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On the Attribution of Lithic Industry from the Early Paleolithic Site of Bogatyri/Sinyaya Balka, the Taman Peninsula

The study describes and compares lithic artifacts from the Early Paleolithic site of Bogatyri/Sinyaya Balka, as well as those collected in coastal screes and on the nearby beach. Interdisciplinary studies, which have been ongoing at the site for more than 20 years, have made it possible to conclude that the age of the site exceeds 1 mln years, and that it was a butchering place. In the Early Pleistocene, a lacustral crater of a mud volcano was situated nearby. This mud marsh was a place where many large mammals such as Taman elephants and Caucasian elasmotheres bathed and perished. Humans procured them before they had drowned, and butchered them, as evidenced by the specific toolkit. The industry of the site is attributed to the Taman variety of the Oldowan stage of the Early Paleolithic. As the comparative analysis indicates, lithics from the screes and from the beach near the site are morphologically different from those at the site. The rocks of which they are made are of a higher quality, and the types are more expressive, which especially concerns cores and spalls. This industry should be attributed to the Taman variety of the Acheulean stage of the Early Paleolithic.

Keywords: *Early Paleolithic, Northern Eurasia, Oldowan and Acheulean technological stages, Taman Peninsula, Bogatyri/Sinyaya Balka, lithic industry.*

Introduction

In 2022, 20 years had passed since the discovery of an archaeological site at the stratotype paleontological site of Sinyaya Balka, on the Taman Peninsula: lithic artifacts were found in association with animal bones in the course of a sightseeing tour to an outcrop (Bosinski et al., 2003). The very first cleanings and excavations of the site showed that stone tools and bones of large animals had been deposited together. Thus, a unique Early Paleolithic archaeological site was discovered; it was given the double name Bogatyri/Sinyaya Balka, because the local name of this place is "Cape Bogatyr". The co-occurrence of artifacts and bones of large animals makes it possible to correlate reliably the traces of ancient human activities to the time of existence of the Taman faunal complex of Eastern Europe, i.e., to the range of 1.4–0.7 Ma BP. Since 2005, Bogatyri/Sinyaya Balka has been studied by the Azov Multidisciplinary Expedition of the Institute for the History of Material Culture RAS, with the participation of paleontologists and geologists from various academic institutions and

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museums of Russia. During the excavations of the site, the Taman coastal cliffs were constantly surveyed; as a result of these survey trips, four more habitation sites and a number of Stone Age localities were discovered in the immediate vicinity of the main site, over a distance of 1 km along the coast. On the basis of these finds, the Taman Paleolithic archaeological complex was compiled by 2011 (Fig. 1). The history and results of this study have been described in numerous publications (Kulakov, 2018b, 2019a; Ranniy i sredniy paleolit…, 2022: 45–52; Shchelinsky, 2021; Shchelinsky, Kulakov, 2009; Kulakov, 2019b; Shchelinsky et al., 2010b).

General information on the site

On the basis of the findings of many years of interdisciplinary studies at Bogatyri/Sinyaya Balka, this site was interpreted as a unique place of meat procurement by ancient *Homo* groups. According to modern reconstructions, in the Early Pleistocene, there was a lacustrine depression in the crater of a mud volcano filled with fresh water, with swampy shores formed by hilly breccia, on the coast of the brackish-water basin. This lake attracted large animals (Taman elephants and Caucasian elasmotheres), coming to water and take "mud baths". Most likely, people tracked when one of the animals got stuck in the mud and could not get out on its own, finished off the animal, and tried to butcher the carcass as quickly as possible until it finally drowned in the mud (Kulakov, 2018c, 2020). A whole set of various butchering stone tools was used to this end. The butchering of carcasses of large animals is vividly evidenced by very large and robust choppers and coarse chopping tools found *in situ* in unredeposited layers; these tools were designed to cut through thick skins and to separate large parts of carcasses (Kulakov, 2018a). The people involved in the procurement of meat supposedly did not stay long at the site (only for the time required for the work), but lived in more secluded places nearby. Some culture-bearing lenses around the site are probably the remains of such short-term habitation sites (Fig. 1) (Kulakov, 2018c). When the site was abandoned and no longer used as a butchering-place, catastrophic post-deposition changes began. A huge fragment of the ancient coast, including the remains of the Bogatyri/Sinyaya Balka site, was separated from the main land, overturned on its side, and covered with volcanic mud

