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The State of Preservation of the Shakhty Rock Art Site and the Prospects of Its Conservation

This article deals with the preservation of the Shakhty rock art site, discovered in the Eastern Pamirs in 1958 by the leading Central Asian Stone Age researcher V.A. Ranov. The analysis of photographs taken in the Shakhty rock shelter during the 2019 survey revealed the nature of destructive processes at the site due to environmental conditions of the Eastern Pamir highland. The article integrates the results of analysis of Ranov's archives at the Donish Institute of History, Archaeology and Ethnography of the National Academy of Sciences, Republic of Tajikistan. Thanks to Ranov's diaries and photographs, it was possible in 2019 to assess the degree of erosion on the rock surface, and the loss of fragments of painted images over more than 60 years. Emergency areas requiring conservation efforts were identified. Principles of conservation and restoration of rock art are outlined, and an overview of techniques developed for sites of this type in the post-Soviet space in the last quarter of the 20th century is presented. State of the art conservation methods for rock art, which, in the future, can be applied for the preservation of emergency areas at Shakhty, are described. A set of measures is suggested to preserve this site.

Keywords: *Eastern Pamirs, rock art, paintings, Shakhty rock shelter, conservation of rock art sites.*

Introduction

The Shakhty rock shelter is located 40 km southwest of the village of Murgab in the Gorno-Badakhshan Autonomous Region. Here, in 1958, the archaeological group of the Pamir expedition of the Academy of Sciences of the USSR, under the leadership of V.A. Ranov, discovered ancient rock paintings. Ranov attributed this site to the Mesolithic–Early Neolithic period, based on the Mesolithic materials of excavations in the rock shelter, as well as on the images (of boars, bears) depicted on the wall, which were atypical of the high mountain regions of the Pamirs, and the archaic style of their execution (1961). Unfortunately, the finds of the Mesolithic period revealed in the rock shelter cannot be considered direct evidence of the age of the drawings on its walls (Ibid.: 81). There are no data about the habitation of wild boars and bears in the territory of the Eastern Pamirs in the Mesolithic period. Ranov has not found any analogs of the Shakhty rock paintings among the rock art sites in Tajikistan

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and adjacent territories, and the remote analogs he cited revealed more differences than similarities, as the scholar himself pointed out (2016: 52–54). In addition, studies of the recent years, including those of Istyk Cave, showed that the process of peopling the high-mountainous regions of the Pamirs began at the end of the Pleistocene, and not in the Early Holocene, as was previously thought. Thus, in the light of recent finds (Shnaider et al., 2019), the earliest date of the drawings in the Shakhty rock shelter may turn out to be even older than previously thought, while the most recent one can be attributed to the Bronze Age (Zotkina, Abolonkova, Alisher kyzy, Sayfulloev, 2022). The discovery of new rock art sites in the Eastern Pamirs indicates the prospects for exploring this territory (Zotkina, Bobomulloev, Solodeinikov et al., 2022). Perhaps, it is the new finds that will be able to shed light on the dating of the drawings in the Shakhty rock shelter. However, clarifying the age of ancient painting certainly requires an integrated approach. It is also important to pay attention to the state of preservation of the rocky surface. Notably, the climatic conditions of the highlands have a special effect on the preservation of archaeological material (Ranov, 1975; Shnaider et al., 2019, 2020). We assume that despite the natural destructive processes that affect the rocks in high-mountain areas, ancient painting is preserved here much better than on the rock art sites in other environmental zones. The "fresh" look of the paint in the Shakhty rock shelter may be due not to the possible renewal or the young age of the images, but to the degree of their preservation in the specific conditions of the highlands. However, this assumption requires a separate study, including one based on monitoring of the state of rock art sites in the region. This work is aimed at partially filling this gap, as well as at developing recommendations on the use of existing stone conservation methods for preservation of ancient painting.

