16th INTERNATIONAL CONGRESS OF SPELEOLOGY

Proceedings

VOLUME 1




Edited by
Michal Filippi
Pavel Bosák

16th INTERNATIONAL CONGRESS OF SPELEOLOGY
BRNO 2013 CZECH REPUBLIC
WHERE HISTORY MEETS FUTURE

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Produced by the Organizing Committee of the 16th International Congress of Speleology.
Published by the Czech Speleological Society and the SPELEO2013 and in the co-operation with the International Union of Speleology.
Design by M. Filippi and SAVIO, s. r. o.
Layout by SAVIO, s. r. o.
Printed in the Czech Republic by H.R.G. spol. s r. o.

The contributions were not corrected from language point of view. Contributions express author(s) opinion.

Recommended form of citation for this volume:
Filippi M., Bosák P. (Eds), 2013. Proceedings of the 16th International Congress of Speleology, July 21–28, Brno. Volume 1, p. 453. Czech Speleological Society. Praha.

ISBN 978-80-87857-07-6

KATALOGIZACE V KNIZE - NÁRODNÍ KNIHOVNA ČR

International Congress of Speleology (16. : Brno, Česko)
16th International Congress of Speleology : Czech Republic, Brno July 21–28,2013 : proceedings. Volume 1 / edited by Michal Filippi, Pavel Bosák. -- [Prague] : Czech Speleological Society and the SPELEO2013 and in the co-operation with the International Union of Speleology, 2013
ISBN 978-80-87857-07-6 (brož.)

551.44 * 551.435.8 * 902.035 * 551.44:592/599 * 502.171:574.4/.5
- speleology
- karstology
- speleoarchaeology
- biospeleology
- ecosystem management
- proceedings of conferences
- speleologie
- karsologie
- speleoarcheologie
- biospeleologie
- ochrana ekosystémů
- sborníky konferencí

551 - Geology, meteorology [7]
551 - Geologie. Meteorologie. Klimatologie [7]

Cover photos (some photos were adjusted/cropped)
Top left – José Bidegain, on his way for the recovery Marcel Loubens' body. Author unknown. For details see the paper by A.A. Cigna.
Top right – "Walking Mammoth" – a prehistoric drawing from the Kapova Cave, Russia. Photo by O. Minnikov. For details see the paper by Y. Lyakhnitsky et al.
Bottom left – "Astronaut" David Saint-Jacques (CSA) collecting microbiological samples for the scientific programme of the ESA CAVES course. Photo by V. Crobu. For details see the paper by Bessone et al.
Bottom right – The long-legged cave centipede Thereuopoda longicornis – a typical species of Lao caves. Photo by H. Steiner. For details see the paper by H. Steiner.

SEDIMENTS AND FAUNAL REMAINS OF THE KURTUN-1 CAVE AT BAIKAL LAKE

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Rich Upper Pleistocene fauna was studied in the Kurtun-1 Cave. The cave is located in Rhiphean limestone in the South West vicinity of Baikal Lake. Entire collection of faunal remains comprises of 23 species of large mammals, 20 species of micromammals, 29 species of birds, 13 species of terrestrial and aquatic molluscs, and 1 species of fish. Kurtun-1 is the only site at Baikal where terrestrial fauna of Kargin Interglacial (MIS 3) is known.

1. Introduction

The cave Kurtun-1 (Fig. 1) is located in Rhiphean limestone on the Primorski Mountain Ridge, South West of the vicinity of Baikal Lake (Fig. 2), on the left bank of the Kurtun River at the height of 133 m above thalweg of the river valley. The site was studied by researchers from the East Siberian Scientific Research Institute of Geology, Geophysics and Mineral Resources (Irkutsk), Archaeological Laboratory of the Irkutsk State University and Geological Institute of the Siberian Branch of the Russian Academy of Sciences.

Figure 1. Entrance of Kurtun-1 Cave.