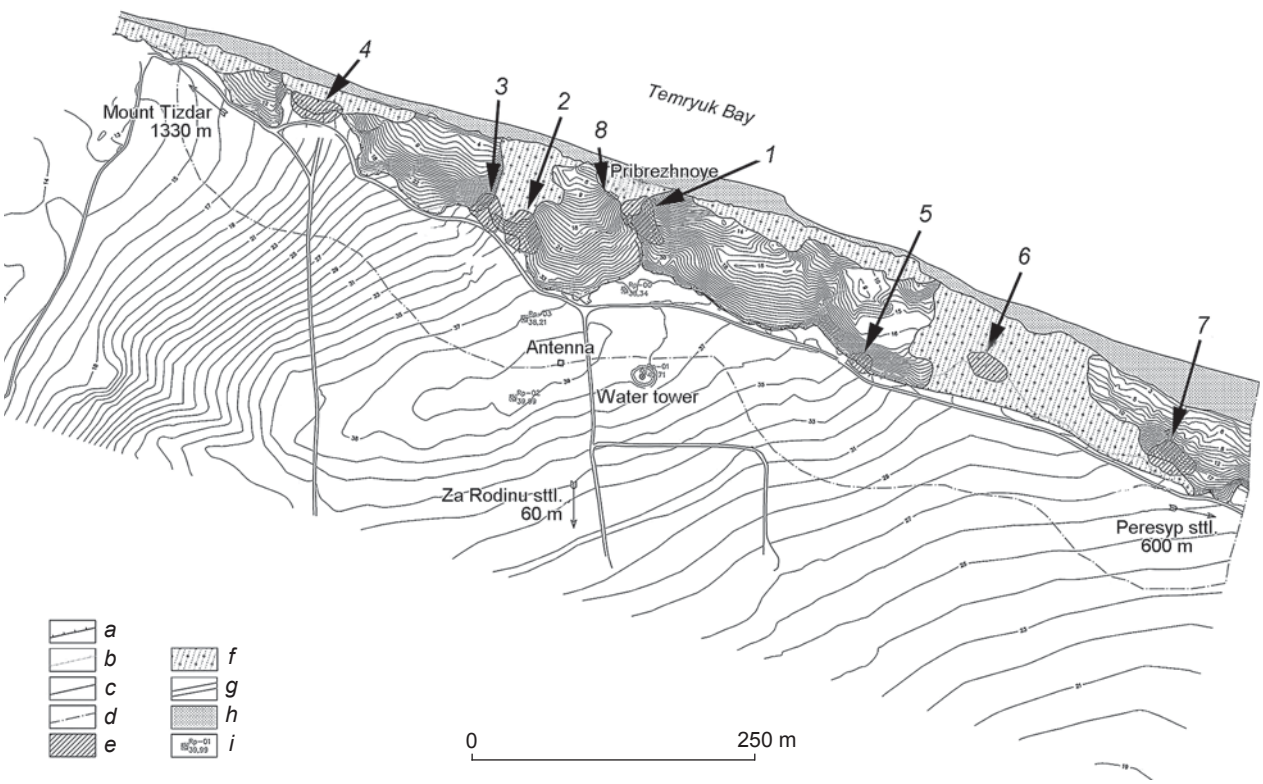

Fig. 1. Topographic plan of the Taman Paleolithic complex. 2011. *Performed by M.A. Galkin*.
1 – the site of Boratyri/Sinyaya Balka; *2* – the site of Rodniki-1; *3* – the site of Rodniki-2; *4* – the site of Kermek; *5* – the locality of Lisy; *6* – the locality of Peresyp-1; *7* – the locality of Peresyp-2; *8* – the locality of Beregovoye (Rodniki-4).
a – coastline in 2011; *b* – the same in 2006; *c* – boundary of the archaeological site; *d* – boundary of the protective zone of the archaeological site; *e* – territory of the site; *f* – collapse zone of the edges of the coast and construction fillings; *g* – earth road; *h* – beach area; *i* – benchmark.

deposits. Because of this, the cultural layers survived till nowadays (Kulakov, 2020).