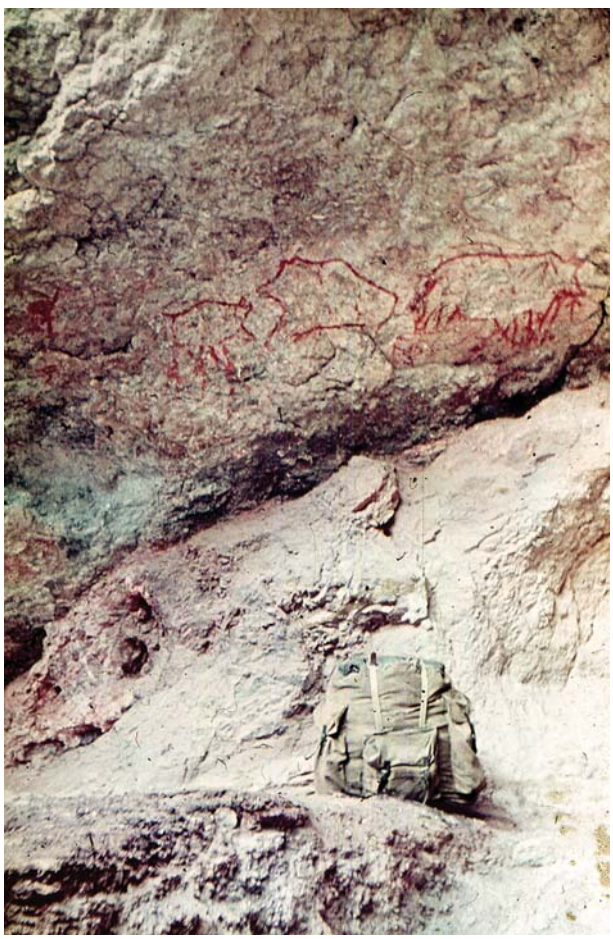

Fig. 1. View of the rock surface with paintings. *Photo by V.A. Ranov, 1958* (slide from the funds of the IIAE NAN RT).

Materials and methods

In the funds of the Donish Institute of History, Archaeology and Ethnography, National Academy of Sciences of the Republic of Tajikistan (IIAE NAN RT), archives of Ranov are kept, including extensive sources, among which are the diaries describing the drawings and the process of excavations in the Shakhty rock shelter, and slides. On the basis of these materials, as well as photographs taken in 2019, and the results of their color filtering (Zotkina, Bobomulloev, Solodeinikov et al., 2022: Fig. 2, *3 a–d;* Zotkina, Abolonkova, Alisher kyzy, Sayfulloev, 2022: Fig. 2), it was possible to determine the degree of intensity of destructive processes that have occurred over the past 60 years, and to draw a conclusion about the prospects for preserving the drawings using modern methods for the conservation of rock art sites and other stone objects.

The Shakhty rock shelter is located in the valley of the Kurteke-sai River, at an altitude of ca 4200 m a.s.l. It is composed of a huge massif of limestone, is open to the east, and is oriented almost strictly to the cardinal points. It is dry, light, well lit by the sun. The width of the entrance is 7.5 m, the shelter goes 6 m deep, the roof height is at least 25–30 m. The drawings are located on the southern wall (Fig. 1). It is inclined by about 45–50° and is composed of reddish-yellow limestones. The images are at a height of 1.6–2.0 m from the floor level, applied with red ocher paint, which has two tones: light-brick and darker burgundy. According to Ranov, the material for paint could have been powdered deposits of ferruginous compounds in the cracks of the cave wall. Judging by the thickness of the lines, the drawings could have been applied with a finger (Ranov, 1958: 27–29, 35). The scholar identified seven figures here, of which only four have been well preserved. Among the interpretable images, he singled out the figures of a wild boar and a bear (or two wild boars), a large animal,

