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A GRAVE IN ILYATKA AND GLOBULAR AMPHORA SITE CLUSTER ON THE SOUTHERN BUG, PODILLYA, UKRAINE

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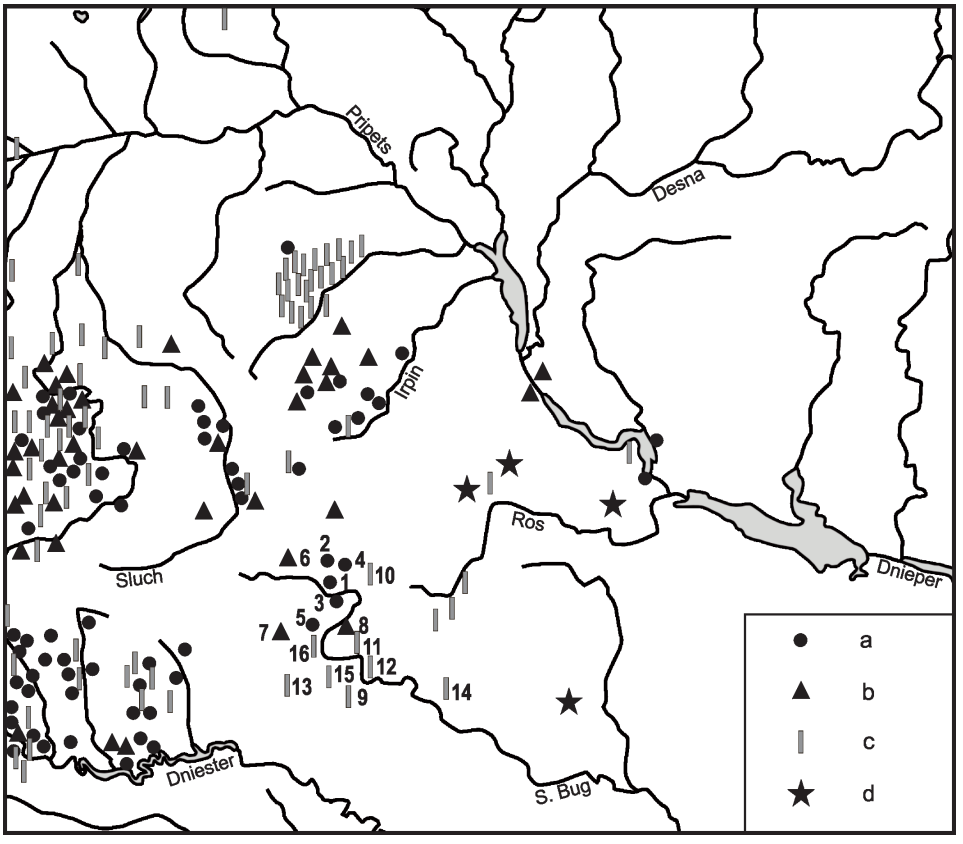
ABSTRACT

Discussed in the article, the multi-burial grave from Ilyatka (Staraya Sinyava district, Khmelnytskyi province, Ukraine) is the first feature of the Globular Amphora culture in the drainage basin of the upper Southern Bug to be subjected to comprehensive bioarchaeological and chronological analyses. The time when the remains of seven people (four men and three women) were deposited in it was determined to be 2700–2550 BC. The feature is part of a small site cluster on the upper Southern Bug, made up of 16 sites. The importance of the cluster follows from its location in one of the crucial communication hubs of the Ukrainian forest-steppe. This makes the cluster vital for the exploration of the forest-steppe settlement by Globular Amphora communities, their expansion towards the middle Dnieper area, and connections to Yamnaya culture groups.

Keywords: Globular Amphora culture, eastern group, Southern Bug catchment, absolute chronology, bioarchaeology

A small Globular Amphora culture (GAC) site cluster in the drainage basin of the upper Southern Bug, in eastern Podillya, Ukraine, has been known since the late 19th century. So far, 16 sites of the cluster have been identified [Szmyt 1999, Annexe 1; 2009; 2021; Zakhar'ev 2015]. When compared with other eastern group concentrations, for instance in Volhynia, western Podillya or on the Moldavian Upland, the cluster on the Southern Bug is far less numerous and made up of sites spread over a distance of about 100 km (Fig. 1). A special significance of the cluster, however, results above all from its location in one of the communication hubs of the Ukrainian forest-steppe. For this reason, it may help determine how far deep into the forest-steppe GAC communities settled and trace their links to steppe groups.



F i g . 1. Sites of the Globular Amphora culture on the Southern Bug.
Key: a – graves; b – pottery; c – flint axes; d – selected sites with GAC elements in other cultural contexts; 1 – 16 – sites mentioned in the text: 1 – Gorbasiv; 2 – Ilyatka; 3 – Letychev-Zavovk; 4 – Novaya Sinyava; 5 – Tartak; Pottery: 6 – Samchyntsy; 7 – Tokarivka; 8 – Vinnitsa; Axes: 9 – Bushynka; 10 – Golodky; 11 – Meleshkiv; 12 – Nikiforivtsy; 13 – Noskivtsy; 14 – Orlivka; 15 – Yaroshenka; 16 – Zhmerynka

In recent years, the significance of the site cluster on the Southern Bug has grown further still, owing to the dynamic development of archaeogenetic studies. The cluster supplied the first series of genetic analyses for the GAC eastern group published in 2018 [Mathieson *et al*. 2018]. Samples for the analyses were collected from the remains of three individuals buried in a grave in Ilyatka, explored by Volodymir Zakhar'ev in 2011 [Zakhar'ev 2015]. Their thorough anthropological examination was conducted by Tetyana Rudych and Oleksandra Kozak [Rudych 2015; Kozak 2015]. Owing to their work, the Ilyatka grave is one of the best explored funerary features in terms of the bioarchaeology of the GAC eastern group even though it was badly damaged during its chance discovery. The results of the aDNA analysis of the individuals buried in the Ilyatka grave are used in genetic research on various aspects of the formation of Europe's genetic structure usually under the name of 'Ukrainian Globular Amphora' [Wang *et al.* 2019]. Moreover, for the genetically studied samples, three radiocarbon measurements were published [Mathieson *et al*. 2018, Suppl. Information 1].

This article revisits the Ilyatka grave by giving a complete catalogue of archaeological sources found in it, results of isotopic analyses and new findings on its absolute chronology. The latter rely on ^{14}C determinations of samples collected from the remains of all individuals buried there. Furthermore, it is an excellent opportunity to outline the entire GAC population settlement cluster on the upper Southern Bug.

A MULTI-BURIAL GRAVE FROM ILYATKA I, STARAYA SINYAVA DISTRICT, KHMELNYTSKYI PROVINCE

The grave was discovered by chance in 2011 within the limits of the village of Ilyatka, close to the town of Staraya Sinyava, on a site known as *Dolina Kokhaniv* (Ukr. Valley of Lovers). It was located in the middle of a slope of a small valley on the right bank of the Ikwa River, a tributary of the Southern Bug, approx. 200 m from the river water current.

When professional archaeologists arrived at the site, the grave had been partially disturbed by its first discoverers; two of the three slabs of its cover were moved aside and the grave fill underneath them was partially dug up. Consequently, the original form of the grave could be reconstructed using information supplied by the discoverers and compared with observations made in the course of exploration.

Grave form

The feature must have had the form of a pit covered by limestone slabs, but its outline could not be registered. The cover lay at a depth of approx. 0.45–0.48 m from today's ground level (Fig. 2: a). It was made of three slabs. The middle one was the most massive and because of that it stayed *in situ*. It was 2.14 m long, 1.49 m wide and 0.12–0.23 m thick. Its longer axis was oriented east-west. The eastern slab was 1.24 m long, 0.50–0.54 m wide and 0.10–0.19 m thick. It adjoined the central slab along the southwest-northeast axis. The crevice between the slabs was filled with small stones. The western slab was 1.12 m long, 0.54 m wide and 0.28 m thick. The unpaved bottom of the grave extended at a depth of 0.68–0.70 m from today's ground level.