Recently, the sites of the Taman Paleolithic complex have been subjected to the ever-accelerating destruction of the Sea of Azov's coast. The Taman coast in the area from the village of Peresyp in the east to the village of Primorsky in the west is being constantly destroyed at various rates depending on the state of wetting of the "mainland" clay of the ancient Kuyalnik basin; the sediments overlying the clay's sliding surfaces creep into the sea. In 2006, in the area of the Taman Paleolithic complex, the process of the sliding of an extensive fragment of the bank, along an extended fissure, began. As a result, in 2010–2011, the northwestern end of Cape Bogatyr, including the northern part of the excavation, started to erode; the lower excavations of 2005 and 2008 at Rodniki-1 were also destroyed. The process of destruction was further exacerbated after 2010, owing to intense development of barren land between the settlements of Peresyp and Za Rodinu for private housing (Fig. 1). In 2013–2014, there was a heavy caving of the bank to the west of Cape Bogatyr. The result was the collapse of the site of Rodniki-1, which turned into a huge scree slowly creeping into the sea (Fig. 2). The last straw in the rapid destruction of the bank was the construction in 2021 of a road to the sea in a landslide cirque between Bogatyri/Sinyaya Balka and Rodniki-2 (Fig. 2). The cracks formed and enlarged as a result of this impact will lead to the collapse of a huge fragment of the bank including Cape Bogatyr with the archaeological site (Fig. 2). We can hardly predict when this collapse will happen, but most likely in the near future.

On the other hand, the destruction of the coast in the area of the Bogatyri/Sinyaya Balka and Rodniki-1 sites created an exceptional situation. When the screes reach the sea, they are washed off by the water and many stones remain on the beach. Among these stones, a representative collection of artifacts was assembled, which were different from the lithics yielded from the excavation.

Lithic industry

The lithic artifacts from all the sites of the Taman complex were made from local rocks—heavily silicified dolomite, according to the identification made by petrographer I.V. Tibilov (St. Petersburg State University) in 2006 based on the samples from the excavation at Bogatyri/Sinyaya Balka. Dolomites in the form of flattened blocks, flat slabs, and tablets of various sizes occur in clays, sands, and hilly breccias, and are easily accessible in coastal outcrops, screes, and on the beach. Raw nodules differ not only in size, but also in color, fracturing, crust thickness, and most importantly, in grain structure and porosity (Shchelinsky, Kulakov, 2009). Experiments by V.E. Shchelinsky and E.Y. Girya have shown that these rocks, regardless of grain sizes, can easily be split with both hard and soft hammers; the detached spalls and shatters have sharp edges and are quite acceptable for processing. The main disadvantage of Taman dolomites

Fig. 2. View of the Taman complex from a quadcopter. 2022. *Photo by V.V. Titov*.
1 – the site of Bogatyri/Sinyaya Balka, excavation area; *2* – the site of Rodniki-2; *3* – landslide cirque at Rodniki-1; *4* – scree at Rodniki-3; *5* – scree at Beregovoye (Rodniki-4); *6* – Cape Bogatyr, collapse of the sand column; *7* – fissures in sediments that will lead to further shore collapse; *8* – road to the beach constructed in 2021 in a large landslide cirque.

is their fragility. The excavations have shown that some fragile stones can fall apart spontaneously in the layer. At Bogatyri/Sinyaya Balka, local dolomites of various structures were used, which explains the different states of preservation of the artifacts. The items in the collection, with the exception of some artifacts from layers 1 and 2, are not rounded, and retain sharp edges and ribs. All the artifacts are patinated to varying degrees and have undergone strong chemical weathering (Ibid.).

Currently, the collection of lithic artifacts includes 593 specimens, more than half of which are tools (Table 1). Notably, 352 artifacts (59.4 %), including 212 (64.24 %) tools, come from unredeposited layers 1–4. Primary reduction at the Oldowan technological stage of the Early Paleolithic was determined primarily by the quantity and quality of available raw materials. At the site under consideration, they were abundant, easily accessible and occurred in tabular pieces, which was favorable for ancient knappers. As early as 1 million years ago, they not only simply split flattened pieces of dolomite and detached flakes with sharp edges—the so-called flake-like spalls—but also invented a technique of "marginal knapping of dolomite tablets". This technique was used for the detachment of spalls retaining crust on their flaking platforms and distal ends. Almost all such spalls show non-conical proximal ends (Ibid.). Core knapping is illustrated by only a few available cores. Therefore, very few spalls have been interpreted as intentional; there are only 51 of them in the unredeposited layers, and most are small, up to 5 cm long. At the initial stage of the studies at the site, many fragments with a kind of a conchoidal fracture on one of the surfaces were classified as "flake-like spalls". Later, with the increasing number of the observed cases of dolomite pieces cracking into fragments and chatters, the attribution of spalls began to be treated with more caution. Now, a piece can be identified as a flake only in the case where it shows the whole set of features: striking platform with a point of percussion, percussion bulb or non-conic proximal end, recognizable distal end, and identifiable ventral and dorsal surfaces. Accordingly, the number of identified flakes has decreased in recent years of excavations.