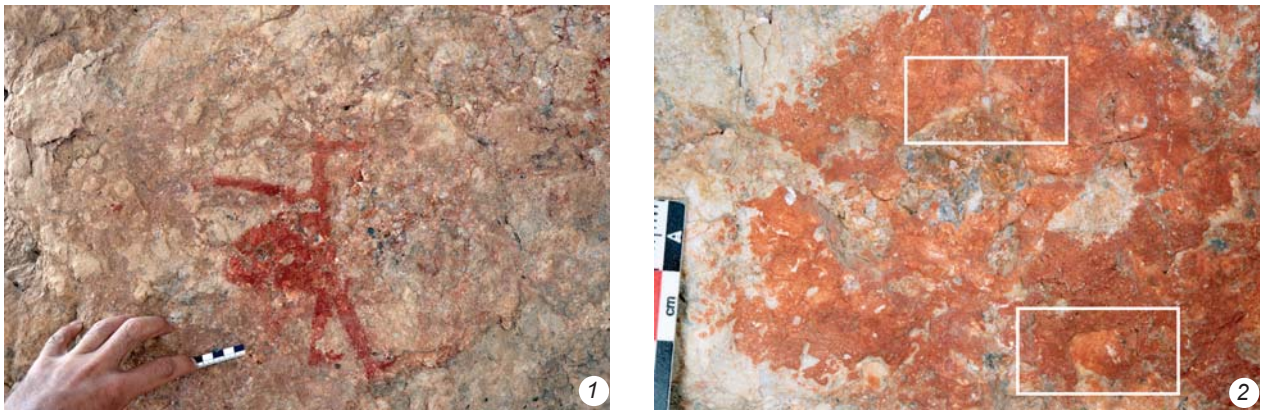

Fig. 2. Photograph of an ornithomorphic figure. *Photo by L.V. Zotkina, 2019* (after (Zotkina, Abolonkova, Alisher kyzy, Sayfulloev, 2022: Fig. 2)).
1 – general view; *2* – area with paint applied to the rocky surface with traces of desquamation.

possibly representative of the bovid family (Bovinae), and an anthropomorphic character, disguised, according to the scientist, as a bird (Ranov, 1961: 71). Surveys of the recent years, using modern methods for detecting poorly distinguishable colored images, indicate the presence here of other images that are traced in half-erased lines (Zotkina, Abolonkova, Solodeynikov et al., 2020). Such preservation is explained by the intensity of scaly exfoliation of the rock—desquamation of limestone due to severe temperature changes, which is typical for the highland regions of the Pamirs. Ranov pointed out the loss of the rocky surface, including the surface with remnants of the pigment: "The wall of the shelter, on which the drawings were applied, is very uneven, rough and, as always in limestone, laminated; individual rough spots protrude above the surface of the rock by 7.5, 3, and 2 cm. There are almost no smooth surfaces" (1958: 29–30). According to the scholar, once, the entire plane of the wall, starting almost from the entrance of the shelter and ending with the narrowest point along the southern wall, was decorated with drawings. This is evidenced by numerous spots of paint, sometimes individual lines or the remains of figures, which are no longer decipherable. Ranov noted that destructive processes continued, as was evidenced by fragments of images with scales fallen out (Ibid.). The results of the 2019 survey also record many losses of the rock surface due to desquamation (Zotkina, Bobomulloev, Solodeinikov et al., 2022: 63). Careful examination of the images reveals areas with paint applied over the previously lost fragments of the surface (Fig. 2). This may indicate, on the one hand, that the process of destruction of the wall with drawings began long before they were created, and, on the other hand, that the images were renewed. The significant traces of the rocky surface loss can also be observed on the painted lines (Fig. 3).

To make decisions related to the conservation work at the site, it is important to understand not only the nature

Fig. 3. Fragment of a zoomorphic image with traces of desquamation over the paint layer (after (Zotkina, Bobomulloev, Solodeinikov et al., 2022: Fig. 2, *3a*), fragment).

of the destruction, but also the intensity of desquamation in the Shakhty rock shelter. Since the rock art sites are located in the open air, we cannot completely eliminate the negative natural impact, and therefore stop the process of the destruction; but with the right approach, it can be significantly slowed down. The first step towards the conservation of the site should be the monitoring of its condition.

The study of the archival materials of Ranov provided insight into the degree of preservation of the wall with drawings in 1958, when they were first discovered. However, the small number of slides of that time and the lack of macro photographs make it impossible to trace the surface desquamation in detail. Nevertheless, a comparative analysis of the images taken in 1958 and 2019 gave some results. When comparing photographs, we used the pigment mapping method (Solodeynikov, 2010) and the DStretch plugin (Harman, 2015).

General principles of conservation and restoration of rock art sites

In recent years, the preservation of rock art sites has increasingly become one of the most important topics (Devlet, 2002; Miklashevich, 2002, 2011; Rogozhinsky, 2004; and others). Researchers often report the destructive processes, paying particular attention to the evidence of vandalism. On the territory of the former USSR, rock art sites became the subject of interest of art restorers only in the last quarter of the 20th century. Their activities are based on proven methods of conservation of stone objects located in the open air. Domestic specialists from the State Research Institute of Restoration (GosNIIR) adapted them to rock massifs with ancient drawings and tested them at Siberian rock art sites. Since 1987, work has been carried out at the sites of the upper Lena basin (Shishkino, Talma, Vorobyevo); in 1992–1999, on the coast of Lake Baikal and its environs (Sagan-Zaba, Orso, Aya, Elgazur, Sakhyurte, Sarma); in 2002–2008, at the Tom, Potroshilovo, and Sulek rock art sites (Ageeva et al., 1993, 1995; Bednarik, Devlet, 1993; Ageeva, Devlet, Rebrikova, 1996; Ageeva, Rebrikova, Kochanovich, 2004; Ageeva, Kochanovich, 2011; and others). We present a brief overview of the experience accumulated to date.

