and belongs to those artefacts that may relate to the Chalcolithic (based on other contextual finds). This is not unlikely given the finer dimensions and regularity of the blade. From a traceological point of view, there is no difference between the microwear complex of this sickle insert and all the other sickles (fig. 17.e–f).

• truncations and bilateral retouch with unilateral cereal polish – 2 (figs 14.2; 17.i);

• truncations and bilateral retouch with bilateral cereal polish – 1 (figs 13.2; 16.b–d);

• truncations (proximal), unilateral retouch and cereal polish on the retouched edge – 2 (figs 13.3; 14.3; 16.e; 17.c–d);

• truncations (proximal), unilateral retouch and cereal polish on the entire ventral surface – 1 (figs 14.5; 17.g–h);

• truncations, backed edge and a retouched, slightly denticulated working edge – 2 (figs 13.4; 16.f);

• blades with unilateral denticulated retouch and cereal polish on the denticulates – 3 (figs 14.1; 17. a–b);

• blades with bilateral discontinuous retouch – 2 (figs 13.1; 15);

• flake with denticulated retouch – 1.

The cereal polish reveals all the characteristic features, viz. shiny aspect, smooth microtopography, striations, and pit-shaped depressions – features recorded on all above-presented sickle (sickle inserts) (see microphotographs at figs 3–7, 12, 15–17). There are, however, some more peculiar cases as one of the truncations in fig. 14.5. There is no easily recognizable lateral and parallel-to-the-edges polish; in fact, the polish with a well-developed 'cereal appearance' covers the entire ventral surface of the tool and possesses quasi-identical features on the edges and the inner parts of the ventral surface (fig. 17.g–h). It is difficult to imagine a harvesting gesture that could produce such a configuration of the polish. One of the biggest blades in the assemblages has polish spots rather than a continuous band of polish on the dorsal negatives, which does not exclude the handholding use for harvesting (similar to the retouched blades in fig. 15), but neither does it constitute unequivocal evidence for such a presumed use (figs 13.1; 16.a).

As mentioned above, these blades with identifiable sickle use (the examples from Rasovo and Chavdartsi) represent a peculiar case of sickle blades – they are not particularly fashioned in the techno-typological traditions of BA tool modelling – no denticulation, no truncation or backing. They are however adapted to be manually used, and this approach is most clearly visible on the blade in fig. 15. The working edge (proximal part) is quite sharp, and the distal part is partially corticated, with bilateral abrupt retouch, facilitating handholding (with or without wrapped leather).

Regarding the production and distribution of such blades – as mentioned above, they could originate from the LBA flint workshop of Ossama, near Mouselievo (Sirakova 2006). Their subsequent distribution in the contemporaneous sites in northern Bulgaria is expected and logical.