The composition of the Bogatyri/Sinyaya Balka toolkit (without finds from the screes) has remained generally the same during all the years of excavations (Table 2) (Ibid.). The most numerous are choppers (Fig. 3, *5*). These flattened tools were made from fragments of various sizes of dolomite slab. All the choppers in the collection are single-sided, with straight, convex, or concave working edges; there are tools with two opposite cutting edges. Accommodation treatment included the careful selection of fragments with the shape ensuring a better hold in the hand.

Over the years of studies, a representative collection of very large and robust choppers has been assembled; therefore, at present, the weight of the items is used to distinguish between these tools. The borderline between choppers and gigantolite-choppers (11 spec.) is a mass of 2.5 kg. The group of super-heavy items, along with choppers, also includes large coarse chopping tools (Table 2) (Kulakov, 2018a).

The category of end-scrapers is the second largest in the collection (Table 2). Notably, out of 47 items, only five were fashioned on spalls; all these are small, up to 3 cm long. The morphology of the end-scrapers is diverse, but largely it was determined by the shape and robustness of the original blank. The main feature for their identification is the semicircular scraping working-edge prepared through fine trimming and multifaceted retouch. All the end-scrapers on shatters are carinated forms, including a group (13 spec.) of core-like ones. Very expressive are the end-scrapers on thin tablets with semicircular working-edges treated over a significant part of the margins (5 spec.) (Fig. 3, *1*).

The category of points is also numerous in the collection (Table 2). This category comprises small items, including three specimens made on flakes, a great number of medium-sized points (7–10 cm), and large robust points exceeding 10 cm (Fig. 3, *4*). All these items are attributed to one category by the presence of a retouched

Table 1. **Distribution of lithic artifacts**

Place of discovery	Core-like	Spalls		Tools	Total
		Large	Small		
Layer 1, 2, sq. 59/1–2	–	1	7	5	13
Layer 3, sq. 59/3–8; 60/1–8	9	17	41	98	165
Layer 4, sq. 61/1–7; 62/1–6	14	20	31	109	174
Layer 5, 6, sq. 63/1–6; 64/1–5; 65/1–4	8	21	18	47	94
Scree	11	29	36	71	147
Total	42 (7.1 %)	88 (14.8 %)	133 (22.4 %)	330 (55.6 %)	593

Table 2. **Distribution of tools**

Place of discovery	Choppers	Coarse chopping tools	Side-scrapers	End-scrapers	Points	Notched-denticulate tools	Beak-shaped tools	Retouched flakes	Retouched fragments
Layer 1, 2, sq. 59/1–2	3	–	1	1	–	–	–	–	–
Layer 3, sq. 59/3–8; 60/1–8	26	2	8	19	20	3	2	1	17
Layer 4, sq. 61/1–7; 62/1–6	32	2	17	21	15	2	4	1	15
Layer 5, 6, sq. 63/1–6; 64/1–5; 65/1–4	16	–	11	6	6	1	–	1	6
Scree	29	–	7	13	9	4	–	9	–
Total	106 (32 %)	4 (1 %)	44 (13.3 %)	60 (18.2 %)	50 (15.1 %)	10 (3 %)	6 (1.8 %)	12 (3.6 %)	38 (11.5 %)