Documentation. When carrying out restoration work on a site, it is of great importance to record objects before, during, and after performing any manipulations. To date, on the basis of the available experience, both restorers and archaeologists have already created some documentation (Rogozhinsky, Khorosh, Charlina, 2004: Pl. 1), including a technology of trace-drawing of the surfaces with images for recording various types of damages (Miklashevich, 2011).

Preventive conservation. The activities of restorers at rock art sites are based on the principles of minimal intervention and reversibility. Therefore, preventive conservation is especially important, implying the maintenance of the natural state of the state. It includes the construction of canopies and overhangs, the installation of drains and drip lines that protect surfaces from water, as well as limiting the accessibility of the site to people and animals by changing the relief, regulating vegetation, limiting traffic, installing fences, gratings, and decking (Davlet, 2002: 104).

Direct methods of conservation. Among them, noteworthy are the structural strengthening of stone; surface treatment that slows down the disintegration of the painting pigment; building up lost fragments or fixing rock crusts; biocidal treatment to protect against damage caused by bacteria, algae, lichens, etc. (Ibid.).

Restoration. Speaking about the restoration of rock art sites, we mean the restoration of the integrity of stones by gluing them together using different adhesive compounds that vary depending on the specific object. At the Tamgaly site, specialists from Kazakhstan carried out a large scope of work on gluing stone fragments with petroglyphs (Charlina et al., 2004).

Thus, today, there are a number of methods aimed at preserving samples of rock art, which are successfully tested on various sites.

Results

The main object of analysis were the photographs of individual images taken in 1958 (Fig. 4). When

Fig. 4. Photographs of images in the Shakhty rock shelter. *Photo by V.A. Ranov, 1958* (slides from the funds of the IIAE NAN RT).

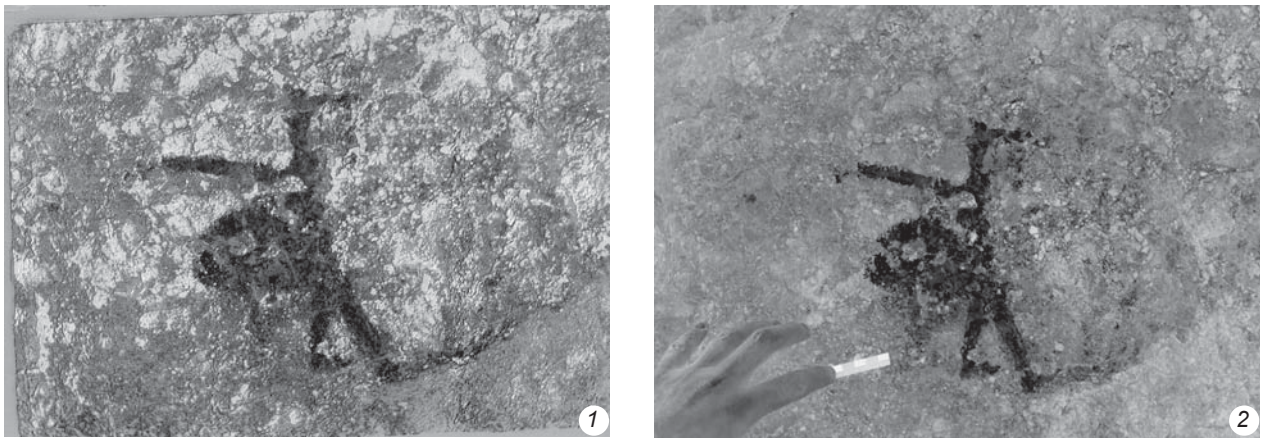

Fig. 5. Pigment maps of the photographs of the ornithomorphic image.
1 – slide by V.A. Ranov, 1958; *2* – photo by L.V. Zotkina, 2019