2. Methods

Cave sediments were tested in five pits and a trench (Fig. 3). Test intervals ranged from 5 to 20 cm depending on saturation of sediments by limestone rubble and the size of clasts. Sediments were sieved in dry condition through 5 mm round aperture screen and bones were picked up from this coarse fraction. Then size fraction -5 mm was washed and wet screened using 1 mm mesh sieves. Size fraction +1 mm was being dried up and faunal remains were extracted.

3. Cave sediments

Cave deposits from the entrance grotto were studied in the test pit #2 (Fig. 4), from the top to bottom:

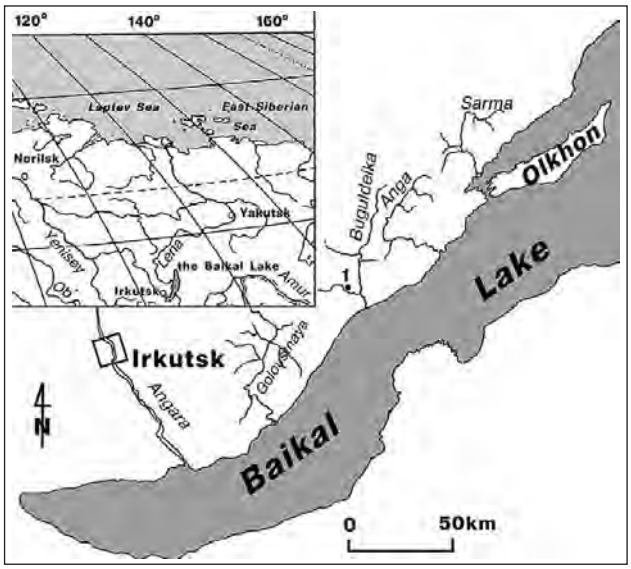

Figure 2. Location of Kurtun-1 Cave.

Thickness, m

Unit 1. Limestone rubble of granule to pebble size, with common slabs of boulder size, abundant plant detritus, excrement from pikas and rodents, and molluscs shells. 0.1–0.15

Unit 2. Unconsolidated breccia consisting of clasts from pebble to cobble size, some irregular lenses of clasts from granule to pebble size, with soft light brown silty clayey moderately calcareous cement, occasional wood debris and pieces of tree branches. Rock fragments are represented by limestone and firm orange brown claystone with manganese films on clast faces. Breccia fills a vertical hole up to 1.8 m deep along the west wall. Contact with unit 3 is gradual. 1.0

Unit 3. Multicolored clayey breccia consisting of angular firm claystone clasts up to 80–90 %. Cement is soft orange brown sandy silty clay with yellow mottles and convoluted lenses. Occasional highly weathered siliceous schist fragments. Sharp subhorizontal contact with unit 4. 0.9

Unit 4. Greenish brown silty clay with fine mica and indistinct inclined parallel lamination. 0.3

Unit 5. Clay breccia with granule sized clasts. 0.1

Unit 6. Greyish yellow and lemon-yellow clayey silt with indistinct lenticular structure. > 0.2

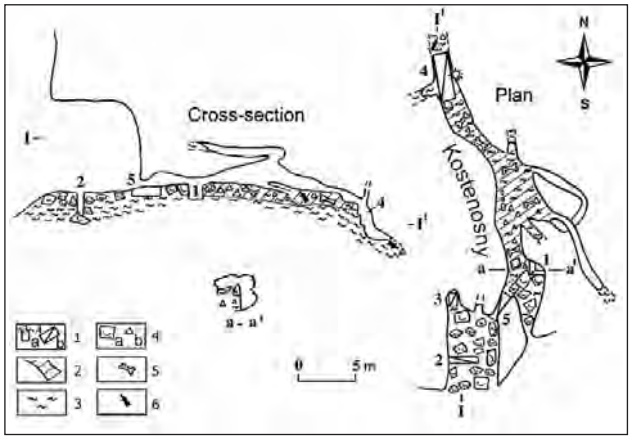

Figure 3. Map of Kurtun-1 Cave. 1 – test pit: a – on cross-section, b – on plan; 2 – trench; 3 – loam; 4 – rock fragments: a – of cobble to boulder size, b – of pebble size; 5 – large mammal bones; 6 – fragments of stalactites and flowstone cores.