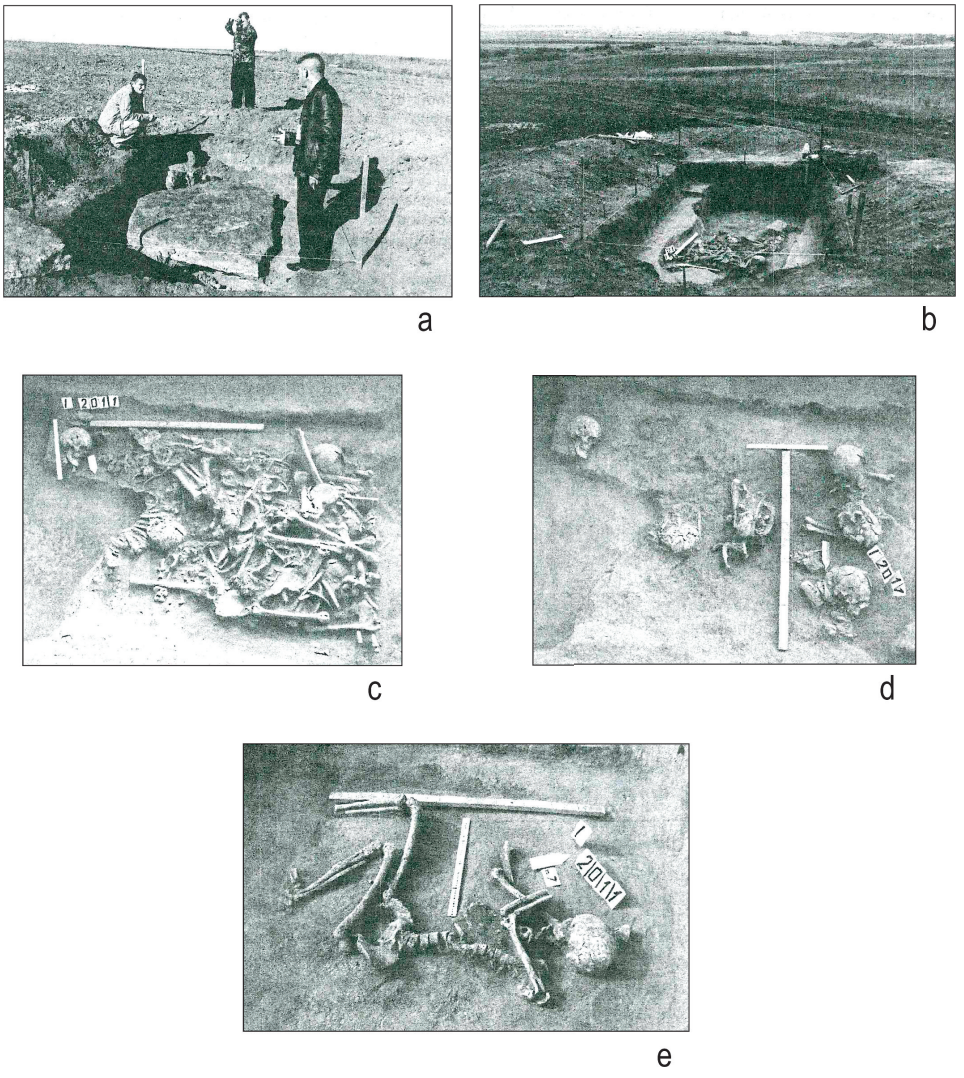
Burials

Single human remains were recorded immediately underneath the central slab (more precisely: underneath its southwestern part), but a concentration of mixed bones was found at a depth of -0.55 m to -0.68–0.70 m. It occupied almost 1.5 sq. m and stretched E-W for 1.55 m and N-S for 0.95 m (Fig. 2: b). The concentration held disarticulated remains of five individuals: four males and one female which were probably replaced from their original position in course of the further burial [cf. other view: Zakhar'ev 2015: 14-15]. The smaller bones were placed on the ground layer while skulls were placed on top of them – three (males nos. 1, 2 and 3) in a row going from south to north and two (no. 4 of a male and no. 5 of a female) perpendicularly to it (Fig. 2: c-d). The long bones and pelvic bones, however, were placed above. The concentration occupied a roughly rectangular area, which may indicate that the pit walls were lined, for instance, with wooden logs, but no traces of wood were observed. The bone layer thickness stayed between 0.15 m in the western portion of the grave and 0.05–0.08 m in its eastern portion.

To the south of the main burial group, there sat a skull of a woman aged 25–35 years (no. 6), oriented with its calotte towards the south and facing west (Fig. 2: c-d). Next to it, a small stone lay and near it, fragments of an ornamented amphora were found together with a fragment of an unornamented vessel. The other bones of this burial must have been discarded when this part of the grave was dug up by its first discoverers.

In turn, 0.25 m west of the bone concentration, at a depth of 0.72–0,74 m, there lay an articulated skeleton of a woman aged 20–30 years (no. 7) in a supine position, with her legs and hands flexed and the head pointing north and facing west (Fig. 2: e). Next to her head, there sat a small flat piece of limestone. There were no other furnishings.

Between Burial 7 and the main burial group (Individuals 1–5), on the grave bottom two small limestone lumps sat next to each other. Another such lump was found 0.70 m west of the bone concentration and 0.75 m south of Burial 7.



F i g . 2. Ilyatka, site I, Khmelnytskyi province. Grave of the Globular Amphora culture: a – stone cover, view from the east; b – layer of human bones, view from the west; c – main burial group (1-5) and skull of Burial 6, upper level; d – main burial group (1-5) and skull of Burial 6, lower level; e – Burial 7, view for the east. Foll. Zakhar'ev 2015

Grave goods

In the eastern portion of the grave, underneath the smaller cover slab, there were at least two clay vessels (a small globular amphora and another unidentified form). Their shards were found in the earth excavated from the grave and next to Skull 6. In the southeastern grave corner, in an undisturbed layer, two so-called

animal-bone buckles were found, with another two such objects being unearthed *in situ* as well but close to Skull 3. These objects are all surviving grave goods. Nothing is known of any other artefacts deposited with the burials.

Small amphora (Fig. 3: 1) – a small two-segment form with a globular base; type VB according to Szmyt [1999]. It was reconstructed in part, having been preserved in eight belly and lip fragments. The wall thickness is 0.5-0.6 cm. Technology: IIIB [*see* Czebreszuk, Kośko, Szmyt 2006]. Ornamentation: two multi-element patterns cover its neck and belly. Both are built of the impressions of so-called fish scales (or arches whose chord has o.2-0.3 cm; on the neck, their protrusions point down, while on the belly they point both up and down). On the neck, under the rim, there is a pair of perforations 0.2–0.4 cm in diameter. Underneath, there runs a band made up of three lines of arches; below there is another analogous band, further below runs a row of triangles filled with arches where the triangle sides are incised. The pattern on the belly is made up of triangles of arches only and interlaced bands of vertical arch impressions; this time their protrusions point up. The bands are mostly made up of two vertical rows of arches, but in a single case a band has only one row of such impressions.

Vessel (Fig. 3: 2-4) – preserved in fragments. It appears to have had two segments (the neck with a shoulder are preserved), a flat base and handles; perhaps an amphora or vase. Unornamented. Technology: IIIB. A saddle-like handle, type: A112 [*see* Czebreszuk, Kośko, Szmyt 2006]. Flat base of indeterminate type.