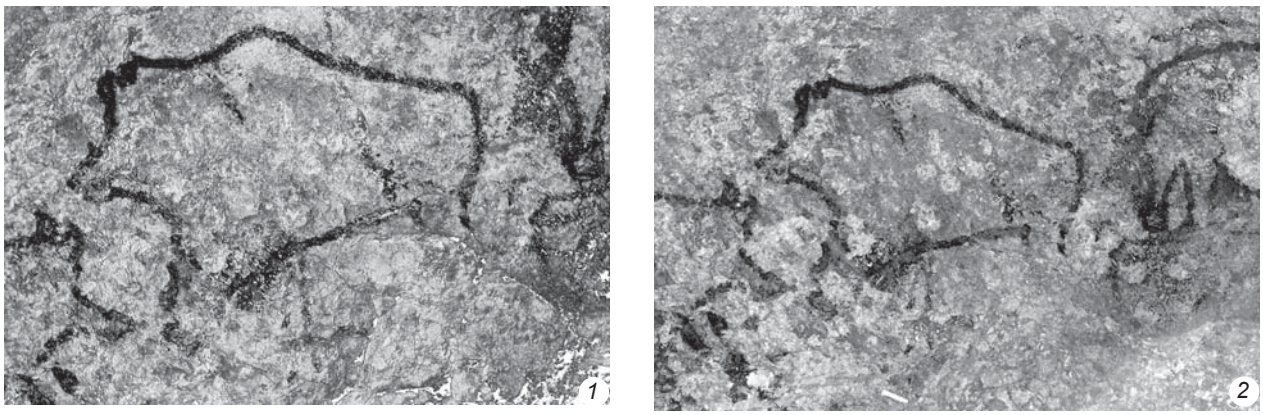

Fig. 6. Pigment maps of the photographs of the zoomorphic image.
1 – slide by V.A. Ranov, 1958; *2* – photo by L.V. Zotkina, 2019

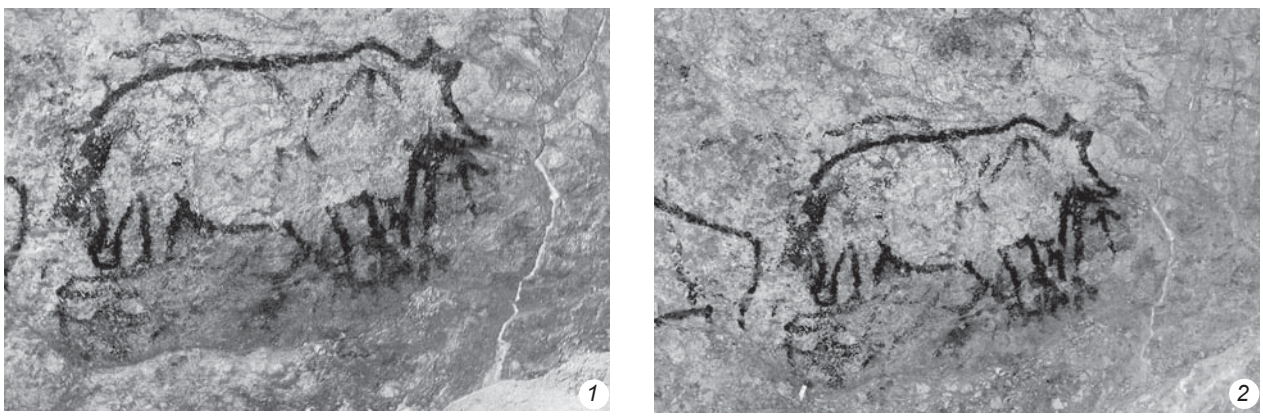

Fig. 7. Pigment maps of the photographs of the zoomorphic image.
1 – slide by V.A. Ranov, 1958; *2* – photo by L.V. Zotkina, 2019

comparing photos of ornithomorphic (Fig. 5) and zoomorphic (Fig. 6) figures of 1958 and 2019, as well as the results of their color filtering, we did not find any losses that could have occurred over the past 60 years. However, owing to the lack of more detailed photographs of 1958, we do not exclude the possibility of destructive changes at the microlevel, which are difficult to identify. The materials available today

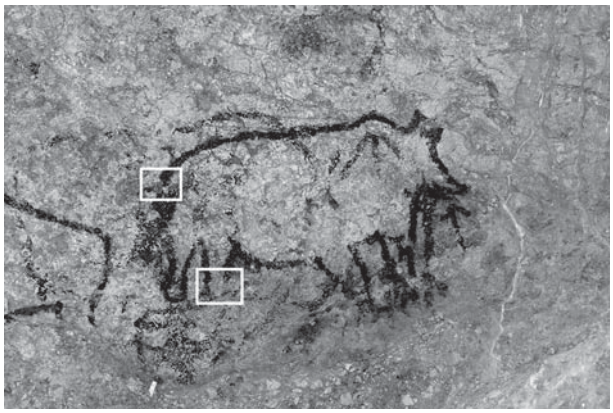

Fig. 8. Pigment map of the photograph of 2019: areas with traces of paint loss that occurred between 1958 and 2019.

show the slight loss of the rock surface with paint layer on another animal image (Fig. 7, 8). Obviously, this section of the rock surface requires conservation to slow down the destruction process.