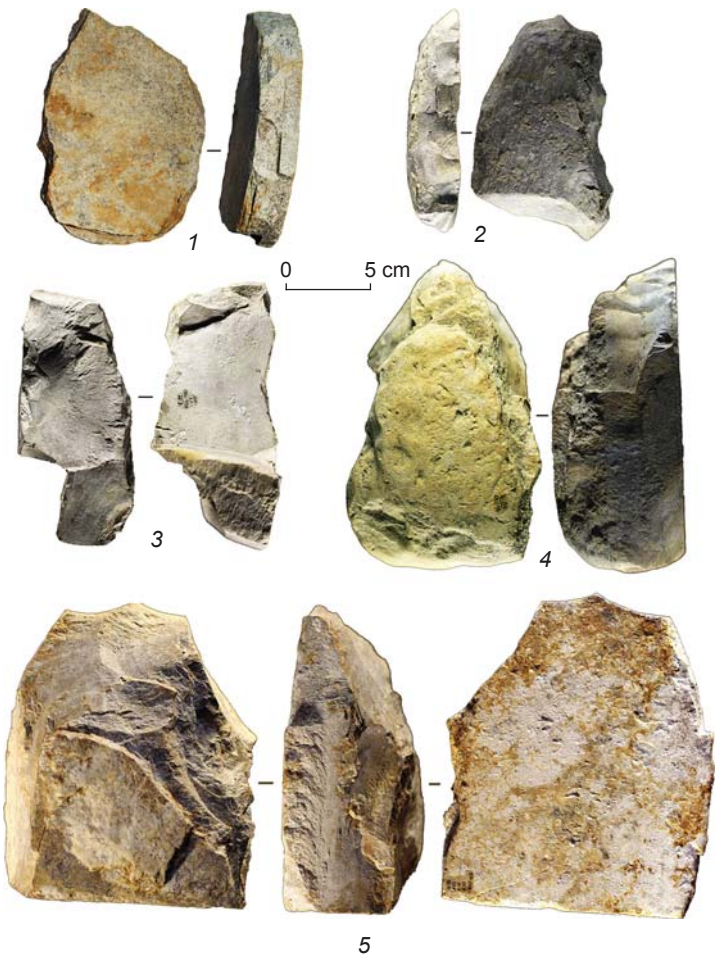

Fig. 3. Dolomite tools from Bogatyri/Sinyaya Balka.
1 – end-scraper on tablet; *2* – side-scraper on fragment; *3* – "chopper-like scraper" on fragment; *4* – robust point ("pick") on fragment; *5* – chopper on tablet. *2–4 – photo by E.Y. Girya.*

sharp protrusion (spur) shaped on the most convenient end of a dolomite fragment.

A significant number of side-scrapers has been identified (Table 2). These were also fashioned on dolomite fragments; only four items were prepared on small flakes. Most of these tools are medium-sized (7–10 cm). The common feature of the side-scrapers is a fairly long straight or slightly concave working-edge on one of the sides, prepared through fine trimming and multifaceted retouch (Fig. 3, *2*, *3*).

Few notched-denticulate and beak-shaped tools have been identified (Table 2). All of them were made on tablets. Three small retouched flakes were recovered. Dolomite fragments bearing minor areas of retouch are numerous (Table 2), but do not form any morphological series.

Thus, a long-term study of archaeological materials from Bogatyri/Sinyaya Balka confirms the initial definition of the lithic industry as a Taman variety of the Oldowan stage with a specific feature representing the "influence produced by local raw materials on the manufacturing technology and shape of tools" (Shchelinsky et al., 2010a: 18–19).

The mentioned recent destruction of the coast in the vicinity of the Taman Paleolithic complex is unfavorable for research; but at the same time, the situation provides the opportunity of simultaneously getting new information on the stratigraphy of sites, and the composition and morphology of

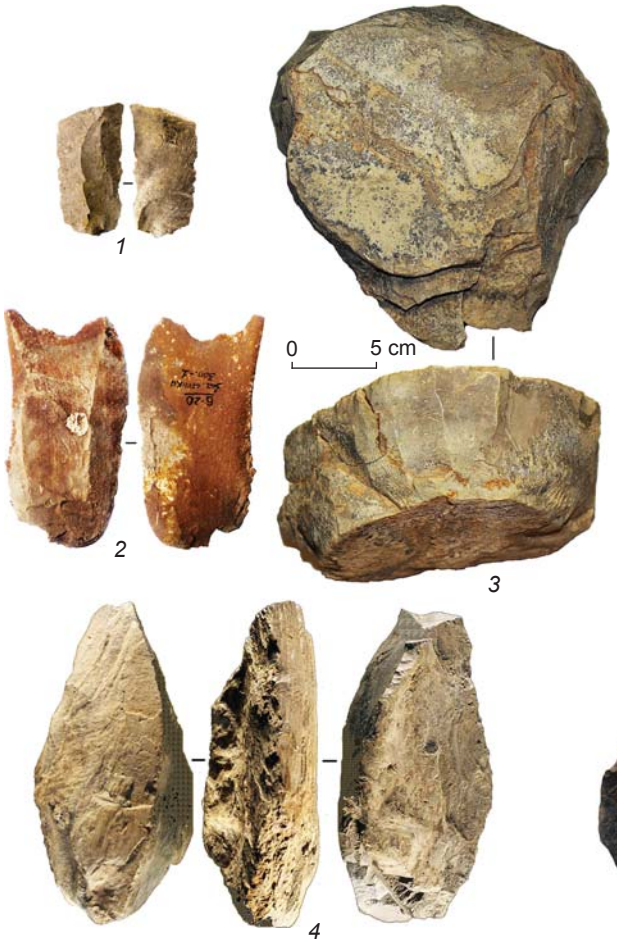

Fig. 4. Dolomite artifacts from the screes under the sites of Bogatyri/Sinyaya Balka and Rodniki-1. *1*, *2* – laminar flakes; *3* – tabular core with circular flaking surface; *4* – tool with bifacial working – proto-handaxe (?) on fragment (*photo by E.Y. Girya*).