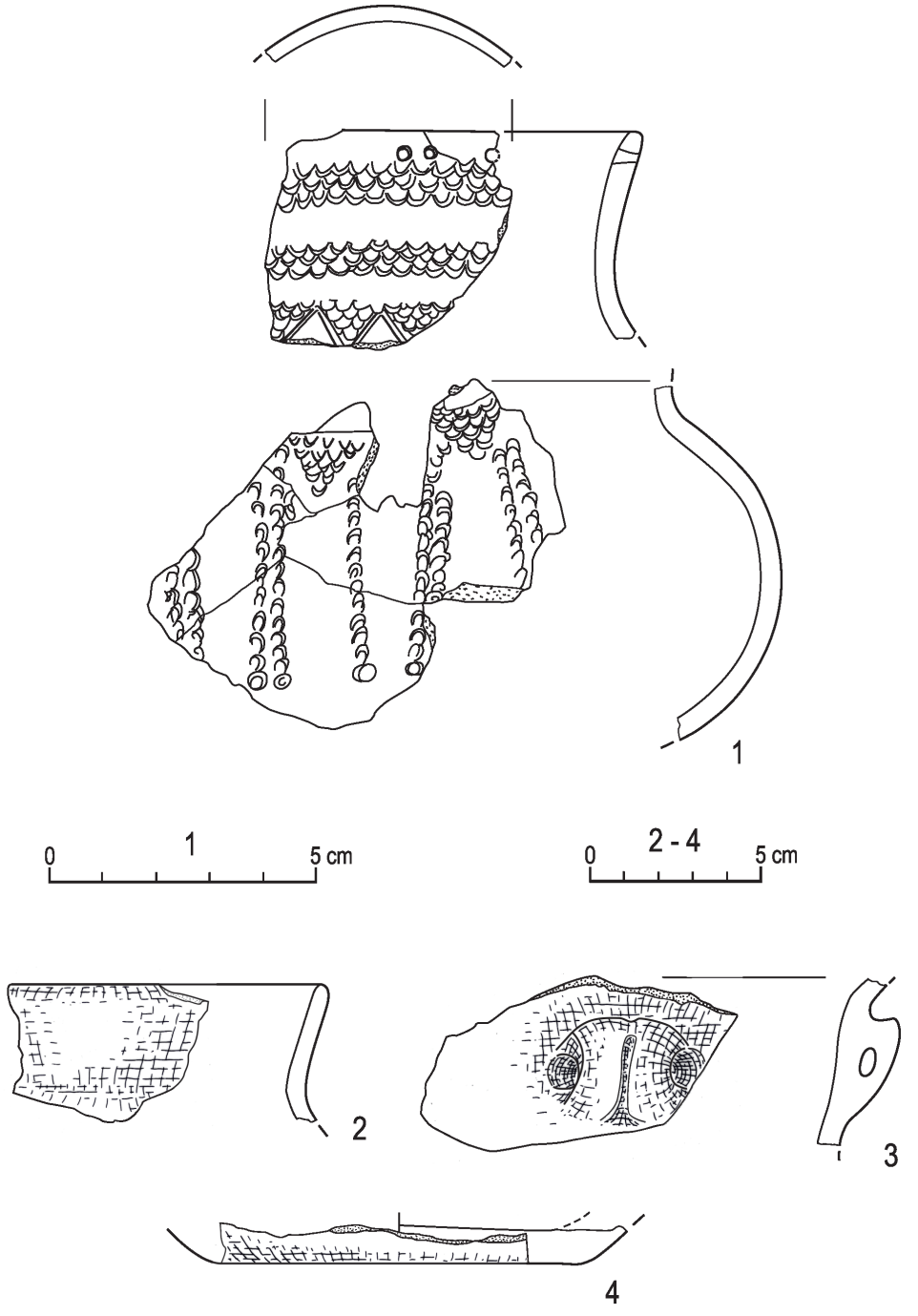
Bone buckles – the first pair

A. A bone buckle (Fig. 4: 1) was found in the SE corner of the grave, next to the other buckle (B). Dimensions: length: 12.5 cm, width: 5.0 cm, thickness: 0.4 cm. Preserved complete. It is shaped like the letter D and has a rectangular notch on the longer straight side. It is open-worked and has two sets of three holes each (0.4–0.5 cm in diameter) placed symmetrically on both sides of the notch. On one side, it bears a linear ornament.

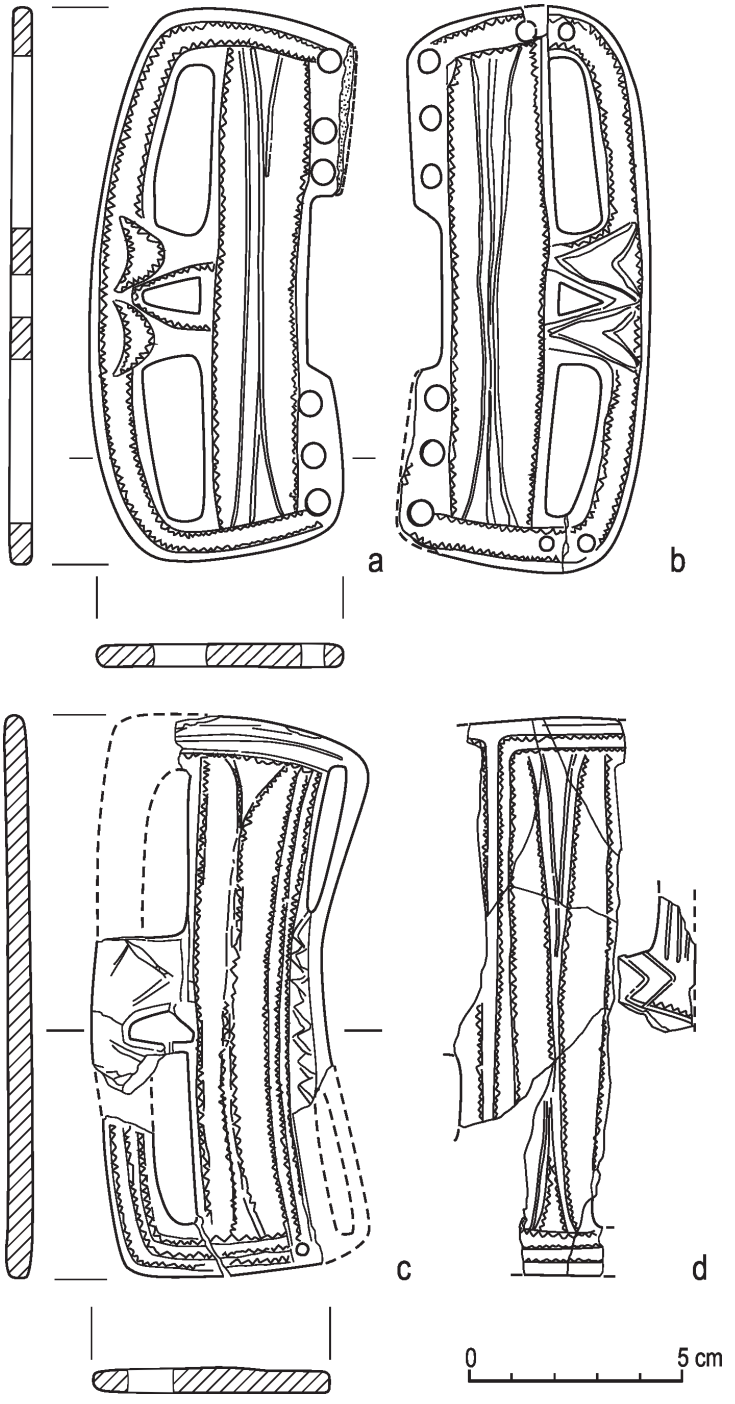
B. A bone buckle (Fig. 4: 2) was found in the SE corner of the grave, next to the other buckle (A). Preserved in three parts, it could be glued together, rendering it almost complete (a small bit is missing from one of the shorter sides). Its dimensions, form and ornamentation are similar, although not analogous, to those of Buckle A. What it differs in is two additional pairs of holes (0.2–0.3 cm in diameter) on the shorter sides, placed asymmetrically with respect to its axis (a shift towards the longer convex side).