Discussion

The damaged section of the plane with paint can be reinforced using the direct methods of conservation only. Depending on the features of the rock crust subject to destruction, effective methods can include structural strengthening of the rock and flanging. Structural strengthening of the rock is used in cases when the inter-crystalline bonds of the rock are breaking down. Another form of destruction is longitudinal delamination, when layers of different hardness alternate in the stone. Destructive processes of this type are among the most dangerous. Structural strengthening of the rock is carried out in two ways: by steeping, when a special solution is repeatedly applied using a flat brush; and by injection, i.e. the introduction of a stone hardener directly into the cracks. After these procedures, the strength of the stone structure is checked. The final result can be judged after a month of exposure under natural conditions (Shchigorets, Vlasov, 2018: 47). As materials for strengthening, some experts recommend the use of helium ethers of silicic acid, for example, stone strengtheners from Remmers. They easily penetrate into the depths of the stone, where they turn into a gel-like substance (Ibid.). However, the most promising today, in our opinion, are preparations of the CaLoSiL series of the German company IBZ-Salzchemie GmbH & Co.KG, which contain calcium hydroxide $Ca(OH)_2$ nanoparticles suspended in various alcohols (ethanol, propanol, isopropanol). The average particle size is 150 nm. These preparations act like consolidators and have been successfully tested in a number of European countries in the works with fresco painting (Daehne, Herm, 2013; Giorgi, Dei, Baglioni, 2000; Ambrosi et al., 2001). A significant disadvantage of the use of the structural strengthening of stone surfaces is irreversibility. It is for this reason that works of this kind are carried out extremely rarely, with preliminary testing of the compositions on experimental sites.

In some cases, associated with a significant delamination of the rock crust from the massif, it is possible to use the reversible flanging method developed by the specialists from GosNIIR. It consists in fixing such a crust with a finishing mixture along the edge, without filling the voids formed under it. This technique practically does not affect the moisture- and vapor-exchange between the atmosphere and the inner layers of the rock (Ageeva, Rebrikova, Kochanovich, 2004). The composition of the restoration material varies depending on the type of stone, and it is based on polymeric organosilicon binders (MSN-7, K-15/3, KO-08) (Ageeva, 2003: 54–61).

Conclusions

The limestones of the Eastern Pamirs, owing to environmental features, are subject to the process of scaly flaking of the stone surface; in some cases, desquamation affects larger fragments of the rock crust. However, comparing the obtained results with the destruction at other rock art sites, which took place even over a shorter period, for example, at the Tom Pisanitsa (Miklashevich, 2011), we observed a low intensity of destructive processes on the rock surfaces of the Shakhty rock shelter that occurred from 1958 to 2019.

Taking into account the fundamental principles and experience of conservation and restoration works carried out at other rock art sites, there is a need in a set of measures to preserve the ancient paintings of the Shakhty rock shelter. Further activities should be based on the long-term observations of the object, photographing of the images, including with the use of macro lenses. Particular attention should be paid to areas with signs of destruction and to those that show negative dynamics, judging by photographic materials from 1958 and 2019. Recording of losses and any changes at the site requires the development of a standardized description and making trace-drawings. Identification of an emergency area calls for conservation works based on the methods of structural strengthening of stone and flanging (in case of detachment of large fragments of the rock crust). As a reinforcing material, nanolime (preparations of the CaLoSiL series) seems to be the most promising. At the same time, the structural strengthening method should first be experimentally tested in the area that does not contain images, using alternative materials, such as

Remmers stone strengtheners. Follow-up observations over several years will indicate the prospects for the use of a particular material. Only after that is it recommended to apply consolidating compositions on surfaces with ancient paint. Owing to the exposure of the rock paintings to the natural environment, it is impossible to completely solve the problem of preserving painted images; however, slowing down the processes of destruction by conservation and restoration methods is still possible.

