

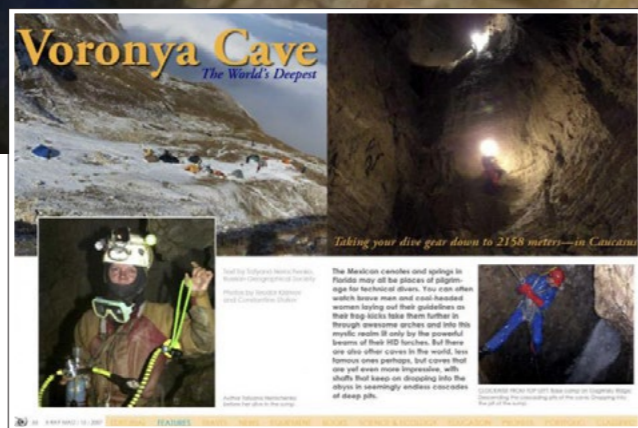
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The Kruber-Voronya Cave is located in the Arabika Mountain Massif of the Gagrinsky Ridge in the Western Caucasus, in the town district of Gagra in the Abkhazia region. With a depth of 2,197m, it is the deepest known cave on the planet. The entrance is located at an altitude of 2,250m. In 2006, an expedition discovered a lake at a depth of 2,146m and went about exploring it. It was named “Dva Kapitana” (“The Two Captains”). During the initial expeditions, which were covered in a previous article in 2007 (see issue #15), the sump was explored to a maximum depth of 51m and 180m horizontally. But what has happened since then?



Russia's Voronya Cave

Diving Deeper into the Deepest Cave on Earth



Members of the expedition transport equipment to the Two Captains sump in Voronya Cave, the deepest known cave on the planet.

The level of the lake and entrance of the sump varies depending on precipitation, season and melting snow. During spring, the surface can rise to 150m above that of the lower levels. The water temperature is about 7°C (~ 46°F).

A brief history

To recap, the first to explore the sump was cave diver Gennady Samokhin, who conducted two dives in the summer of 2006. The passage was oval, some 2m by 1.5m in dimension, and sloped gently down-

ward. After first diving 20m to a depth of 6m, Gennady reached a depth of 14m on his second dive and laid out 40m of guide line. Further down, the passage became slightly wider only to contract again before a big stone obstructed the passage.

Click issue 15 above, for prior Voronya expeditions



Gennady Samokhin on his way of the Two Captains sump in Voronya Cave (above) and preparing to dive (left)



That was where further progress was halted and matters came to an end, when we last covered the exploration of Voronya Cave in early 2007. "What is there on the bottom of the world's deepest

two 4-litre tanks, he managed to bypass the blocking rock and explore a further 80m, which took him down to a depth of 20m. The following summer, Samokhin continued the exploration, this time

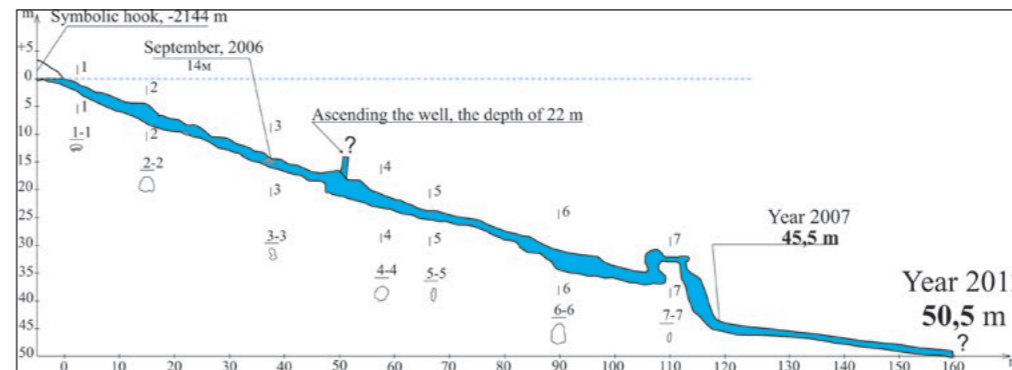
cave so very close to sea level?" wondered one member of the 2006 team, Yuriy Kasyan, in this article.

Recent exorations

The next diver to explore the sump was Oleg Klimchuk who visited the cave in the winter of 2007. Using

accompanied by fellow cave diver, Yuriy Evdokimov, using tanks with just air.