Observed thickness: 2.3

Grain-size analysis of the 2-d unit showed, that sediments consist of silt (11.7%), sand (20.1%) and clay (46.7%). Fine and medium sand grains prevail in sand fraction (11.7% and 5.6% respectively).

Light minerals consist of quartz (82.0%) and potassium feldspar (11.4%) with minor quantities of muscovite (3.6%), biotite (0.3%) and plagioclase (2.7%).

Main components of heavy minerals are epidote (26.8%) and hornblende (22.8%), minor pyrite (8.4%), unidentified Ti minerals (11.8%), goethite (7.3%), ilmenite and magnetite (7.1%), leucoxene (2.6%), zircon (2.6%) and garnet (2.0%).

Illite and chlorite compose the clay fraction of unit 2.

Cement and filling of the clay breccia of the unit 3 consist of silt (18.4%) and clay (63.5%) with insignificant admixture of fine and medium sand. Bulk content of carbonates, both in the form of sandy and silty grains, and also in a form of cement, comprises 15.5%.

Light minerals of sediments of the unit 3 consist of quartz (86.2%), muscovite (9.8%) and insignificant admixture of plagioclase (2.3%) and biotite (0.6%).

Heavy minerals consist of epidote (31.6%), ilmenite (22%), hornblende (14.1%), unidentified Ti minerals (8.8%) and goethite (6.8%), with very minor zircon (3.8%), tourmaline (2.7%), sphene (2.4%), rutile (1.5%), leucoxene (1.7%), pyrite (1.5%) and garnets (1.2%).

Grain-size analysis of sediments of the unit 4 showed dominancy of the clay fraction (81.7%) and presence of silt particles (11.2%). Fine and medium sand content was insignificant (0.9% and 0.1% respectively).

Light minerals of the unit 4 consist of quartz (66.6%) and muscovite (33.3%) with admixture of potassium feldspar (0.3%).

Heavy minerals consist of unidentified Ti minerals (33.1%), limonite (18.9%), pyrite (12.1%), ilmenite (10.3%) with minor amount of hornblende (9.8%), zircon (6.3%) and tourmaline (7.0%).

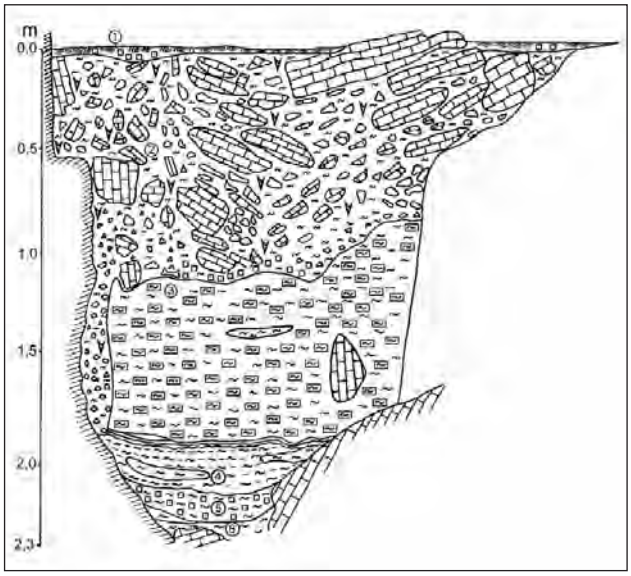

Figure 4. Cross-section of cave deposits from the entrance grotto: northern wall of the pit #2. See legend at Fig. 5.