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References

Ageeva E.N. 2003

Konservatsiya i restavratsiya skulptury iz kamnya: Ucheb. pos., S.P. Maslenitsyna (ed.). Moscow: Ros. Gos. Gumanit. Univ.

Ageeva E.N., Antonova E.I., Rebrikova N.L., Sizov B.T. 1993

Shishkinskiye pisanitsy: Rezultaty obsledovaniya i predlozheniya po restavratsii. In *Sovremenniye problemy izucheniya petroglifov*. Kemerovo: Kem. Gos. Univ., pp. 186–189.

Ageeva E.N., Devlet E.G., Rebrikova N.L. 1996

Rezultaty obsledovaniya, perspektivy sokhraneniya i ispolzovaniya pamyatnikov naskalnogo iskusstva ozera Baikal. In *Arkheologicheskoye naslediye Baikalskoy Sibiri*, iss. 1. Irkutsk: Tsentr po sokhraneniyu ist.-kult. naslediya, pp. 111–115.

Ageeva E.N., Devlet E.G., Rebrikova N.L., Sklyarevsky M.Y. 1995

Sostoyaniye pamyatnika naskalnogo iskusstva Sagan-Zaba i perspektivy yego sokhraneniya i ispolzovaniya. In *Naskalnoye iskusstvo Azii*, iss. 1. Kemerovo: Kuzbassvuzizdat, pp. 29–30.

Ageeva E.N., Kochanovich A.V. 2011

Preventivnaya konservatsiya na pamyatnike naskalnogo iskusstva Tomskaya pisanitsa. In *Naskalnoye iskusstvo v sovremennom obshchestve (k 290-letiyu nauchnogo otkrytiya Tomskoy pisanitsy): Materialy Mezhdunar. nauch. konf*., vol. 1. Kemerovo: Kuzbassvuzizdat, pp. 172–175.

Ageeva E.N., Rebrikova N.L., Kochanovich A.V. 2004

Opyt konservatsii pamyatnikov naskalnogo iskusstva Sibiri. In *Pamyatniki naskalnogo iskusstva Tsentralnoy Azii: Obshchestvennoye uchastiye, menedzhment, konservatsiya, dokumentatsiya*. Almaty: Iskander, pp. 116–120.

Ambrosi M., Dei L., Giorgi R., Neto C., Baglioni P. 2001

Colloidal particles of $Ca(OH)_2$: Properties and application to restoration of frescoes. *Lanmuir*, vol. 17: 4251–4255.

Bednarik R., Devlet E.G. 1993

Konservatsiya pamyatnikov naskalnogo iskusstva Verkhney Leny. In *Pamyatniki naskalnogo iskusstva*. Moscow: IEA RAN, pp. 7–24.

Charlina L.F., Yatsenko E.L., Rogozhinsky A.E., Isakov K.T. 2004

Konservatsiya petroglifov v Kazakhstane. In *Pamyatniki naskalnogo iskusstva Tsentralnoy Azii: Obshchestvennoye uchastiye, menedzhment, konservatsiya, dokumentatsiya*. Almaty: Iskander, pp. 128–133.

Daehne A., Herm C. 2013

Calcium hydroxide nanosols for the consolidation of porous building materials – results from EU-STONECORE. *Heritage Science*, vol. 1. URL: https://doi.org/10.1186/2050-7445-1-11

Devlet E.G. 2002

Pamyatniki naskalnogo iskusstva: Izucheniye, sokhraneniye, ispolzovaniye. Moscow: Nauch. mir.

Giorgi R., Dei L., Baglioni P. 2000

A new method for consolidation wall paintings based on dispersions of lime in alcohol. *Studies in Conservation*, vol. 45 (3): 154–161.

Harman J. 2015

Using DStretch for rock art recording. *International Newsletter on Rock Art*, No. 72: 24–30.

Miklashevich E.A. 2002

O proyekte SAIPI po sokhraneniyu, konservatsii i muzeyefikatsii pamyatnikov naskalnogo iskusstva. *Vestnik Sibirksoi assotsiatsii issledovateley pervobytnogo iskusstva*, iss. 5: 7–11.

Miklashevich E.A. 2011

Dokumentirovaniye povrezhdeniy petroglifov Tomskoy pisanitsy. In *Naskalnoye iskusstvo v sovremennom obshchestve (k 290-letiyu nauchnogo otkrytiya Tomskoy pisanitsy): Materialy Mezhdunar. nauch. konf*., vol. 1. Kemerovo: Kuzbassvuzizdat, pp. 128–138.