Bone buckles – the second pair

C. A bone buckle (Fig. 4: 3) was found in the bone concentration, in the NW corner of the grave, next to Skull 3, in pair with Buckle D. It is damaged (bits are missing from longer sides). Its dimensions are similar to those of Buckles



F i g . 3. Ilyatka, site I, Khmelnytskyi province. Pottery. Foll. Zakhar'ev 2015



F i g . 4. Ilyatka, site I, Khmelnytskyi province. Bone buckles. Foll. Zakhar'ev 2015

A and B, but its form differs: the curve of one of the longer sides is gentler while the other longer side lacks a rectangular notch; it has a slight dent instead; on both sides of the dent, instead of two pairs of holes, there are longitudinal notches (2.9–3.0 cm long, 0.4 cm wide). On one side, it bears a linear and zigzag ornament.

D. A bone buckle (Fig. 4: 4) was found in the bone concentration, in the NW corner of the grave, next to Skull 3, in pair with Buckle C. It is damaged (bits of longer sides are missing, while the central part is preserved). Its form, dimensions and ornamentation are probably similar to those of Buckle C.

Biological, genetic and isotopic description of the buried individuals

A detailed anthropological examination of the human remains was performed in the bioarchaeological laboratory of the Institute of Archaeology, National Academy of Sciences of Ukraine. The remains were described, analyzed osteometrically and odontologically, including the identification of sex and age, and compared by Tetyana Rudych [2015], while the traces of pathological lesions and traumas on the skulls and postcranial skeletons were studied by Oleksandra Kozak [2015]. Their crucial findings are given in Table 1. The morphological features on the skeletons put the persons from the grave slightly out from the hole GAC community. Pathological lesions are not entirely characteristic for the contemporary GAC populations. Healed and unhealed skull traumas in most individuals could be the evidences of interpersonal violence in the community possibly due to some extended contacts in the cluster. These is actual also for the traces of infectional diseases, which were found on the bones of most persons. The occupational markers on the occipital and postcranial bones as well as the signs of joint degeneration were probable consequences of long walking, heavy lifting, and archery.

The reported genetic examinations of three individuals from Ilyatka (no. 1, 2 and 7) revealed the dominance of the so-called ancient farmer ancestry (ca. 75%) combined with western hunter-gatherers ancestry (estimated until ca. 25%) [Mathieson *et al*. 2018]. Moreover, the results obtained for Ilyatka are fully consistent with the genetic characteristics of six GAC individuals from Kierzkowo, Poland. This allowed the conclusion that "individuals from two sites in Poland and Ukraine form a tight genetic cluster, showing genetic homogeneity over a large distance" [Mathieson *et al.* 2018].

Furthermore, we have now figures for stable isotope content in bones, specifically of carbon ^{13}C and nitrogen ^{15}N (Table 2). The series is very compact and shows a basic agreement of isotope content in all individuals: intra-site $\delta^{13}C$ range is 0.4‰, and intra-site $\delta^{15}N$ range is 0.6‰. The content of both isotopes indicates a diet of chiefly animal-origin products with a share of C_3 plants, with the food coming mainly from terrestrial eco-systems [cf. Gerling 2015, Fig. 6.16]. No significant differences were noticed between men and women. For the former,

$\delta^{13}C$ ranges from -20.1‰ to -19.8‰, while $\delta^{15}N$ – from 9.2‰ to 9.8‰. For the latter, the respective ranges are -20.2‰ to 19.9‰ and 9.3‰ to 9.5‰. This small variability can be explained by a similar diet of all examined individuals. Perhaps only the narrower variability range of $\delta^{15}N$ in women suggests a very close similarity of their diet and slightly greater differences in the case of males.

Table 1

Ilyatka, Khmelnytskyi Province. Basic anthropological data. Foll. Rudych 2015 and Kozak 2015

Individual	**Sex**	**Age**	**Location and way of deposition**	**Traces of traumas and diseases**	**Comment**
1	male	45-55	in the main concentration of bones; without anatomic order	Vertebral diseases, traces of meningeal reactions, dental diseases (abscess cavity, parodontopathy, calculus); chronic respiratory and middle ear inflammations, osteomyelitis of the tibia, signs of systemic infection disease.	Mathieson *et al*. 2018 (as sample ILK001)
2	male	40-50	in the main concentration of bones; without anatomic order	Blunt healed trauma (26×27 mm, depth 3-4 mm) on the right frontal bone; dental diseases (antemortal tooth lost, calculus, granuloma formation, parodontopathy), chronic respiratory and middle ear inflammations, signs of chronic infection disease on the scull. Healed trauma of the right knee (ligamentopathy).	Mathieson *et al*. 2018 (as sample ILK002)
3	male	20-25	in the main concentration of bones; without anatomic order	Probable surface healed trauma on the left frontal bone, healed fracture of the distal radius (Colle's fracture), traumatic ossification of the ligaments of the right leg. Traces of the possible latent TB meningitis, *cribra orbitalia* (trace of anemia); chronic respiratory and middle ear inflammation, dental calculus, extensive teeth enamel hypoplasia as a stress marker.	
4	male	25-35	in the main concentration of bones; without anatomic order	Probable perimortal trauma of the posterior right parietal bone (round unhealed penetrating injury with diameter ca.30 mm). Traces of possible latent TB meningitis; chronic inflammation of the middle ear and respiratory sinuses; dental diseases (calculus, parodontopathy), sever tooth abrasion with enamel chipping and tooth crown fracture. Slight periosteal reaction on the long bones.	

Individual	Sex	Age	Location and way of deposition	Traces of traumas and diseases	Comment
5	female	30-35	in the main concentration of bones; without anatomic order	Probable trauma (fracture) of the sacrum; chronic inflammation of the middle ear and respiratory sinuses, rhinitis; dental diseases (calculus, caries, granulomas, parodontopathy); severe tooth abrasion with enamel chipping; possible traces of latent TB leptomeningitis	
6	female	25-35	deposited SE from the main concentration; in anatomic order	Healed surface depression (diam. 13 mm) on the left parietal bone; subacute inflammation of the maxillary sinus; traces of meningeal reaction (possible latent TB meningitis), dental diseases (caries, calculus, parodontopathy); severe abrasion with enamel chipping	
7	female	20-30	deposited W from the main concentration; in anatomic order	Chronic inflammation of the middle ear and respiratory sinuses; traces of meningeal reaction (probable latent TB meningitis); dental diseases (calculus), teeth enamel hypoplasia. Severe taphonomic changes.	Mathieson *et al*. 2018 (as sample ILK003)

Absolute chronology of Ilyatka burials

As already mentioned, the archaeogenetic studies were accompanied by the ^{14}C dating of samples collected from Individuals 1, 2 and 7; the determinations have laboratory designations of MAMS-0072–MAMS-0074 [Mathieson *et al*. 2018, Suppl. Information]. In 2020, radiocarbon age determinations were performed on bone samples collected from all the seven individuals buried in the Ilyatka grave. For this purpose, the Poznań Radiocarbon Laboratory used the AMS method (determinations Poz-129625–Poz-129631). It is worth adding that the stable-isotope content values discussed above rule out a reservoir effect, i.e. making the radiocarbon age of bone remains older. All age determinations are shown in Table 2.