On the first day, Samokhin made his way through a narrow, winding, underwater passage to reach a depth of 24m. The following day, Yuriy Evdokimov managed to reach 36m. On the third day, Samokhin went even further to a depth of 45.5m and 140m horizontally. At a depth of 37m, the passage widened to 3.5m and then ascended to 31m. Here he found a dome about 3m in diameter and a horizontal passage (oval shape in shape, 1m by 1.7m), which dropped down via an underwater shaft with a 3m



The sump profile from Gennady Samokhin's expedition in Voronya Cave

diameter. At a depth of 42m, the shaft changed to a sloping gallery. At that point, the documented length reached 2,191m.

During summer expeditions in 2010 and 2011, cave diver Yuriy Basilevsky attempted to dive the sump with a semi-closed rebreather, but was unable to bypass the big stone block at a depth of 12m.

2012 Expedition

In the summer expedition of 2012, Samokhin dived the sump with trimix gasses, exploring a further 180m to a depth of 50.5m, extending the recorded length to 2,197m. A total of 59 cavers from the Ukraine, Russia, Lithuania, Poland, Israel, Spain, Ireland, United Kingdom and Lebanon participated in the historical expedition, lasting of 34 days. Led by Yuriy Kasyan, the team included cave divers as young as 13 years old on up to 57 years of age. What follows is Samokhin's account of his exploration of the world's deepest known cave.

"In 2007, after reaching a depth of 45m, I was convinced that it was the last dive in the Two Captains sump," said Samokhin. "It was difficult enough. Forty-five meters may not seem much. A couple of constrictions may not sound like such a big deal either. However, when you have to consider everything at once, you really need to come up with a new approach for attacking the challenges ahead. At that time, I had

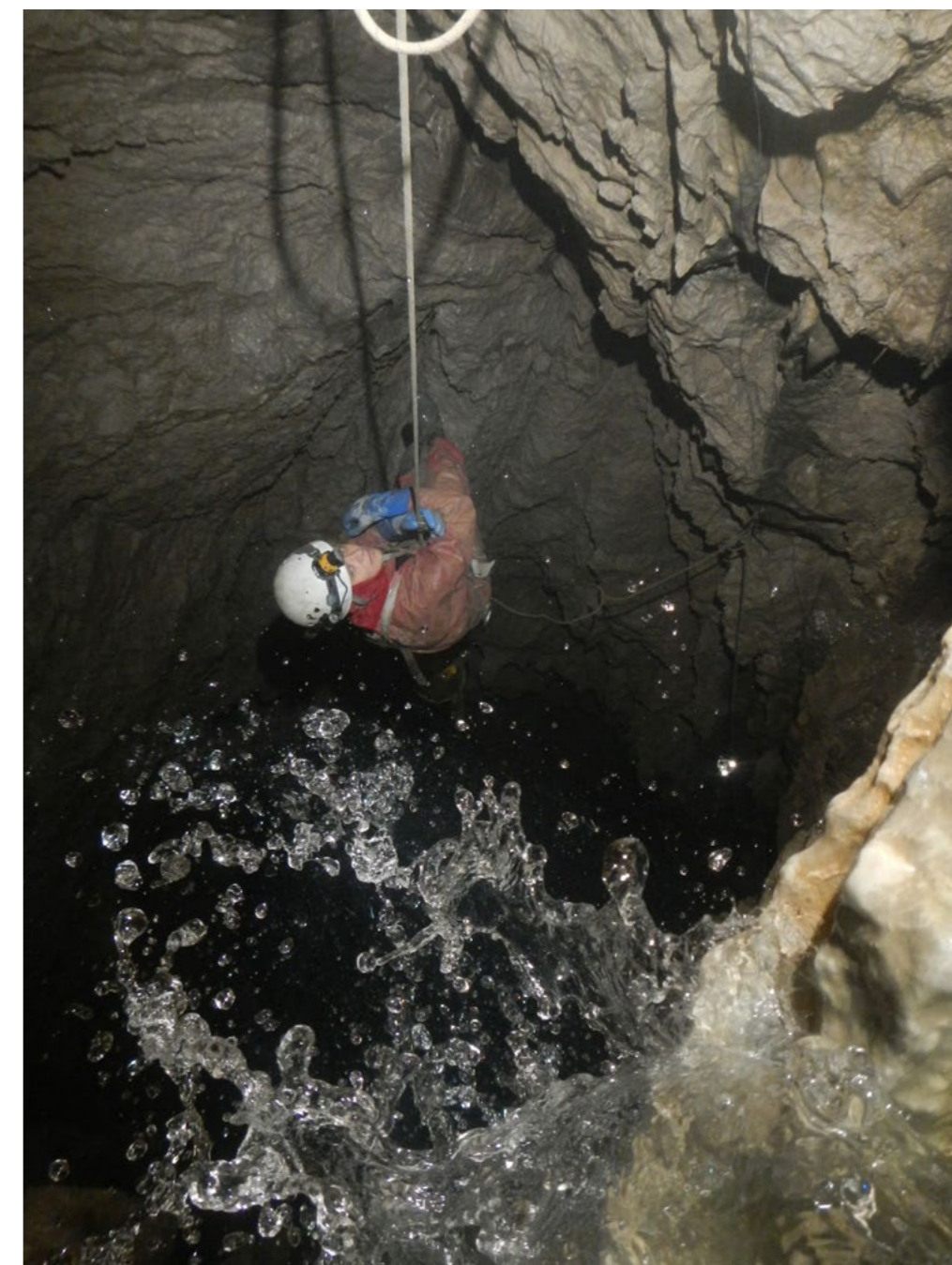
two sidemounted 300 bar 7-liter tanks and an additional tank, which I carried by hand. As I was exiting the sump, I had only 50