Ranov V.A. 1958

Otchet o rabotakh Pamirskogo otryada v 1958 g. v grote Shakhty. In *Fondy Instituta Istorii, arkheologii i etnografii im. A. Donisha Natsionalnoy akademii nauk Respubliki Tadzhikistan*.

Ranov V.A. 1961

Risunki kamennogo veka v grote Shakhty. *Sovetskaya arkheologiya*, No. 6: 70–81.

Ranov V.A. 1975

Pamir i problema zaseleniya vysokogornnoy Azii chelovekom kamennogo veka. In *Strany i narody Vostoka*, iss. XVI: Pamir. Moscow: Nauka, pp. 137–167.

Ranov V.A. 2016

Begushchiye po skalam: Naskalniye risunki Pamira. Dushanbe: Donish.

Rogozhinsky A.E. 2004

Regionalniy uchebniy seminar “Pamyatniki naskalnogo iskusstva Tsentralnoy Azii: Obshchestvennoye uchastiye, menedzhment, dokumentatsiya i konservatsiya”. In *Pamyatniki naskalnogo iskusstva Tsentralnoy Azii: Obshchestvennoye uchastiye, menedzhment, konservatsiya, dokumentatsiya*. Almaty: Iskander, pp. 6–7.

Rogozhinsky A.E., Khorosh E.K., Charlina L.F. 2004

O standarte dokumentatsii pamyatnikov naskalnogo iskusstva Tsentralnoy Azii. In *Pamyatniki naskalnogo iskusstva Tsentralnoy Azii: Obshchestvennoye uchastiye, menedzhment, konservatsiya, dokumentatsiya*. Almaty: Iskander, pp. 156–161.

Shchigorets S.B., Vlasov D.Y. 2018
Osnovy prakticheskoy konservatsii pamyatnikov iz kamnya: Ucheb. pos. St. Petersburg: Izd. VVM.

Shnaider S.V., Kolobova K.A., Filimonova T.G., Taylor W., Krivoshapkin A.I. 2020
New insights into the Epipaleolithic of western Central Asia: The Tutkaulian complex. *Quaternary International*, vol. 535: 139–154. URL: https://doi.org/10.1016/j.quaint.2018.10.001

Shnaider S.V., Sayfulloev N.N., Alisher kyzy S., Rudaya N.A., Dedov I.E., Zotkina L.V., Zhukov V.A., Karaev A., Navruzbekov M., Alekseitseva V.V., Krivoshapkin A.I. 2019
Perviye danniye izucheniya mnogosloinogo pamyatnika Istykskaya peshchera (Vostochniy Pamir, Tadzhikistan). In *Problemy arkheologii, etnografii i antropologii Sibiri i sopredelnykh territoriy*, vol. XXV. Novosibirsk: Izd. IAET SO RAN, pp. 293–298.

Solodeinikov A.K. 2010
O metodike fiksatsii naskalnykh izobrazheniy v peshchere Shulgan-Tash (Kapovoy). In *Kulturnoye naslediye Yuzhnogo Urala kak innovatsionniy resurs*. Ufa: Inst. instorii, yazyka i literatury Ufim. nauch. tsentra RAN, pp. 70–85.

Zotkina L.V., Abolonkova I.V., Alisher kyzy S., Sayfulloev N.N. 2022
Naskalnoye iskusstvo Vostochnogo Pamira: Analogii i kontseptsii o vozraste risunkov. *Stratum Plus*. (In press).

Zotkina L.V., Abolonkova I.V., Solodeinikov A.K., Sayfulloev N.N., Shnaider S.V. 2020
Naskalnaya zhivopis grota Shakhty (Vostochniy Pamir): Noviye danniye i perspektivy issledovaniya. In *Trudy VI (XXII) Vserossiyskogo arkheologicheskogo syezda v Samare*, vol. III. Samara: Samar. Gos. Sots.-Ped. Univ., pp. 80–82.

Zotkina L.V., Bobomulloev B.S., Solodeinikov A.K., Abolonkova I.V., Shnaider S.V., Sayfulloev N.N. 2022
Noviye danniye o naskalnom iskusstve Vostochnogo Pamira. *Vestnik Novosibirskogo gosudarstvennogo universiteta*. Ser.: Istoriya, filologiya, vol. 21 (3): 60–72.

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