According to grain-size analysis, unit 6 consists of silty (36.9%) clays (48.7%) with admixture of fine (2.3%) and medium (0.3%) sand.

Quartz prevails among the light minerals (84.5%), while muscovite plays a secondary role (12.1%). Quantities of potassium feldspar and plagioclase are insignificant (2.8% and 0.6% respectively).

Heavy minerals predominately consist of unidentified Ti minerals (44.6%), minor quantities of zircon (11%), tourmaline (11.8%), pyrite (8.6%), leucoxene (8.1%) and epidote (4.8%) with admixture of ilmenite (3.2%), goethite (1.6%), garnets, sphene, hornblende, anatase, disthen, and tremolite (0.5–0.7% each).

Cave sediments in the Kostenosny Passage were studied in the test pit #1 (Fig. 5), from top to bottom:

Thickness, m

Unit 1. Sandy loam, brownish grey, containing limestone clasts up to 0.4 × 1.2 m, stalactite and flowstone fragments up to 0.7 × 0.5 × 0.4 m, abundant mammal bones, fish scales and plant detritus. The layer was highly disturbed by pika burrows and saturated with their excrements. 0.5–0.9

Unit 2. Silty clay, brown, with abundant fine limestone and grey siliceous slate fragments, bones of large mammals and micromammals. Quantity of rock fragments vary in wide limits. 0.4–0.6

Unit 3. Sandy silty clay, brownish-grey. 0.1–0.2

Unit 4. Silty clay, reddish-brown, highly calcareous, containing abundant fragments of firm claystone. 0.15

Observed thickness: 1.7

The #1 pit exposed limestone at bottom only near the wall. Central parts of the passage have much thicker sediments; full thickness of cave deposits was intersected nowhere.

The upper rubble layer of unit 1 in the Kostenosny Passage was formed from the Kargin Interglacial (MIS 3) to Holocene. This conclusion is supported by ^{14}C data 33,500±1,000 (GIN-5823) of brown bear bone extracted

from the depth 0.4–0.6 m. The unit 1 is not stratified and contained the remains of fossil Pleistocene and subfossil Holocene fauna.

Brown silty clays of the underlying unit 2 in the Kostenosny Passage were accumulated during Kargin Interglacial (MIS 3) on the basis of ^{14}C data >40 K (SOAN-2902) obtained from charcoal. Also the shell of a relatively thermophilic terrestrial mollusc *Gastrocopta theeli* (West.) (Popova et al. 2002) was found there.

No paleontological remains were found in the underlying units 3 and 4.