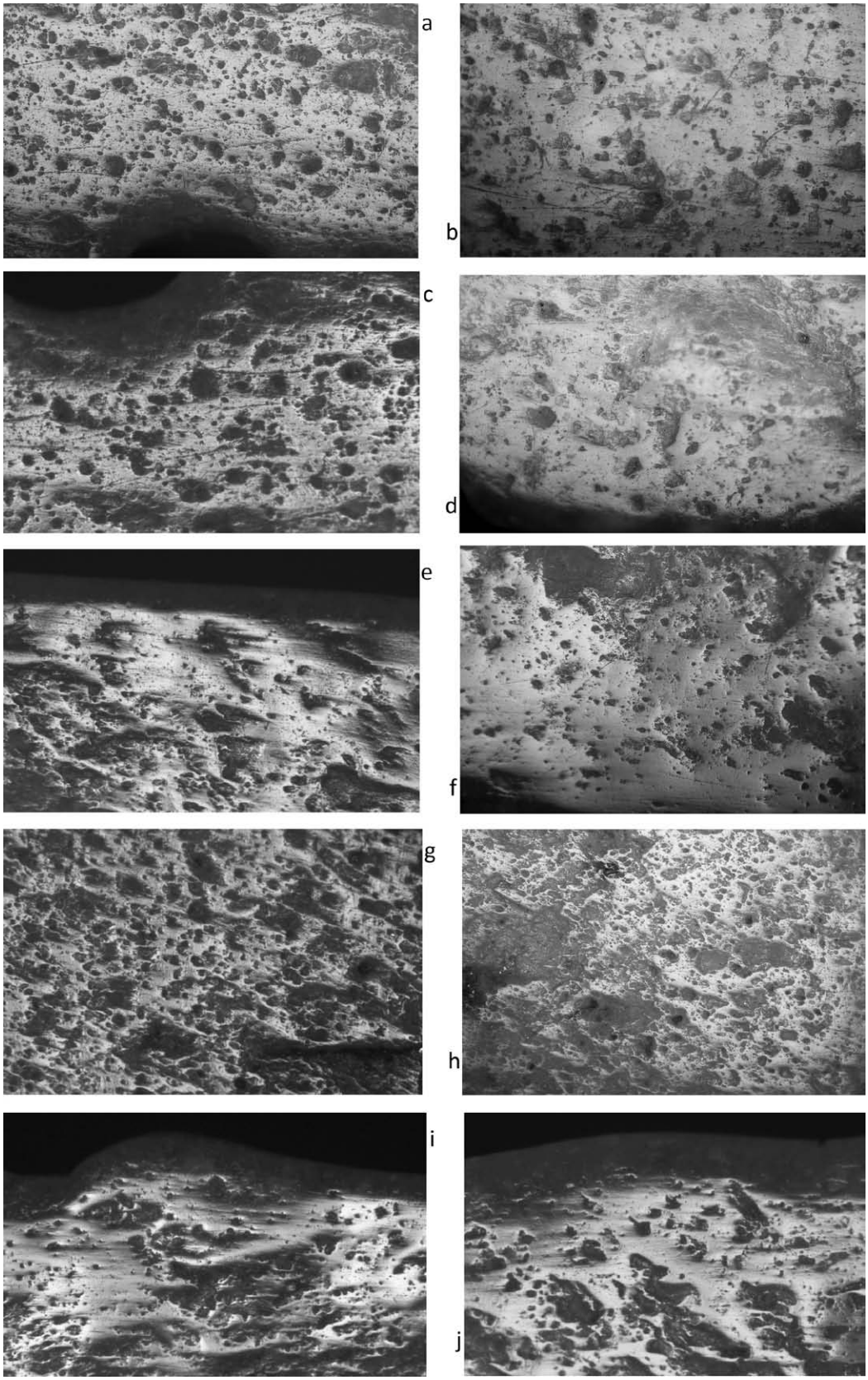

Fig. 17. Microphotographs (x100) of artefacts in fig. 14 with typical cereal polishes (photos M. Gurova)
Обр. 17. Микрофотографии (x100) на артефакти от обр. 14 с типично излъскване от зърнени култури (снимки М. Гюрова)

Discussion: Evolution *vs* devolution in the BA (post-BA) harvesting toolkit

The drastic shift in sickle morphology and mode of use recognisable at the transition from the Chalcolithic to BA has its social and economic basis and related consequences. Apart from various indicators of significant change in the material culture in post-Chalcolithic times (environmental stress, massive migrations) the shift in the agricultural toolkits could be at least partially explained by crop diversity. In comparison with the large spectrum of Cerealia taxa in the Neolithic and Chalcolithic, during the BA some new species appeared along with many weeds which possibly necessitated improvements in the harvesting toolkit and mode of use. More details and background about crop diversity in the Bronze Age are presented in the general overview of the prehistoric agricultural toolkits from a diachronic perspective (Gurova 2018).

The incontestable fact is that the progressive disintegration of the Chalcolithic lifestyle with all its achievements led to a discontinuity and fragmentation of prehistoric society, a process that took – in the conventional chronology in Bulgaria – between 5 and 10 centuries (depending on the context of samples, dates and their modelling) known as the 'transitional period'. From the lithic (chipped-stone assemblages) perspective, there is no reason to argue for some inherited know-how of knapping techniques from the Chalcolithic flint industry. While the Chalcolithic lamellar production reached the highest possible peak with standard blade and superblade production and very rich typological repertoire, Bronze Age blade-based assemblages show a noticeable decline. The only element of continuity and maintenance of high-standard production relates to the category of bifacial tools (spear and arrowheads) based on the pressure flaking technique. Several studies provide an adequate illustration of the typological repertoire of the BA flint assemblages (see, for example, Zlateva-Uzunova 2002, 2005). Among Bulgarian BA assemblages, there are no bifacials (other than projectile points) used as sickle inserts, contrary to the evidence from the late Troy sequence (Gurova 2020b, Pl. 12). Still unexplored from a comparative perspective are the sites with a significant presence of various bifacial tools from the Caucasus, considered as segments for composite instruments, and revealing considerable techno-typological variety, reflecting the reconstructions of hafting and use (Ostanishinskii 2013).