artifacts. Starting from 2017, the huge screes formed on the coast, mainly on the western side of Cape Bogatyr and at the Rodniki-1 excavation site, made it possible to assemble a representative collection of lithic artifacts (55 spec.) designated as "artifacts from the screes" (Fig. 4). These artifacts were produced from the same local mixed-quality tabular dolomites as those from the excavation, but the former were manufactured from the highest quality fine-grained varieties of dolomite.

The first peculiar feature of this collection was the presence of well-prepared cores (4 spec.) therein. Especially expressive are the cores made from robust dolomite tablets, with half-circle flaking surfaces (Fig. 4, *3*). Genuine nuclear knapping is confirmed by the available flakes (26 spec.); some of these are really large, up to 10 cm long. True laminar flakes (Fig. 4, *1*, *2*), removed only through marginal knapping, are the most remarkable.

The toolkit is basically similar to that in the excavation's collection. Choppers with convex blades are prepared on large and flattened dolomite fragments (8 spec.); one of them is a gigantolite weighing more than 5 kg. Single-edged side-scrapers (7 spec.) are made on fragments of dolomite tablets of various sizes. End-scrapers (3 spec.) and points (2 spec.) are also fashioned on variously-sized, but more robust dolomite fragments. Denticulate and beak-shaped tools on fragments are few. A large subtriangular dolomite fragment, with traces of bifacial treatment, was the most unexpected find (Fig. 4, *4*); it was discovered in the scree at Rodniki-1 in 2006. This tool was

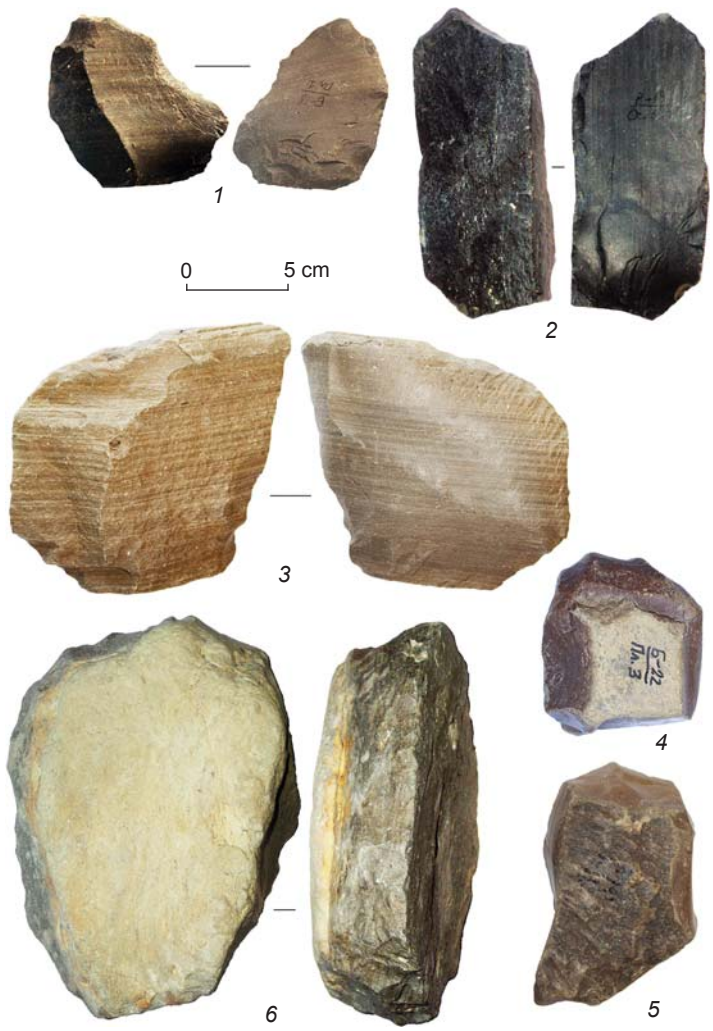

Fig. 5. Dolomite artifacts from the beach under the sites of Bogatyri/Sinyaya Balka and Rodniki-1. *1*, *3* – flakes; *2* – primary laminar flake; *4* – core-like end-scraper on fragment; *5* – "chopper-like scraper" on fragment; *6* – chopper on fragment.