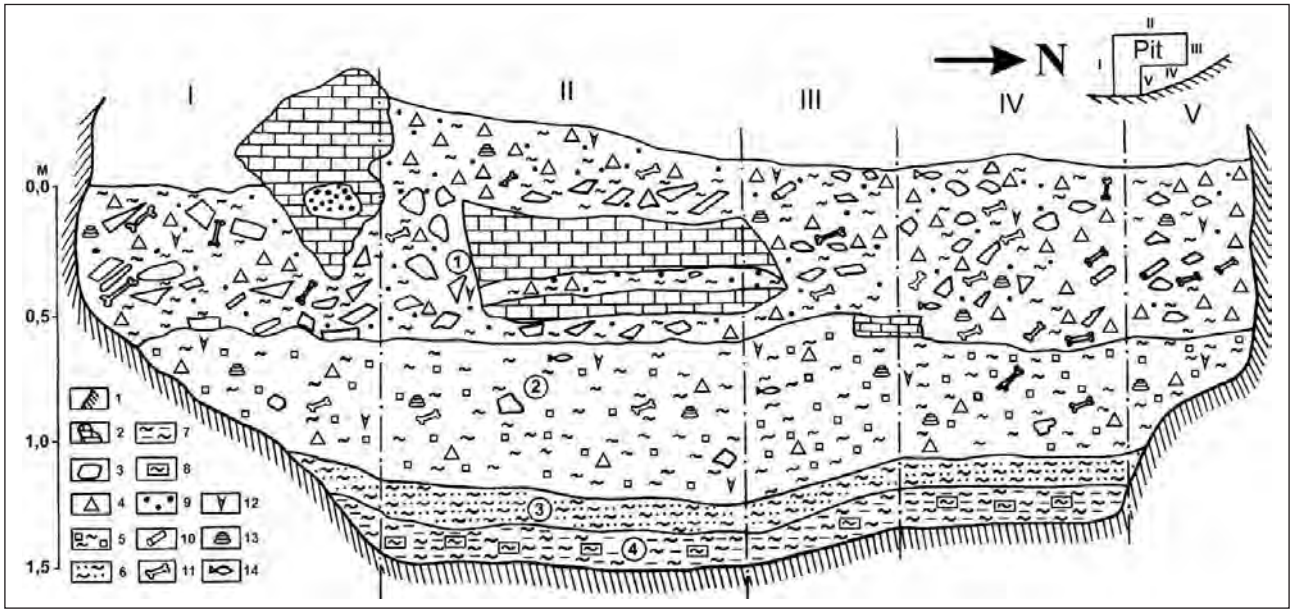

Figure 5. Cross-section of cave sediments in the pit #1, Kostenosny Passage. 1 – host rocks; 2–4 – limestone fragments: 2 – of boulder and bigger size, 3 – of cobble size, 4 – of pebble size; 5 – clastic silty clay; 6 – sandy silty clay; 7 – silty clay; 8 – claystone clasts; 9 – pika's excrements; 10 – wooden debris; 11 – large mammal bones; 12 – micromammalia bones; 13 – mollusc shells; 14 – fish remains.

4. Faunal remains

Bone saturation of sediments varies significantly in different parts of the cave. Bone remains are rare in the entrance grotto, whereas they were abundant in the Kostenosny Passage. The latter can probably be explained by the likelihood of usage of distant parts of the passage as dens by carnivores. Relics of recent bear's lair and fox's den were clearly visible before excavations began. Extensive physical weathering of walls and ceiling triggered collapse of blocks, slabs and smaller rubble, and also contributed to impoverishment of the paleontological remains in the entrance grotto.

Overall, 602 identified bones of 23 species of large mammals and small carnivores were extracted from the cave sediments; one taxon was identified to genus. Total number of micromammalian bones is not available because plentiful bone remains obtained from unit 1 in the Kostenosny Passage were not counted. Micromammalian remains belong to 20 species and 12 taxa identified to genus. Collections of avifauna remains consist of 194 bones of 29 species; 4 taxa identified to genus. Along with the above, numerous Arctic grayling remains, isolated snake spondyls, and shells of 13 species of terrestrial and aquatic molluscs were found.

Amongst the bones of large mammals, 11% of which belong to the extinct species of the Upper Palaeolithic faunal complex, namely woolly rhinoceros, Baikalian yak, cave hyena and cave lion. At the present time, the Siberian goat, red wolf and arctic lemming locally extinct on the Primorski Ridge (Nekipelov et al. 1965), while their bones are part of the cave taphocoenosis.

The most abundant remains among the large mammal bones belong to roe deer (19.0%), red deer (10.0%), musk deer (9.5%) and brown bear (9.0%). The bones of the extinct woolly rhinoceros, cave hyena and bison make up 4%, 3.5% and 2% respectively.

Faunal remains extracted from the layers, which had been formed during Kargin Interglacial (MIS 3), have especial significance amidst obtained collection because terrestrial fauna of this time interval was not yet studied at Lake Baikal. Total number of large mammal bones comprises of 301 specimens. Remains of roe deer, red deer and sable prevail (18%, 12% and 10% respectively), and the bones of other mammals are less common: wooly rhinoceros, cave hyena and badger (all by 6%), fox (5%), brown bear and reindeer (by 4%), wolf and bison (by 3%).