Turning back to the most diagnostic sickle type of the BA – denticulates, it is noticeable that they were fashioned on relatively regular blades which, instead of being fractured (like the Chalcolithic sickle inserts), are shaped using truncation and backing, both having a positive impact for the accommodation of the implements into grooved handles. In the case of handheld use, the backing could have a shaping and accommodating effect. This production can be traced from the EBA with a noticeable increase during the LBA and EIA. Why denticulates? Presumably and logically to compensate for the lack of the working edges of obliquely inserted blade segments into a curved handle – the style of sickle known as the Karanovo type with remarkable sustainability of more than two millennia (cf. Gurova 2018). There is however at least one insurmountable disadvantage of the BA sickle inserts on backed blades – they cannot be reversed in the handle; ergo – their lifespan is shorter *a priori*. This argument is made by Rosen in his reasoning about sickle evolution in the Levant and the replacement of backing by the Canaanean blade technology (Rosen 1997, 147).

As for the hafting of the diverse BA sickle inserts, denticulates (uni- or bilateral) with parallel cereal polish are suitable for hafting in a straight handle thus forming a long working edge and experiments have shown that the denticulated working edges are more efficient than naturally sharp blades (Clarkson, Shipton 2015, 168–169; fig. 5). It has also been claimed that fine denticulated edges work better than those with coarse denticulation (Vardi, Gilead 2013, 389). On the other hand, decades ago Semenov suggested various means of simple hafting of a singular insert into a well-adapted and

shaped wooden handle (Semenov 1957, 149–150).

It is difficult to decide if the sustainability of the BA agricultural toolkit represents a refinement or a decline compared to the preceding forms known from the Neolithic and the Chalcolithic. Each community and society reached adequate decision-making based on the technological basis, inherited know-how and inherent creativity. However, what is indisputable is the fact that via different ways of establishment, the proto-historic Balkan *oikumene* succeeded in maintaining a high quality of agricultural toolkits that remained unsurpassed by metal productions and assured the propagation and prosperity of the population.

The variability of the harvesting toolkit during the post-Chalcolithic periods raises a number of questions for serious scientific discussion, including: i) why did Bronze Age flint assemblages break with the two thousand-year tradition of production and use of the efficient, composite sickle of Karanovo type; ii) why did they also break with the Chalcolithic tradition of intensive use of high-quality Ludogorie flint and resume or revitalize the extraction, distribution and use of Balkan flint (in its Gortalovo and Bohot macroscopic variants); iii) which were the cultural connections with the Levant and Anatolia where in the BA *oikumene* there were large sickle blades (including denticulates), bifacial sickles (incl. the large geometrics from the Levant) some of which occur among the Bulgarian repertoire (as denticulates), though other types are missing (namely, the bifacials and the large geometrics); iv) to what extent can Bronze Age and post-Bronze Age flint industries contribute to elucidating some of the factors and mechanisms behind the long and still enigmatic 'Transitional' period in the Bulgarian chrono-cultural sequence; and v) how deeply involved in the 'Transitional' phenomenon were the complex Yamnaya migrations evidenced by aDNA studies and suggesting invasion by people of mixed East European and Near Eastern ancestry, creating discontinuities in cultural practices mainly across Central Europe (cf. Haak et al. 2015; Scorrano et al. 2021)?

These are among many questions for which answers are still sought.

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References

Anderson, P. (ed.) 1999. *Prehistory of agriculture: new experimental and ethnographic approaches* (Monograph 40). Los Angeles: University of California.

Anderson, P., Peña-Chocarro, L. (eds) 2014. *Early agricultural remnants and technical heritage (EARTH): 8,000 years of resilience and innovation* (3 volumes series). Oxford: Oxbow Books.

Andreeva, P., Stefanova, E., Gurova, M. 2014. Chert raw materials and artefacts from NE Bulgaria: A combined petrographic and LA-ICP-MS study. *Journal of Lithic Studies* 1.2, 25–45; https://doi.org/10.2218/jls.v1i2.1129

Boyadzhiev, Y. 1995. Chronology of prehistoric cultures in Bulgaria. In Bailey, D., Panayotov, I. (eds) *Prehistory of Bulgaria* (Monographs in World Archaeology 22). Madison, Wisconsin: Prehistory Press, 149–191.

Chevalier, A., Marinova, E., Peña-Chocarro, L. (eds) 2015. *Plants and people. Choices and diversity through time*. *Early agricultural remnants and technical heritage (EARTH): 8,000 years of resilience and innovation*, vol. 1, Oxford & Philadelphia: Oxbow Books.

Cholakov, I., Traykova, L., Valentinova, M., Alexiev, A. (in press). Rescue archaeological excavations of a site near by village of Chavdartsi, Lovech district. *Archeological discoveries and excavations in 2022*. Sofia (in press) (in Bulgarian with English summary).