A comparison of both sets of determinations (MAMS and Poz) reveals a discrepancy between them. The MAMS determinations are clearly older than Poz ones: by 151 radiocarbon years (Individual 1), 142 years (Individual 2) and 150 years (Individual 7). Agreement ranges are small, although it is possible to calibrate jointly each pair. However, due to the systematic time shift of the MAMS series, mentioned above, a decision was made to exclude it from further considerations

Table 2

Ilyatka, Khmelnytskyi province. Results of radiocarbon datings and stable isotopes analysis. Calibration in OxCal v4.4.2 [Bronk Ramsey 2020]; atmospheric data from Reimer *et al.* 2020

Individual	Lab. no.	Sample	Age 14C (BP)	Age cal BC		Stable isotopes	Comments
				68.3% probability	95.4% probability		
1	MAMS-0072	human bone	4221±22	2893 (40.1%) 2869calBC 2801 (28.2%) 2778calBC	2900 (47.0%) 2857calBC 2806 (40.7%) 2752calBC 2723 (7.8%) 2701calBC		Mathieson *et al.* 2018 (as sample ILK001)
	Poz-129625	human bone	4070±35	2835BC (6.1%) 2819BC 2666BC (7.8%) 2646BC 2636BC (41.1%) 2568BC 2526BC (13.3%) 2497BC	2851BC (11.4%) 2809BC 2747BC (3.4%) 2726BC 2698BC (80.7%) 2476BC	$\delta^{13}C$ = -19.8‰ $\delta^{15}N$ = 9.2‰	0.9%N 4.6%C, 1.9%coll
2	MAMS-0073	human bone	4192±22	2881 (15.8%) 2862calBC 2805 (41.6%) 2756calBC 2719 (10.9%) 2704calBC	2889 (24.1%) 2846calBC 2812 (50.2%) 2742calBC 2731 (21.1%) 2675calBC		Mathieson *et al.* 2018 (as sample ILK002)
	Poz-129626	human bone	4050±35	2627BC (38.1%) 2561BC 2539BC (30.1%) 2492BC	2843BC (5.0%) 2814BC 2672BC (90.5%) 2470BC	$\delta^{13}C$ = -20.1‰ $\delta^{15}N$ = 9.4‰	0.8%N 4.4%C, 3.2%coll
3	Poz-129627	human bone	4120±35	2856BC (20.8%) 2807BC 2751BC (10.8%) 2723BC 2701BC (33.0%) 2622BC 2596BC (3.7%) 2585BC	2871BC (26.3%) 2799BC 2780BC (69.2%) 2576BC	$\delta^{13}C$ = -19.9‰ $\delta^{15}N$ = 9.5‰	1.0%N 5.2%C, 2%coll
4	Poz-129628	human bone	4045±35	2624BC (35.4%) 2560BC 2539BC (32.9%) 2491BC	2839BC (3.5%) 2816BC 2670BC (91.9%) 2469BC	$\delta^{13}C$ = -19.9‰ $\delta^{15}N$ = 9.8‰	2.5%N 8.5%C, 4.7%coll
5	Poz-129629	human bone	4130±35	2860BC (22.8%) 2806BC 2754BC (13.8%) 2721BC 2703BC (31.7%) 2627BC	2872BC (27.7%) 2798BC 2782BC (67.7%) 2580BC	$\delta^{13}C$ = -20‰ $\delta^{15}N$ = 9.5‰	1.1%C 5.3%C, 3.4%coll
6	Poz-129630	human bone	4070±35	2835BC (6.1%) 2819BC 2666BC (7.8%) 2646BC 2636BC (41.1%) 2568BC 2526BC (13.3%) 2497BC	2851BC (11.4%) 2809BC 2747BC (3.4%) 2726BC 2698BC (80.7%) 2476BC	$\delta^{13}C$ = -19.9‰ $\delta^{15}N$ = 9.3‰	3.6%N 11.4%C, 5.4%coll
7	MAMS-0074	human bone	4225±22	2894 (44.9%) 2871calBC 2799 (23.4%) 2781calBC	2901 (52.6%) 2861calBC 2806 (36.7%) 2754calBC 2721 (6.1%) 2703calBC		Mathieson *et al.* 2018 (as sample ILK003)
	Poz-129631	human bone	4075±35	2837BC (7.7%) 2818BC 2667BC (51.9%) 2570BC 2519BC (8.7%) 2500BC	2857BC (13.6%) 2807BC 2751BC (4.8%) 2722BC 2701BC (61.1%) 2554BC 2546BC (15.5%) 2487BC 2482BC (0.5%) 2476BC	$\delta^{13}C$ = -20.2‰ $\delta^{15}N$ = 9.5‰	1.1%N 5.3%C , 2.9%coll

and rely on the Poznań series for establishing the absolute chronology of burials from the Ilyatka grave. It must be made clear that this may prove difficult as the dates fall on one of the plateaus of the calibration curve, spanning the period of *c.* 2850–2650 BC.

Observations made while exploring the Ilyatka grave and compared with the general knowledge about the funerary customs of GAC populations support several competing hypotheses. Crucial for judging them, the characteristics of the grave in question can be listed as follows:

(a) It lacks any stone walls; its cover consists of three stone slabs, with the largest one being placed in the centre

(b) Human remains in the main burial group were disarticulated and covered by the largest cover slab

(c) Burial 7 and possibly also Burial 6, placed on both sides of the main group, were articulated.

Characteristic (a) makes the Ilyatka grave atypical among the grave forms of the GAC eastern group, especially the Podillya subgroup. Typically, this group's graves take the form of a cist with walls of stone slabs. Often, their bottoms and covers are stone slabs as well [cf. Szmyt 1999: 25–26]. Such grave chambers could be entered, allowing for successive deposition of dead bodies. However, there is also evidence of several dead bodies being interred in them on a single occasion [Szmyt 1999: 28–29]. As no such structure is found in Ilyatka, it appears that the feature was used only once. But then again, the grave may have been opened and closed several times by removing or at least moving aside the stone slab over the grave pit.

Characteristic (b), namely the disarticulation of the remains of Individuals 1-5, is encountered in both the entire GAC oecumene and its eastern group, including Podillya. We know of such situations as, for instance, when making space for a new burial, the remains that had been deposited previously were moved aside thereby changing their arrangement into a disarticulated one. A case in point is Khartonivtsy II [Szmyt 1999: 28]. Perhaps then in Ilyatka too, the state that the main burial group was in resulted from the 'cleaning' of the grave space for new burials.

Characteristic (c), in turn, namely the presence of at least one or perhaps two articulated burials, and lying in an artificial order at that (on both sides of the main burial group), brings to mind the sophisticated arrangements of dead bodies of people or animals known from various GAC groups. An example is offered by a grave from Kolodiezhno, Volhynia, in which eight dead bodies were symmetrically arranged on both sides of the main burial [Szmyt 1999: 29]. This characteristic may indicate that both articulated burials were deposited at the same time or after a short time interval.

In sum, the three characteristics of the Ilyatka grave support at least four hypotheses:

(1) All the burials, i.e. the main group (Individuals 1–5, disarticulated) and the two burials outside it (Individuals 6 and 7), were interred at the same time

(2) Individuals 1–5 were placed first in the grave, followed by Individuals 6 and 7 (interred at the same time), which means that it was used twice

(3) Individuals were interred in the grave in three phases:

   a. first Individuals 1–5, followed by Individual 6 and Individual 7

   b. first Individuals 1–5, followed by Individual 7 and Individual 6.

(4) The grave witnessed seven successive burials, i.e. it was used in seven phases, with the remains of Individuals 1–5 being moved aside (disarticulating them in the process) prior to the interment of Individuals 6 and 7.

The hypotheses were tested using the modelling functionalities of the Oxcal v4.4.2 software [Bronk Ramsey 2020]. It turned out that none of them could be disproved.