interpreted as a "pick" (Ranniy i sredniy paleolit…, 2022: Fig. 34), but in view of other artifacts from the screes it can now be considered a proto-handaxe. The refined flakes collected on the cape during the first visit to the site in 2002 can also be included into this collection (Bosinski, 2003: Abb. 7); the same can be said of the distinct side-scraper found in the scree in 2003 (Shchelinsky et al., 2010a: Fig. 13, *3*). Formerly, the interpretation of these artifacts was unclear as compared to the items from the main Bogatyri/Sinyaya Balka collection.

When the talus deposits of the destroyed site of Rodniki-1 and the western slope of Cape Bogatyr reached the beach and were washed with the seawater, it became possible to collect artifacts from the sand's surface, especially after strong storms. The collection from the beach currently includes 32 items. The artifacts from the beach are distinguished by a brown, gray or gray-brown patina, as well as roundness (Fig. 5). The composition of the beach collection is generally similar to that of the scree assemblage. There is a distinctive core with a half-circle flaking surface, and expressive spalls (10 spec.), including laminar flakes (Fig. 5, *2*), very large flakes (Fig. 5, *3*), and an indisputable flake with trimming on the bulb of percussion—a convergent side-scraper (Fig. 5, *1*). The beach collection is dominated by choppers (11 spec.); two of these are gigantolites weighing ca 5 kg. These tools are made from large tabular fragments of dolomites. The choppers with extended convex blades (Fig. 5, *6*) look especially well-prepared. For the first time, a bifacial chopper was found on the beach. Points of various sizes on robust dolomite fragments (4 spec.) form the second-largest category. The core-shaped end-scraper (Fig. 5, *4*) and the "chopper-like scraper" (Fig. 5, *5*) are typical, but heavily rounded.

Conclusions

The collection of artifacts from Bogatyri/Sinyaya Balka is replenished with new finds each field season; the new finds always confirm the interpretation of this industry as the specific Taman variety of the Oldowan technological stage of the Early Paleolithic. Finds from the screes suggest that somewhere around the excavation area or, most likely, over it, there were deposits containing different artifacts. This assumption is well documented by the stratigraphic scheme recently proposed by a group of geologists from the Geological Institute, Russian Academy of Sciences (Moscow). The proposed stratigraphic sequence reveals three strata of sediments between the villages of Peresyp and Za Rodinu, on the northern coast of the Taman Peninsula (Tesakov et al., 2020: 8). The lower and middle strata belong to the Early Pleistocene. The middle stratum contains all the stratified sites of the Taman Paleolithic complex, while the upper one has not yet been dated and may well contain younger lithic artifacts (Ibid.: Fig. 2).

The artifacts from the screes differ considerably from the finds from the excavation. They were made from the same local raw materials, but have a different morphological appearance. A distinctive feature of surface-collected materials is the presence of typical cores with a specific morphology of flaking surfaces and genuine intentional spalls, including very large ones. But most importantly, the surface collection includes a tool with bifacial treatment of the working edges. Such a technique has not been recorded on the artifacts from the excavation. At the moment, it seems that the collections assembled in the screes and on the beach can be preliminarily combined into one complex and identified as the industry of the subsequent Acheulean stage of the Early Paleolithic.

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References

Bosinski G., Scelinskij V.E., Kulakov S.A., Kindler L. 2003
Bogatyri (Sinaja Balka) – Ein altpaläolithischer Fundplatz auf der Taman-Halbinsel (Rußland). In *Erkenntnisjäger: Kultur und Umwelt des frühen Menschen*. Halle (Saale): Landesamt für Archäologie, Landesmuseum für Vorgeschichte, pp. 79–89. (Veröffentlichungen des Landesamtes für Archäologie; Bd. 57/I).

Kulakov S.A. 2018a
Krupniye rubyashchiye orudiya v industrii rannepaleoliticheskoy stoyanki Bogatyri/Sinyaya Balka. *Zapiski IIMK RAN*, No. 17: 165–170.

Kulakov S.A. 2018b
Rannepaleoliticheskaya stoyanka Bogatyri/Sinyaya Balka na Tamanskom poluostrove. *Arkheologicheskiye vesti*, No. 24: 19–32.