Clarkson, C., Shipton, G. 2015. Teaching ancient technology using "Hands-ON" learning and experimental archaeology. *Ethnoarchaeology* 7.2, 157–172.

Colledge, S., Conolly, J. 2007. The Neolithisation of the Balkans: A review of the archaeological evidence. In Spataro, M., Biagi, P. (eds) *A short walk through the Balkans: the first farmers of the Carpathian Basin and adjacent regions* (Quaderno 12). Trieste: Centralgrafica s.n.c., 25–38.

Gurova, M. 2001a. Eléments de tribulum de la Bulgarie – références ethnographiques et contexte préhistorique. *Archaeologia Bulgarica* V.1, 1–19.

Gurova, M. 2001b. Kremachna kolektsia ot praistoricheskoto selishte Mihalich (razkopki 1998–1999). *Godishnik na Arheologicheskia institut s muzey* I, 192–202 (in Bulgarian).

Gurova, M. 2005. Eléments de faucilles néolithiques en silex de la Bulgarie: évidence et contexte. *Archaeologia Bulgarica* IX.1, 1–14.

Gurova, M. 2006**.** Functional aspects of the Early Neolithic flint assemblages from Bulgaria and NW Anatolia. In Gatsov, I., Schwarzberg, H. (eds) *Aegean – Marmara – Black Sea: the present state of research on the Early Neolithic*. Langenweissbach: Beier & Beran, 157–175.

Gurova, M. 2008a. Towards an understanding of Early Neolithic populations: a flint perspective from Bulgaria. *Documenta Praehistorica* 35, 111–129.

Gurova, M. 2008b. Les assemblages en silex d'Ilipinar. II^{e} partie: Aspects fonctionnels. In Roodenberg, J., Roodenberg, S.A. (eds) *Life and death in a prehistoric settlement in northwest Anatolia. The Ilipinar Excavations*, vol. III. Leiden: NINO, 269–314.

Gurova, M. 2008c. Prehistoric agricultural tools – indicatiors of the process of Neolithization. In Gurova. M. (ed.) *Prehistoric research in Bulgaria: new challenges*. Sofia: NAIM–BAS, 39–55 (in Bulgarian with English summary).

Gurova, M. 2011. Chalcolithic flint assemblages: trajectory to the regional diversity/similarity. In Boyadzhiev, Y., Terziiska-Ignatova, S. (eds) *The golden fifth millennium. Thrace and its neighbour areas in the Chalcolithic*. Sofia: NAIM–BAS, 275–284.

Gurova, M. 2012. Establishing the identity of Bulgaria's first farmers – a new perspective. *Achaeologia Bulgarica* XVI.2, 1–26.

Gurova, M. 2013. Tribulum inserts in ethnographic and archaeological perspective: case studies from Bulgaria and Israel. *Lithic Technology* 38.3, 179–201; https://doi.org/10.1179/0197726113Z.00000000020

Gurova, M. 2014a. Cereal polish: diagnosis, challenge or confusion. In Marreiros, J., Bicho, N., Gibaja, J. (eds) *International conference on use-wear analysis: Use-wear 2012*. Newcastle: Cambridge Scholars Publishing, 90–102.

Gurova, M. 2014b. Some examples of technological change in Prehistoric Bulgaria. In Van Gijn, A., Whittaker, J.C., Anderson, P.C. (eds) *Exploring and explaining diversity in agricultural technology. Early agricultural remnants and technical heritage (EARTH): 8,000 years of resilience and innovation*, vol. 2, Oxford & Philadelphia: Oxbow Books, 342–351 (184–188).

Gurova, M. 2014c. Prehistoric threshing sledges: A case study from Bulgaria. In Van Gijn, A., Whittaker, J.C., Anderson, P.C. (eds) *Exploring and explaining diversity in agricultural technology. Early agricultural remnants and technical heritage (EARTH): 8,000 years of resilience and innovation*, vol. 2, Oxford & Philadelphia: Oxbow Books, 157–160.

Gurova, M. 2014d. Kremnevyi ansambl' epohi rannei bronzy tellia Yunatsite: funktsional'nyi analiz. In Munchaev, R. (ed.) *Drevnie kul'tury Yugo-vostochnoi Evropy i Zapadnoi Azii. Sbornik k*

90-letiyu so dnia rozhdenia i pamiati N. Merperta. Moskva: Institut Arheologii, RAN, 212–226 (In Russian).