Voronya Cave

bars of gas in each tank, instead of the predicted 90 bars. That is when I realized that further exploration would require a bigger quantity of gas and use of trimix. I also came to the conclusion that it would be better and safer to use a rebreather.

Preparations

But this was easier said than done.



Samokhin on his way from camp to the Two Captains sump

Other teams have attempted to dive the sump using rebreathers and failed. Passages are quite narrow in places, so regular rebreathers cannot be utilized. "In 2011, a fateful decision was made by our team. We had decided to organize a great expedition and use three deep divers for diving at the bottom of the cave. All of

the three divers were very experienced cavers," said Samokhin.

"However, before we even departed for Abkhazia," said Samokhin, "we were informed that one of the divers would not be able to join us. Next, as we were about to descend to the bottom of the cave, transporting all the bags of equipment for diving

and setting camp to a depth of 1,200m, we received news that the second diver did not make it through the border, due to issues with his passport. As a result, we ended up having only one diver—me. It was thus necessary to reassess and rework the scheme for traversing the sumps. There were 31 tanks in the camp at a

depth of 1,200m. Now only seven of them was needed and another two were brought just in case.

"Thanks to a massive effort, the gear made it to the Rebus camp, which had been set up at a depth of about 1,960m. Here was a cozy platform, a pack of UPS batteries to supply computers with power and a pile of 7-litre

Gennady Samokhin prepares for a dive in the Two Captains sump (right); View of the Two Captains sump lake (below); Samokhin starts his dive in the sump (lower left)



here: <https://www.youtube.com/watch?v=8B260K1PU>.

Two Captains sump

On the August 8, the team of five cave divers—including Gennady Samokhin, Yuriy Kasyan, Aidas Gudaitis, Arturas Artyushenko and Alex Pustovitin—carried two bags of 6-litre tanks with nitrox, two bags with underwater equipment, wetsuits, warm clothes and a bag of ropes and rigging equipment, plus a half-filled bag of photos into the cave. Kasyan had gone down quickly to begin rigging the cave, while the others, heavy with bags, came down slowly to the Two Captains sump.

"This year, the surface of the sump face was at the 2,144m level," said Samokhin, "1.5m below the mark of the water level we made the first time we visited the sump. The level of the sump's surface seemed to be ever changing; There was a time when we found the mark 4m under the water. In any case, this mark represented the extreme point of penetration—The Underground Pole!

"Changing our attire from

tanks, looking rather knocked about from previous expeditions. We were surprised they had not become rusty, but had a white musty appearance that was a bit disconcerting.

"We had no intentions of just sitting around. The following day we would dive the Two Captains sump. Below the camp at a depth of 1,980m was the Kvitochka sump

(meaning 'diminutive flower'). We planned to take five 4-litre tanks, one for each person. All the divers agreed to use only one tank. In the case of a regulator failure, it was possible to swim 5-6m holding one's breath." A YouTube video, by three cavers from Lithuania, describing the passage of the Kvitochka sump in 2010 has been posted



Gennady Samokhin gets into the entrance to the Two Captains sump in Voronya Cave (left) and starts his dive (below)

Voronya Cave

passed by the middle or the bottom level. At 22m was a small elevation (about 0.5m by 0.5m) and after that, a beautiful column with a diameter of about a meter bisecting the passage in two. I took the one on the right and made a note to look on the left upon my return."

Call me an optimist

"After the column, the passage went sideways," said Samokhin. "It became possible to turn and go more or less horizontally, touching walls with my tanks. At this point, I

came across two handbags with a hammer and hooks, which we left behind five years earlier. The depth was 35m and the passage felt wide. Call me an optimist! In reality, the passage was only a meter wide, with a height up to one-and-a-half meters. Continuing to a bend at 37m, I attached the guide line to the rocks and left the bags behind. The pressure was 190 bar on one gauge and 170 bar on other. So far, so good.