Kulakov S.A. 2018c
Rannepaleoliticheskaya stoyanka Bogatyri/Sinyaya Balka – primer adaptatsii drevneishikh gominid. In *Paleoliticheskaya stoyanka Azykh v Azerbaidzhane i migratsionniye protsessy: Sbornik materialov Mezhdunar. nauch. konf., 01–05 okt. 2018 g., Baku–Gabala*, M.N. Ragimova (ed.). Baku: Inst. arkheologii i etnografii NAN Azerbaidzhana, pp. 119–135.

Kulakov S.A. 2019a
Dostizheniya sotrudnikov IIMK RAN v izuchenii paleolita Kavkaza v kontse XX – nachale XXI veka. In *Proshloye chelovechestva v trudakh peterburgskikh arkheologov na rubezhe tysyacheletiy: (K 100-letiyu sozdaniya rossiyskoy akademicheskoy arkheologii)*, Y.A. Vinogradov, S.A. Vasiliev (eds.). St. Petersburg: Petersburg. vostokovedeniye, pp. 9–17.

Kulakov S.A. 2019b

Site du Paléolithiqe inférieur de Bogatyri/Sinyaya Balka dans le péninsule de Taman, Krai de Krasnodar, Russie. *L'Anthropologie*, vol. 123 (2): 194–215.

Kulakov S.A. 2020

K voprosu o stratigrafii i geologicheskom polozhenii kostenosnoy linzy v kulturosoderzhashchikh otlozheniyakh stoyanki Bogatyri/Sinyaya Balka: Vzglyad arkheologa. In *Rannepaleoliticheskiye pamyatniki i prirodnaya sreda Kavkaza i sopredelnykh territoriy v rannem pleistotsene*, E.V. Belyaeva, A.S. Tesakov (eds.). St. Petersburg: Petersburg. vostokovedeniye, pp. 65–90.

Ranniy i sredniy paleolit Priazovya: Sovremennoye sostoyaniye issledovaniy. 2022

A.K. Otcherednoy, V.V. Titov (eds.). Rostov-na-Donu: Izd. YuNC RAN.

Shchelinsky V.E. 2021

Ranniy ashel Zapadnogo Predkavkazya. St. Petersburg: Peterburg. vostokovedeniye.

Shchelinsky V.E., Dodonov A.E., Baigusheva V.S., Kulakov S.A., Simakova A.N., Tesakov A.S., Titov V.V. 2010a

Rannepaleoliticheskiye pamyatniki Tamanskogo poluostrova (Yuzhnoye Priazovye). In *Drevneishiye obitateli Kavkaza i rasseleniye predkov cheloveka v Yevrazii*, S.A. Vasiliev, V.E. Shchelinsky (eds.). St. Petersburg: Peterburg. vostokovedeniye, pp. 11–46.

Shchelinsky V.E., Dodonov A.E., Baigusheva V.S., Kulakov S.A., Simakova A.N., Tesakov A.S., Titov V.V. 2010b

Early Palaeolithic sites on the Taman Peninsula (Suthern Azov Sea region, Russia): Bogatyri/Sinyaya Balka and Rodniki. *Quaternary International*, vol. 223/224: 28–35.

Shchelinsky V.E., Kulakov S.A. 2009

Kamenniye industrii eopleistotsenovykh rannepaleoliticheskikh stoyanok Bogatyri/Sinyaya Balka i Rodniki na Tamanskom poluostrove (Yuzhnoye Priazovye, Rossiya). In *Drevneishiye migratsii cheloveka v Yevrazii: Materialy Mezhdunar. simp.*, A.P. Derevianko, M.V. Shunkov (eds.). Novosibirsk: Izd. IAET SO RAN, pp. 188–206.

Tesakov A.S., Trifonov V.G., Simakova A.N., Sokolov S.A., Trikhunkov Y.I., Chelik K., Frolov P.D., Belyaeva E.V., Shalaeva E.A., Gaidalenok O.V., Bachmanov D.M. 2020

Geodinamicheskiye i biotsenoticheskiye usloviya rannego–srednego pleistotsena v kontekste zaseleniya drevnim chelovekom Krymsko-Kavkazsko-Araviyskogo regiona. In *Rannepaleoliticheskiye pamyatniki i prirodnaya sreda Kavkaza i sopredelnykh territoriy v rannem pleistotsene*, E.V. Belyaeva, A.S. Tesakov (eds.). St. Petersburg: Petersburg. vostokovedeniye, pp. 7–24.

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