Gurova, M. 2016. Prehistoric sickles in the collection of the National Museum of Archaeology in Sofia. In Bacvarov, K., Gleser, R. (eds) *Southeast Europe and Anatolia in prehistory: Essays in honor of Vassil Nikolov on his 65th anniversary* (Universitätsforschungen zur Prähistorischen Archäologie 293). Bonn: Verlag Dr Rudolf Habelt GMBH,159–165.

Gurova, M. 2017. Geometric microliths from Holocene sequences in Bulgaria. In Mărgărit, M., Boroneanţ, A. (eds) *From hunter-gatherers to farmers. Human adaptations at the end of the Pleistocene and the first part of the Holocene. Papers in honour of Clive Bonsall*. Târgovişte: Cetatea de Scaun, 273–292.

Gurova, M. 2018. Prehistoric agricultural toolkits in diachronic perspective: A case study from Bulgaria. In Ivanova, M., Atanassov, B., Petrova V., Takorova, D., Stockhammer, Ph. (eds) *Social dimensions of food in Prehistoric Balkans.* Oxford: Oxbow Books, 190–214.

Gurova, M. 2020a. The Troy VI–VII Chipped stone assemblages: functional connotations. In Pernicka, E., Brian Rose, C.B., Jablonka, P. † (eds) *Troia 1987–2012: Grabungen und Forschungen III. Troia VI bis Troia VII: Ausgehende mittlere und spate Bronzezeit* (Studia Troica, Monographien 7). Bonn: Verlag Dr Rudolf Habelt GMBH, 952–978.

Gurova, M. 2020b. Bronze Age flint denticulates: A Bulgarian case study in transregional perspective. In Manclossi, F., Marchand, F., Boutoille, L., Cousseran-Nere, S. (eds) *Stone in Metal Ages*. Oxford: Archaeopress, 27–41.

Gurova, M., Andreeva, P., Stefanova, E., Stefanov, Y., Kočić, M., Borić, D. 2016. Flint raw material transfers in the prehistoric Lower Danube Basin: An integrated analytical approach. *Journal of Archaeological Science: Reports* 5, 422–441; http://dx.doi.org/10.1016/j.jasrep.2015.12.014

Gurova, M., Kecheva, N., Andreeva, P., Stefanova, E., Todorov, V., Sandeva, D. 2021. Multidisciplinary research on flint raw materials and artefacts from northwestern Bulgaria. *Bulgarian e-Journal of Archaeology* 11.2, 231–267; https://doi.org/10.57573/be-ja.11.231-267

Gurova, M., Stefanova, E., Andreeva, P., Kecheva, N., Bonsall, C. 2022. Prehistoric flint raw materials and artefacts from Bulgaria: The next step in provenancing Balkan flint. – *Archaeologia Bulgarica* XXVI.3, 1–30.

Gurova, M., Ivanov, G. in press. Agricultural implements from two intriguing chipped-stone assemblages of the Bronze Age and Early Iron Age in NW Bulgaria. In: Todorova, N., Petrova, V., Borissova, I. (eds) *Studia Archaeologica Universitatis Serdicensis*, Supplementum. Sofia.

Haak, W., Lazaridis, I., Petterson., Rohland, N., … & Reich, D. 2015. Massive migration from the steppe was a source for Indo-European languages in Europe. *Nature* 522, 207–211; https://doi.1038/nature14317

Hristov, M., Panayotova, K., Gurova, M., Panayotov, I., Mikov, R. (in press). Rescue archaeological investigations at site no. 16, km 195+300 – 195+600, LOT 1, AM Trakia Highway (preliminary report). In Aleksandrov, S. (ed.) *Archaeological rescue excavations for infrastructure projects 3* Sofia (in press) (in Bulgarian with English summary).

Ibáñez, J.- J., Clemente-Conte, I., Gassin, B., Francisco-Gibaja, J., González-Urquijo, J., Márquez, B., Philibert, S., Rodríguez-Rodríguez, A. 2008. Harvesting technology during the Neolithic in South-West Europe. In Longo, L., Skakun, N. (eds) *Prehistoric technology 40 years later: functional studies and the Russian Legac*y (BAR International Series 1783). Oxford: Archaeopress, 183–196.

Ivanov, G., Markov, M., Vasileva, J., Zhivkov, V., Varbanov, V., Gurova, M. 2020. An Early Iron Age (12–10 c. BC), Early Roman (1 c. AD) and Revival period (18–19 c.) site. *Archeological discoveries and excavations in 2019*. Sofia, 904–909 (in Bulgarian with English summary).

Ivanov, G., Hristova, T., Tonkov, N., Gurova, M. 2022. A 19–17 and 15–12 c. BC settlement by the village of Oreshet. *Archeological discoveries and excavations in 2021*. Sofia (in press) (in Bulgarian with English summary).