The collection of micromammalian bones extracted from the Kargin sediments consists of 3,510 specimens. The largest part of it belongs to the remains identified only to Arvicolidae family, which comprises 42.7% of whole collection. Remains of other rodents and lagomorphs are far less abundant: *Ochotona hyperborea* (18.8%), *Lepus timidus* (2.8%). *Clethrionomys rufocanus* (12.5%), *C. rutilus* (5.1%), *C.* sp. (2.3%), *Microtus gregalis* (4.0%), *M.* sp. (3.4%), *Alticola cf. argentatus* (3.4%).

Abundance of pika remains in taphocoenosis of the cave is attributed to the wide spread nature on rocky screes and cliffs in the surrounding area.

The list of the Kargin fauna is populated with fish (1 species), snakes, birds (20 species and 4 taxa identified to genus), terrestrial (7 species) and aquatic (1 species and 2 taxa identified to genus) molluscs.

A list of fauna of the Kargin Interglacial from the cave Kurtun-1: Mammalia: Insectivora: *Sorex sp.*; Chiroptera: *Murina hilgendorfi* Peters; Lagomorpha: *Lepus timidus* L., *Lepus* sp., *Ochotona hyperborea* Pall.; Rodentia: *Pteromys volans* L., *Sciurus (Sciurus) vulgaris* L., *Tamias (Eutamias) sibiricus* Laxm., *Spermophilus (Urocitellus) undulatus* Pall., *Spermophilus (Urocitellus)* sp., *Marmota* sp., *Apodemus* sp., *Micromys* cf. *minutus* Pall., *Cricetulus* sp., *Alticola* cf. *argentatus* Severtzov, *Clethrionomys rufocanus* Sundev., *C. rutilus* Pall., *Clethrionomys* sp., *Lagurus* cf. *lagurus* Pall., *Myopus* sp., *Arvicola* cf. *terrestris* L., *Microtus (Stenocranius) gregalis* Pall., *M.* aff. *fortis* Büchn., *M. (Microtus) oeconomus* Pall., *M.* cf. *arvalis* Pall., *Microtus* sp.; Carnivora: *Canis lupus* L., *Vulpes vulpes* L., *Cuon alpinus* Pall., *Ursus (Ursus) arctos* L., *Martes (Martes) zibellina* L., *Mustela (Kolonocus) sibirica* Pall., *M. (Putorius) eversmanni* Lesson, *Meles meles* L., *Crocuta (Crocuta) spelaea* Gold., *Panthera (Leo) spelaea* Gold., *Felis (Lynx) lynx* L.; Proboscidea: *Mammuthus primigenius* Blum.; Perissodactyla: *Equus* sp., *Coelodonta antiquitatis* Blum.; Artiodactyla: *Sus scrofa* L., *Moschus moschiferus* L., *Cervus (Cervus) elaphus* L., *Capreolus capreolus* L., *Rangifer tarandus* L., *Bison (Bison) priscus* Boj., *Capra (Ibex) sibirica* Pall., *Ovis (Ovis) ammon* L. Pisces: Salmaniformes: *Thymallus arcticus* Pall., *Thymallus* sp., Reptilia: Squamata: Serpentes. Aves: Anseriformes: *Anas clypeata* L., *A. platyrhynchos* L., *A. acuta* L., *A. guerguedula* L., *Bucephala clangula* (L.), *Mergus serrator* L.; Falconiformes: *Accipiter gentilis* (L.), *Falco peregrines* Tunstall, *F. tinunculus* L.; Galliformes: *Bonasa bonasia* L., *Tetrao tetrix* (L.), *T. urogallus* L., *Lagopus* sp., *Perdix dauricae* Pall.; Strigiformes: *Strix* sp., *Otus scops* (L.), *Surnia ulula* (L.); Apodiformes: *Apus pacificus* (Latham); Piciformes: *Picus* sp.; Passeriformes: *Turdus* sp., *Monticola saxatilis* (L.), *Pyrrhula pyrrhula* (L.), *Coccothraustes coccothraustes* (L.), *Nucifraga caryocatactes* (L.), *Pyrrhocorax pyrrhocorax* L. Mollusca: Gastropoda: *Succinea* ex gr. *oblonga* (Drap.), *S. putris* L., *Bradybaena schrencki* (Midd.), *Vallonia tenuilabris* (Al. Brawn), *V.* ex gr. *pulchella* (O.F.Müller), *Gastrocopta theeli* (West.), *Pupilla muscorum* (L.), *Lymnaea* sp., *Anisus (Gyraulus) acronicus* (Fér.), Bivalvia: *Euglesa* sp.