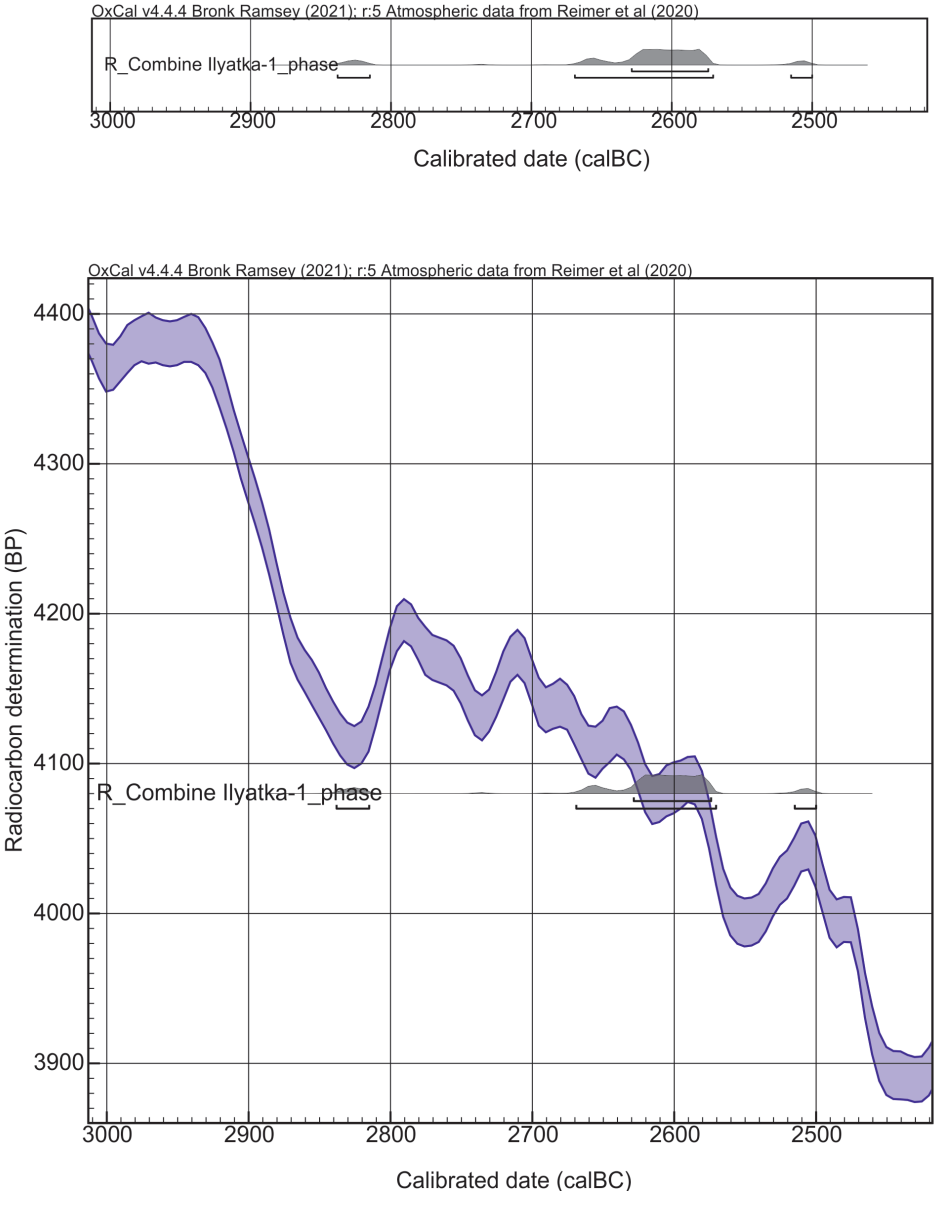
Model 1. Assuming that all the individuals were buried in the grave in one phase, its beginning would fall on 2671–2595 BC while its end – on 2616–2556 BC (probability of 68.3%; Fig. 5). Furthermore, a joint calibration of all seven determinations (Poz-129625–Poz-129631) proved fully admissible using the *Combine* function. A date thus obtained fits into the interval of 2629–2575 BC (probability of 68.3%) or 2670–2571 BC (probability of 95.4%).

Model 2. With two phases, the beginning of the grave use falls within the range of 2646–2590 BC (probability of 68.3%) or 2729–2576 BC (probability of 95.4%), while the end – within the range of 2621–2551 BC or 2658–2419 BC, respectively (Fig. 6).

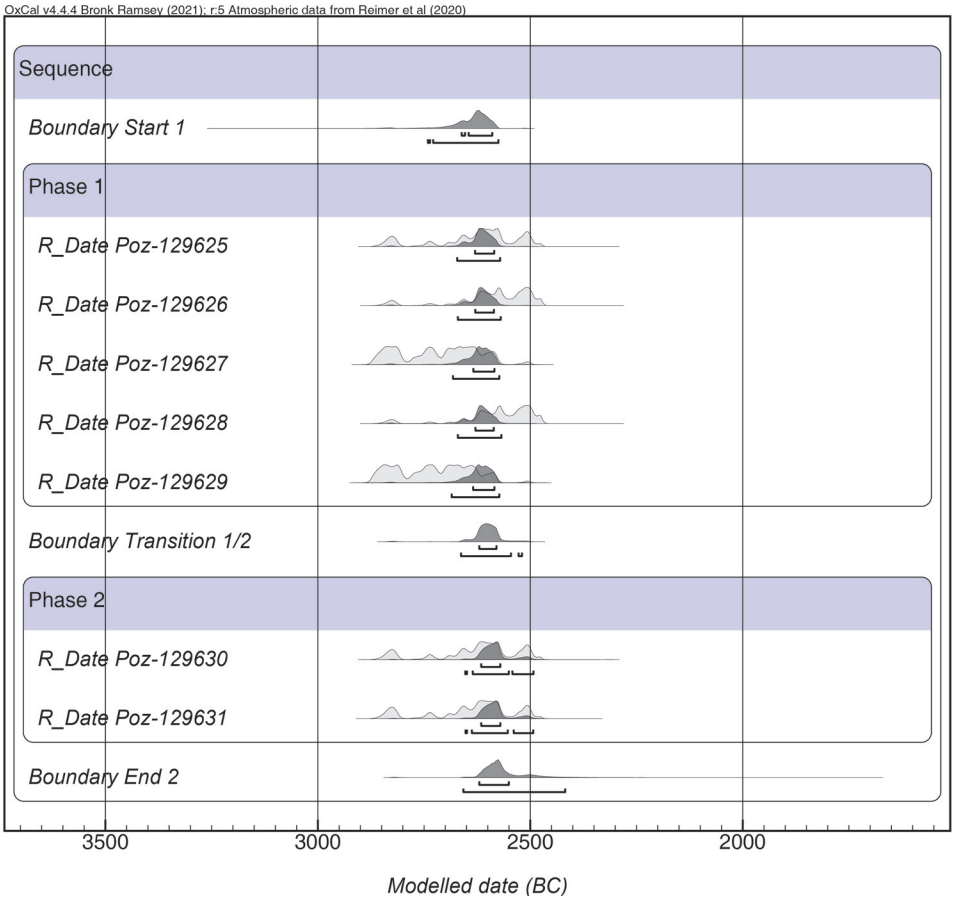
Model 3. Plausibly, there could have been three phases in both version A and version B. In model 3A, the period of grave use stays between the ranges of 2641–2588 BC and 2622–2557 BC (probability of 68.3%) or 2720–2573 BC and 2660–2446 BC (probability of 95.4%). In model 3B the period of grave use stays between the ranges of 2642–2589 BC and 2620–2544 BC (probability of 68.3%) or between 2705–2576 BC and 2658–2376 BC (probability of 95.4%).

Model 4. The series of determinations under discussion can also serve to build a model where seven dead bodies were successively deposited in the grave, i.e. a model in which there were seven phases of grave use. Its beginning would then fall within the range of 2701–2611 BC (probability of 68.3%), while the interment of dead bodies would end, with the same probability, within the range of 2616–2556 BC (Fig. 7).

In sum, it can be assumed that the Ilyatka grave was used over a period, covering the 27th and the first half of the 26th century BC. This period can hardly be narrowed due to a plateau in the calibration curve. It cannot be ruled out that the seven dead bodies were deposited in the grave on a single occasion or in several phases (two, three or even seven).