Korobova, G. 1996. The Blades with "Mirror-like" Polishing: Myth or Reality? In Kozłowski, S., Gebel, H. (eds) *Neolithic chipped stone industries of the Fertile Crescent, and their contemporaries in adjacent regions. Studies in early Near Eastern production, subsistence, and environment.* Berlin: Ex oriente, 227–231.

Manclossi, F., Rosen, S. 2019. Dynamics of change in flint sickles of the age of metals. New insights from a technological approach. *Journal of Eastern Mediterranean Archaeology and Heritage Studies* 7.1, 6–22.

Manolakakis, L. 2002. Funktsiyata na golemite plastini ot Varnenskia nekropol. *Arheologia* 3, 5–17.

Manolakakis, L. 2005. *Les industries lithiques énéolithiques de Bulgarie* (Internationale Archäologie Band 88). Rahden/Westf.: Verlag Marie Leidorf GMBH.

Manolakakis, L. 2011. A flint deposit, a tell and a shaft: a lithic production complex at Ravno3 – Kamenovo? (Early Chalcolithic, North-East Bulgaria). *Studia Preahistorica* 14, 225–244.

Mazzucco, N., Mineo, M., Arobba, D., Caramielo, R., Ferme, L., Gassin, B., Guilbeau, D., Ibáñez, J.-J., Morandi, L., Mozota, M., Pichin, F., Portillo, M., Rageot, M., Remolims, G., Rottoli, M., Gibaja, J. 2022. Multiproxy styudy of 7500-year-old wooden sickle from the Lakeshore Village of la Marmotta, Italy. *Scientific Reports* 12, https://doi.org/10.1038/s41598-022-18597-8

Marinova, E. 2007. Archaeobotanical data from the Early Neolithic of Bulgaria. In Colledge, S., Conolly, J. (eds) *The origins and spread of domestic plants in Southwest Asia and Europe*. Walnut Creek: Left Coast Press, 93–109.

Marinova, E., Valamoti, S.-M. 2014. Crop diversity and choice in Prehistoric southeastern Europe: cultural and environmental factors shaping the archaeobotanical record of northern Greece and Bulgaria. In Chevalier, A., Marinova, E., Peña-Chocarro, L. (eds) *Plants and people. Choices and diversity through Time. EARTH: 8,000 years of resilience and* innovation, vol. 1. Oxford: Oxbow Books, 64–74.

Ostanishinskii, S.M. 2013. Vkladyshevie orudia poselenia Meshoko. In Berlizov, N.E. (ed.) *Drevnosti Zapadnogo Kavkaza*. 1. Krasnodar: Gosudarstvennyi istoriko-arheologicheskii muzei-zapovednik, 4–28 (in Russian).

Popova, T. 2010. *Plant Environment of Man between 6000 and 2000 BC in Bulgaria* (BAR International Series 2064). Oxford: Archaeopress.

Retamero, F., Schjellerup, I., Davies, A. (eds) 2016. *Agricultural and pastoral landscapes in preindustrial societies. Choices, stability and change. Early agricultural remnants and technical heritage (EARTH): 8,000 years of resilience and innovation*, vol. 3, Oxford & Philadelphia: Oxbow Books.

Rosen, S. 1986. Appendix C: note on the Gezer flint caches. In Dever, W. (ed.) *Gezer IV: The 1969-71 seasons in field VI, the "Acropolis"*, vol. IV, part. 1. Jerusalem: Nelson Glueck School of Biblical Archaeology, 159–162.

Rosen, S. 1997. *Lithics after the Stone Age. A handbook of stone tools from the Levant*. Walnut Creek, London, New Delhi: Altamira Press.

Scorrano, G., Yeday, F., Pinotti, T., Feizabadifarahani, M., Kristianse, U. 2021. The genetic and cultural impact of the steppe migration into Europe. *Annals of Human Biology* 48.3, 223–233; https://doi.1080/03014460.2021.1943984

Semenov, S.A. 1957. *Pervobytnaya tehnika (opyt izuchenia drevneishih orudii izdelii po sledam raboty)* (Materialy i issledovaniua po arheologii SSSR, 54). Moskva–Leningrad: Izdatel'stvo Akademii nauk SSSR (in Russian).

Sirakov, N., Tsonev, T. 1995. Chipped-stone assemblage of Hotnitsa-Vodopada (Eneolithic/Early Bronze Age transition in northestern Bulgaria) and the Problem of the Earliest "Steppe Invasion" in Balkans. *Préhistoire Européenne* 7, 241–264.