5. Archaeological findings

Isolated bone artefacts were found in the upper layer 0.6–0.8 m in the Kostenosny Passage (Goryunova et al. 1996). They are represented by the harpoon, needle case and the fishhook of unknown age. Most likely the cave was used occasionally as a temporary dwelling by human beings.

A fire-pit was discovered in the layer of brown loam with limestone rubble at the depth of 0.9–1.0 m. ^{14}C data >40K (SOAN-2902) was obtained from the charcoal. The charcoal location was in the entrance part of the manhole into the Kostenosny Passage. The passage was used by brown bears, foxes, cave hyenas and cave lions as a den and a lair. This suggests that the fire was started with the purpose of hunting for carnivores.

6. Conclusions

The Upper Pleistocene site Kurtun-1 is characterized by vast diversity of discovered species of mammals and birds, and novelty of number of finds:

1) the richest site of the Kargin mammal and avian fauna by the number of species in Eastern Siberia;

2) the only site of Upper Pleistocene avifauna at Baikal lake;

3) first locality at Baikal where bones of the cave hyena, the steppe polecat and the red wolf were found;

4) second locality at Baikal containing remains of *Panthera (Leo) spelaea* Gold. (the first find was made in the vicinity of the Sagan-Zaba bay (Ovodov 2009);

5) first site at Baikal where relatively thermophilic terrestrial mollusc *Gastrocopta theeli* (West.) was found in the Upper Pleistocene sediments;

6) the presence of fire-pit and charcoal older than 40 thousand years in cave sediments, advantageous location of the entrance grotto for temporary shelter, overnight stop and hunting for carnivores allows to consider the cave Kurtun-1 as the most promising place for the search of Palaeolithic human remains at Baikal at the present day.

The cave carries a great potential for additional characteristics of the fauna of Kargin Interglacial.

References

Goryunova OI, Filippov AG, Vetrov VM, Berdnikova NE, 1996. Caves of Pribaikalski National Park (materials for the Code of archaeological sites of the Irkutsk region). In: Archaeological heritage of Baikal Siberia: study, conservation and usage, issue 1, Irkutsk, 101–109 (in Russian).

Mlikovsky J, Chenzychenova F, Filippov A, 1997. Quaternary birds of the Baikal region, East Siberia. Acta Societatis Zoologicae Bohemicae, 61, 151–156.

Nekipelov NV, Sviridov NS, Tomilov AA, 1965. Animal world. In: Predbaikalia and Transbaikalia. Science Press, Moscow, 282–322 (in Russian).

Ovodov ND, 2009. Large Upper Pleistocene cat in Siberia. What is it? In: Questions of archaeology, ethnography, anthropology of Siberia and neighbouring territories, vol. 15. Publishing House of Institute of Archaeology and Ethnography, Novosibirsk, 182–185 (in Russian).

Popova SM, Shibanova IV, Filippov AG, 2002. Climate Reconstructions of Upper Cenozoic in Pribaikalia. Geography and Natural Resources, 1, 108–115 (in Russian).