F i g . 5. Ilyatka, site I, Khmelnytskyi province. Model 1 (one phase). Calibration in Oxcal v4.4.4 [Bronk Ramsey 2021]



F i g . 6. Ilyatka, site I, Khmelnytskyi province. Model 2 (two phases of burial depositions: first 1-5, then 6 and 7). Calibration in Oxcal v4.4.4 [Bronk Ramsey 2021]

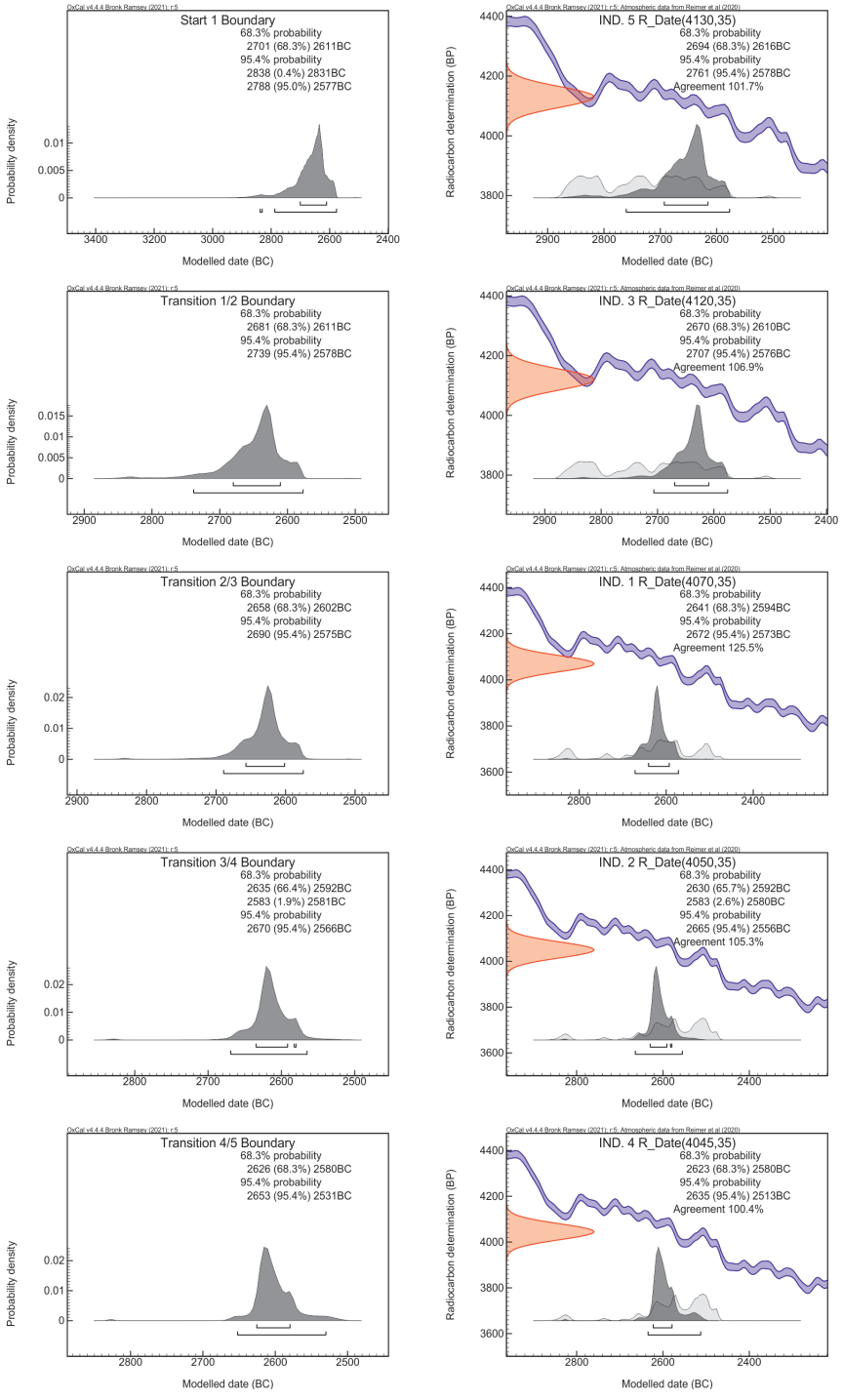


Fig. 7A. Ilyatka, site I, Khmelnytskyi province. Model 4 (seven phases of burial depositions). Calibration in Oxcal v4.4.4 [Bronk Ramsey 2021]

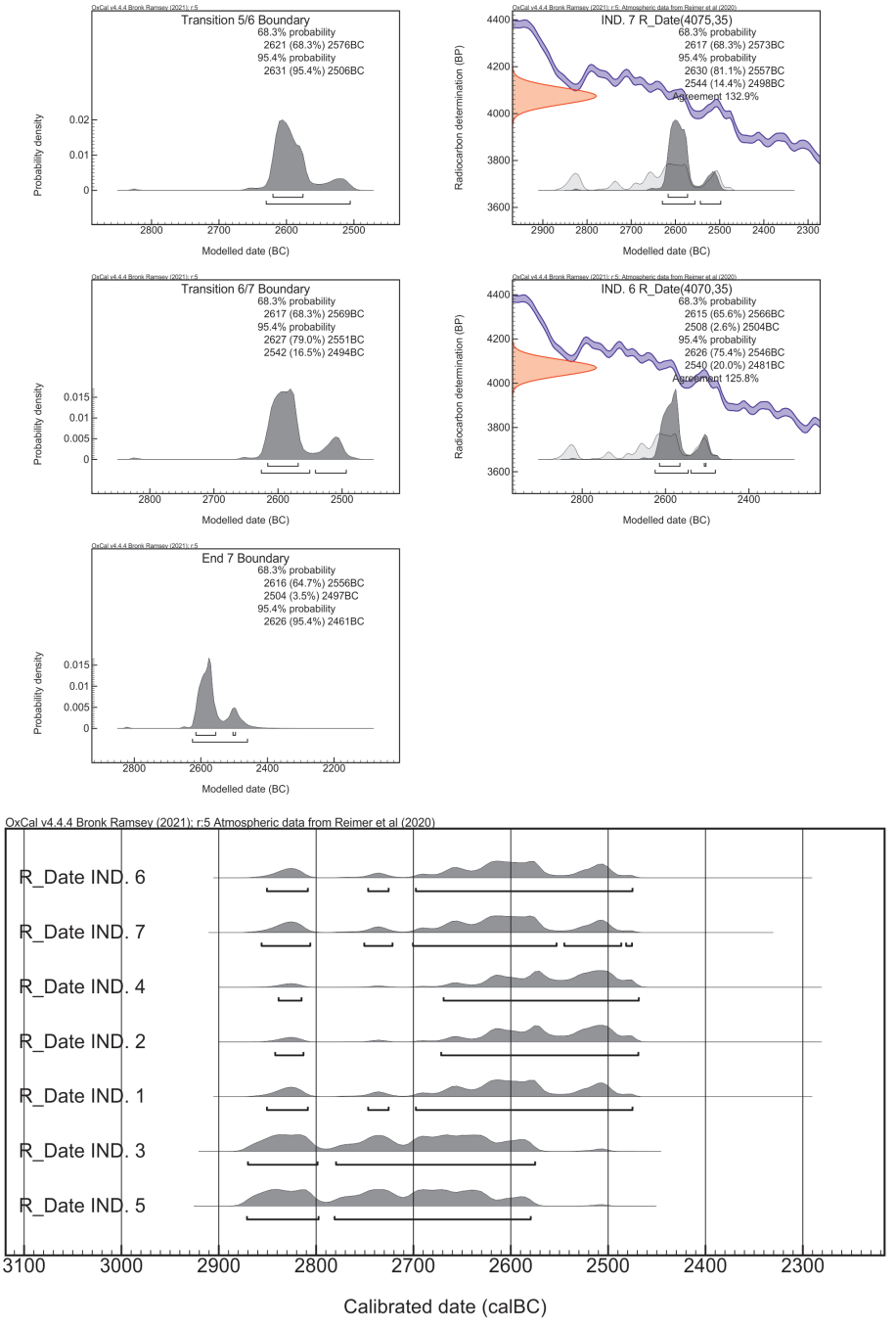


Fig. 7B. Ilyatka, site I, Khmelnytskyi province. Model 4 (seven phases of burial depositions). Calibration in Oxcal v4.4.4 [Bronk Ramsey 2021]