Sirakova, S. 2006. *Kasnopraistoricheska eksploatatsia na kremachni nahodishta po dolinite na rekite Osam i Vit, Severna Bulgaria*. Sofia (in Bulgarian).

Skakun, N. 1993. Agricultural implements in the Neolithic and Eneolithic cultures of Bulgaria. In Anderson, P., Beyries, S., Otte, M., Plisson, H. (eds) *Traces et fonctions: les gestes retrouvés* (Etudes et Recherches Archéologiques de l'Université de Liège 50.2). Liège: Université de Liège, 361–368.

Skakun, N. 1999. Evolution of agricultural techniques in Eneolithic (Chalcolithic) Bulgaria: Data from use-wear analysis. In Anderson, P. (ed.) *Prehistory of Agriculture: New Experimental and Ethnographic Approaches*. Los Angeles: University of California, 199–210.

Skakun, N. 2006. *Orudia truda i hozyaistvo drevnezemledel'cheskih plemen Yugo-vostochnoi Evropy v epohy eneolita (po materialam kyl'tury Varna)*. Sankt Petersburg: Nestor–Istoria (in Russian).

Unger-Hamilton, R. 1999. Harvesting wild cereals and other plants: experimental observations. In Anderson, P. (ed.) *Prehistory of agriculture: new experimental and ethnographic approaches*. Los Angeles: University of California, 146–152.

Van Gijn, A., Whittaker, J.C., Anderson, P.C. (eds) 2014. *Exploring and explaining diversity in agricultural technology. Early agricultural remnants and technical heritage (EARTH): 8,000 Years of Resilience and Innovation*, vol. 2, Oxford & Philadelphia: Oxbow Books.

Van Gijn, A. 2010. *Flint in Focus. Lithic Biographies in the Neolithic and Bronze Age*. Leiden: Sidestone Press.

Vardi, J., Gilead, I. 2013. Keeping the Razor Sharp: Hafting and Maintenance of Sickles in the Southern Levant during the 6th and 5th millennia BC. In Borrell, F., Ibáñez, J.-J., Molist, M. (eds) *Stone tools in transition: from hunter-gatherers to farming societies in the Near East*. Barcelona: Universitat Autònoma de Barcelona. Servei de publicacions, 377–394.

Zlateva-Uzunova, R. 2002. Kremachni ansambli ot rannata bronzova epoha v rayona na "Maritsa-iztok", s.m. Madrets i s.m. Galabovo. *Godishnik na Arheologicheskia institut s myzey* II, 120–128 (in Bulgarian).

Zlateva-Uzunova, R. 2005. Kremachni ansambli ot rannata bronzova epoha v Gornotrakiiskata nizina. *Godishnik na department Arheologia, Nov Balgarski Universitet* VI, 39–73 (in Bulgarian).

Сърповете от бронзовата и ранната желязна епоха в еволюцията на праисторическите земеделски оръдия от България

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(резюме)

Данни за земеделието в праисторията се предоставят основно от палеоботаничните изследвания (разкриващи широк спектър зърнени култури) и анализа на различни, свързани със земеделските практики, оръдия от камък, кост и рог. Трасологическият/функционален анализ на кремъчни артефакти позволява идентифицирането на елементите от съставни жътварски

оръдия – сърпове, които са един от основните компоненти на земеделския инструментариум.

Свидетелствата за развити земеделски практики по нашите земи от самото начало на неолита (VI хил. пр.Хр.) са изобилни и категорични: пълен „пакет“ Cerealia taxa с безусловен близкоизточен произход и богат арсенал от кремъчни артефакти (главно пластини и оръдия върху тях) с диагностични микропризнаци от употреба като елементи от сърпове. През неолита сърповете са с дръжки от еленов рог, в които косо (под ъгъл) се подреждат кремъчни артефакти в ролята на зъбци. Тази стилистична версия на неолитен сърп е добре позната като Карановски тип сърп (обр. 3). Неолитните елементи от сърп много често са направени от т. нар. балкански флинт (с Горнокредна възраст и идентифицирани находища в Централа Северна България) и са част от характерните и диагностични находки за раннонеолитните култури Караново I и II в целия ареал на тяхното проявление (т. нар „formal toolkits“), които се срещат като реминисценти форми до края на неолита. През халколита настъпват съществени промени в кремъчните индустрии: а) в основен източник на суровина се превръща висококачественият лудогорски кремък с Долнокредна възраст от Североизточна България; б) кремъчното производство достига върхове в техниките за производство на пластини и в типологическия репертоар на ансамблите. Елементите от сърп стават по-стандартизирани, отново базирани на пластини и оформени върху тях оръдия (обр. 4). Дръжки на сърпове обаче не са достигнали до нас, което предполага тяхната направа от дървесни видове, по-нетрайни от роговите неолитни дръжки. Принципът на диагонално закрепване се запазва.

На праисторическите сърпове и тяхната еволюция са посветени дългогодишните проучвания на основния автор (МГ), намерили израз в множество публикации вкл. такива с обобщаващ характер и диахронен анализ на кремъчния земеделски инструментариум.

Тази статия представя кратък ретроспективен преглед на данните за сърповете през неолита и халколита и поставя акцент върху земеделските сечива през бронзовата епоха и ранната желязна епоха, които не без основание могат да се дефинират като протоисторически периоди.

Подчертан е дълбокият разрив с хилядолетната традиция на Карановския тип сърп и симптоматичната, а впоследствие и масова поява на оръдия (главно пластини) с назъбващи ретуши (т. нар. denticulates), които се превръщат в диагностични оръдия и доминиращ тип сърп през бронзовата епоха. Пластините с назъбващи ретуши са разнообразни по морфо-метрични показатели и характер на оформящата вторична обработка. Ретушите биват едно- и билатерални, едно- и бифасиални, фини, дълбоки, ситни, едрофасетъчни и т. н. За начините на закрепване се съди индиректно по размерите и обработката на оръдията и разположението на работните участъци с типичното излъскване от рязане на житни насаждения. Излъскванията вече са основно успоредни на надлъжните (работни) ръбове на изделията (обр. 5). Практиката на интенционално пречупване на пластините и директната им употребата е изоставена и се заменя с технологични прийоми като нанасяне на надлъжни и напречни затъпявания на пластините с акомодационна цел – да се улесни закрепването им в права дръжка с дълбок жлеб. Наред с доминиращата тенденция, през ранната бронзова епоха спорадично се срещат реминисцентни форми на елементи от сърп с диагонално излъскване. Особено интересна е изолираната серия сегменти от вкопани структури в Южна България, които имат директни контекстулни корелати сред ансамблите от бронзовата епоха в Южен Левант, района на Негев (обр. 6–7).

Статията представя по-подробно артефактите, използвани като жътварски оръдия, от три неотдавна проучени обекта в Северна България: Орешец (община Димово), Расово (община Медковец) и Чавдарци (община Ловеч) (обр. 1). Обектите са многопластови и с преобладаване на вкопани структури (обр. 2). Кремъчните им ансамбли се отнасят контекстуално към късната бронзова епоха (Орешец и Чавдарци) и късната бронзова/ранната желязна епоха

(Расово). Обектите са забележителни с присъствието на представителни серии от сърпове, вкл. и масивни корубести пластини-сърпове (употребявани без дръжки), които иновационно допълват репертоара на протоисторическите земеделски сечива. Според наличните данни тяхната поява в земеделския инструментариум датира най-рано през късната бронзова епоха, но продължава и през ранната желязна епоха. Производството на подобни масивни пластини през късната бронзовата епоха е документирано от С. Сиракова в ателие в м. Осъма до Муселиево (Плевенско). Многообразието на жътвените оръдия през пост-халколитните периоди поставя редица въпроси за сериозна научна дискусия като: а) защо ансамблите от бронзовата епоха прекъсват хилядолетната традиция на употреба на съставните и много ефикасни сърпове Карановски тип; б) защо ансамблите от бронзовата епоха прекъсват халколитната традиция на масова употреба на висококачествен лудогорски флинт и възобновяват добива, разпространението и употребата на балканския флинт (или подобен нему – в макроскопските му варианти Горталово и Бохот); в) какви са културните влияния от Леванта и Анатолия, където през бронзовата епоха се срещат масово масивни пластини-сърпове (вкл. с назъбващи ретуши), изделия с напълно покриващи бифасиални ретуши и геометрични макролити (large geometrics) като последните два типа отсъстват от репертоара у нас; г) доколко кремъчните индустрии от бронзовата и пост-бронзовата епоха могат да допринесат за изясняване на някои от факторите и механизмите за продължителния и все още енигматичен „преходен период“ от културно-хронологическата секвенция в България; д) в каква степен преходният период е белязан от миграцията на Ямната култура, която според генетичните изследвания се осъществява чрез инвазия на популации със смесен източноевропейски и близкоизточен произход и предизвиква значителни промени в материалната култура, основно в Централна Европа (но и с вторично въздействие по нашите земи?).

Тези и редица други въпроси все още търсят своя адекватен отговор.