GLOBULAR AMPHORA CULTURE SITE CLUSTER ON THE UPPER SOUTHERN BUG

The GAC site cluster on the Southern Bug, eastern Podillya, is small (Fig. 1), currently comprising 16 explored sites. The first was discovered in the late 19th century during amateur excavations at Novaya Sinyava [Neyman 1889: 42–44]. In all likelihood this was a destroyed grave from which only one vessel survived and two shards of another one. The 1930s witnessed the discovery of another grave at Tartak [Sitsinski 1930], while in the 1960s and 1970s two other graves were exposed at Letychev-Zavovk and Gorbasiv [Prikhodnyuk 1970; Maleyev, Yakubovskiy 1974; Sveshnikov 1983: 52–53; Maleyev 1986: 99–103; Zakhar'ev 2015: 15–20]. Already in the 21st century, the grave in Ilyatka, discussed here, was discovered. On two successive sites, GAC pottery shards were unearthed: Samchyntsy [Sveshnikov 1983: 54] and Tokarivka (unpublished material from excavation by M. Szmyt, V. Rud' and P. Włodarczak). From Vinnitsa, we know of an intact vessel which may come from a grave but no information on its context is available [Sulimirski 1968: 197; Sveshnikov 1983: 53–54]. This series of finds is supplemented by eight chance finds of flint axes, showing technological and typological traits consistent with GAC standards, from Bushynka, Golodky, Meleshiv, Nikiforivtsy, Noskivtsy, Orlivka, Yaroshenka and Zhmerynka [Szmyt 2009; 2021].

Altogether, 16 GAC sites were explored in the area in question, including five graves, three sites that yielded pottery characteristic solely of the GAC, and eight stray finds (without a context) of flint axes, resembling GAC forms. All these sites were discovered by chance. They are distributed over a distance of about 200 km, from Samchyntsy in the northwest to Orlivka in the southeast (Fig. 1). They are mostly located in the hinterland of the upper Southern Bug valley, in smaller valleys joining it.

Despite their still relatively small number, the presence of GAC settlement remains in the area under discussion is significant. At this juncture, two aspects are worth noting: (**a**) connection to the eastern direction of the expansion of GAC populations, ultimately leading towards the drainage basin of the middle Dnieper and (**b**) location in the broad borderland adjoining the oecumene of the Yamnaya (Pit-Grave) culture population.

a. The middle Dnieper area was penetrated by GAC populations. This is evidenced by sources discovered on both western and eastern banks of the Dnieper. In the west, GAC sites were identified in the northwestern belt of the forest-steppe, stretching between the confluences of the Irpin and Dnieper in the north and the Ros and Dnieper in the south. These are, for instance, grave remains from Kanev and a campsite at Khodosovka-Dibrova as well as flint axe finds at Doslidnitskoe and Tuta Dmitrovskaya [Sveshnikov 1983: 36; Szmyt 1999, Cat. 1D; Łysenko,

Szmyt 2011: 239–244]. Two GAC sites are known from the eastern part of the Dnieper valley: Kyiv-Nikolskaya Slobodka and Bile Ozero 1 [Sveshnikov 1983: 36; Szmyt 1999, Cat. 1C: 26; Rozdobudko, Yurchenko 2005; Łysenko, Szmyt 2011: 239–243].

The characteristics of pottery and bone goods from the sites on the Dnieper show that the GAC communities that penetrated this area came from both Volhynia and Podillya. The latter region is suggested by, for instance, a 'fish scales' ornament and bone buckles [Łysenko, Szmyt 2011, Fig. 2: 1,4; 5], hence, exactly the same characteristics as those observed in Ilyatka. From this perspective and considering the geography of forest-steppe routes [Kośko, Kločko 2011], one must conclude that the settlement cluster on the Southern Bug was located in a 'transit area' and helped people migrate to the Dnieper area. The shortest route in terms of geography may have run along the Ros valley, which starts about 50–60 km east of the GAC settlement cluster on the Southern Bug.

b. The forest-steppe zone between the Carpathians and Dnieper river is where direct contacts were possible between GAC and Yamnaya culture communities. That they did indeed come into contact is shown by a large number of sources such as 'pure' GAC or Yamnaya culture graves as well as syncretic features. The latter respected the principal rules of a 'Yamnaya' funerary ritual, supplementing it with single GAC artefacts – mostly vessels [Szmyt 2021: 416–419]. At present, most archaeological information concerns the western end of the forest-steppe (on the Prut and Dniester rivers), less information is available on its eastern end (on the middle Dnieper), while the least is known about its central portion on the Southern Bug [Szmyt 2021: 425–426].

The Ilyatka grave changes this situation. First and foremost, its established absolute chronology – if only a broad one – bears out the presence of GAC communities on the Southern Bug in the 27th and in the first half of the 26th century BC. Another grave from this region which was radiocarbon dated (Poz-129657 4120±35 BP), one from Zaychiki [Zakhar'ev 2015: 15–20], indicates a possibility that GAC groups could be present there as early as the 28th or even the second half of the 29th century BC.

However, the Ilyatka grave has a peculiar characteristic which finds no analogy in the GAC. Typical of it, a stone cist is missing from the grave and replaced only by slabs covering burials. Importantly, formally similar arrangements are found in the Yamnaya culture. Such graves covered by stone slabs were documented on the middle Dniester and on the lower Southern Bug at the closest. In the Dniester Barrow Complex, in the vicinity of Yampil, a stone slab cover was found in Prydnistryanske, barrow IV, feature IV/4 [Klochko *et al*. 2015, Fig. 29-30] and in Pysarivka 2/3 [Ivanova, Toschev 2015, Fig. 18:9]. On the lower Southern Bug, stone slab covers were recorded for instance in Bugskoye, barrow 2/grave 7 [Shaposhnikova *et al*. 1986, Fig. 20:4], Bugskoye, barrow 3/grave 2 and 16 [Shaposhnikova *et al*. 1986, Fig. 21:4,8], Bugskoye, barrow 6/grave 18

[Shaposhnikova *et al*. 1986: Fig. 24:4,6], Pokrovka, barrow 1/grave 6 and barrow 3/grave 4 [Shaposhnikova *et al*. 1986, Fig. 29:1-3,10] or Novoyurevka, barrow 1/grave 15 [Shaposhnikova *et al*. 1986, Fig. 29:13].

The Ilyatka grave, however, does not correspond fully to Yamnaya culture graves. In the Yamnaya graves stone slabs cover a relatively deep pit, most often rectangular in plan and cross-section, whereas in Ilyatka, the pit outline could not be detected. Thus, tying a design untypical of the GAC, namely a stone cover lacking any additional stone structure, to patterns drawn from the Yamnaya culture is a hypothesis calling for further study. It is worth recalling that genetic tests did not reveal any elements of steppe origin in the three analyzed individuals from Ilyatka.

CONCLUSION

Discussed in this article, the multi-burial grave from Ilyatka is the first GAC feature from the drainage basin of the upper Southern Bug to be subjected to comprehensive bioarchaeological and chronological analyses. The time of its use when the remains of seven people (four men and three women) were deposited in it was determined to be 2700–2550 BC. The feature is part of a small GAC site cluster on the upper Southern Bug, made up of 16 sites. The importance of the cluster follows from its location in one of the crucial communication hubs of the Ukrainian forest-steppe. This makes the cluster vital for the exploration of the forest-steppe settlement by GAC communities, their expansion towards the middle Dnieper area, and connections to Yamnaya culture groups. Perhaps a borrowing from the latter unit, the Ilyatka grave form featured, untypically of the GAC, a stone slab cover placed over burials. This hypothesis requires further study. However, it should be noted that this is also important in the light of current genetic research results. For the time being, no steppe elements have been revealed in the genetic makeup of the GAC population [Mathieson *et al*. 2018; Schroeder *et al*. 2019]. On the other hand, other studies indicate the possibility of reverse gene flow: from the GAC population to the Yamnaya culture population [Wang *et al*. 2019]. Research into this intriguing problem will continue.

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