"I had used only a third of my gas, so everything was going according to plan. Above my head

were two windows. That was strange, I only remembered one from my visit five years prior. Turning back, I went around the column at 22m; the water was clear and the guide line in sight. Two to three meters above the column, I noticed an oval opening, some 1m by 0.7m going up. Having only seen the entrance, I pondered going further without the line but decided against it.

"Coming back, I constantly adjusted my tanks while crawling along the 10-15m narrows, from 22- 18m of depth. As I was slowly



'walking' to 'diving' suits (which were very thin and light, specially made for deep cave diving) was straightforward. Despite wearing layers of fleece jackets and pants, it was quite comfortable nonetheless.

"The dive had two primary goals," said Samokhin. "The first was reestablishing the guide line to 37m, the location of a small extension and a very unpleasant narrow section behind it. The second was to carefully look round and plan for a deep dive.

"I knew by experience that a minimum of four 6-litre tanks would be required to go beyond a depth of 45m in the sump. It was not possible to carry them on, all at once, due to the restricted space. To get around this issue, we planned that two tanks of

trimix would be carried forward by two support divers who went in ahead of the main explorer. The explorer would go to 37m using two tanks with Nitrox before changing to the trimix tanks put there by the other divers and use these to dive down as far as possible. Upon returning, he would leave the spent trimix tanks at 37m, go back on nitrox tanks for the ascent to 6m, where there was oxygen for decompression. The equipment and tanks left behind would be collected by a support team on the next day. However, 66 percent of the diver team dropped out. I needed to figure out whether I could possibly carry all four tanks at once through the narrow passage on my own.

"Over time, we have obviously become more familiar with

the sump," said Samokhin. "So I decided to dive with two 6-litre tanks with 270bar of Nitrox 32, to become accustomed with the sump. Although it may not sound like a major issue, there was a little problem: I did not have a reel, as the second diver had it. But where was he?"

"The previous day, I had carefully packed 200m of marked guide line into a little bag, which would be hand-carried," said Samokhin. "Up to a depth of 10m, visibility was about 15-20cm. At 14m, I passed the stone that stopped me in 2006 because of my back-mounted equipment. From 18-22m, the passage had several constrictions, which I had to traverse sideways. I took note there was a multilevel winding passage, and it should have been



Gennady Samokhin
at Two Captains
sump in Voronya
Cave

Voronya Cave

stone and the 'suitcase' on one side of the stone. From here on, I breathed out of the tanks in the suitcase. Once in the narrow winding passage, it became much harder to swim. It takes a lot of effort to move sideways while dragging two tanks by hand and breathing from those very same tanks at the same time. The regulator hose was not long enough to allow me to put it down. If I let go of the suitcase, the regulator would be pulled out of my mouth.

Fish

"Reaching a depth of 22m, I was out of breath," said Samokhin. "At the narrowest point, I pushed the suitcase through and placed it

ascending, the cheerful shouts of welcome echoed from above. Even with no decompression, the dive took 32 minutes. I spent 20 to 30 minutes getting dressed before climbing the 180m back up to Rebus camp.

"For the second dive, I decided to carry four tanks at once. Twin 6.8 litre composite tanks with trimix were firmly affixed in a sidemount. The two 6-litre nitrox tanks were placed in transport bags so I could carry them by hand. As a precautionary measure, I would also leave an oxygen tank for decompression at 6m."

The next day Samokhin, Kassyan, Gudaitis and Gintautas went through the Kvitochka sump.

Kvitochka sump

"Being the exploratory diver, it was agreed that I should not carry down any bags," said Samokhin. "So the others carried two sacks each. I gave them a head

start, but I soon caught up with them in the winding Gambit passage. Encumbered with two fully-loaded transport bags, one cannot move so fast, especially in narrow places. Without the load, however, it was much less noticeable how cramped the quarters really were.

"It took us less than half an hour to kit up to traverse the sump. While gearing up, Yuriy Kassian and Gudaitis Aidas assembled a sophisticated construction from two tanks, regulators, belts and ropes to make it more easy to carry. I asked if they could add a carrying handle and change the orientation of valves for first stage of regulators. The resulting contraption resembled a large suitcase with a handle, which later turned out to be negatively buoyant (a real added bonus).

"I left the oxygen tank on the guide line at depth 6m. The silt continued down to two to three meters. At 14m, I was relieved to be able maneuver myself above the

on the rocks behind. Attempting to pass through myself, I needed both hands to adjust the tanks on my side. However, the hose was too short and I pulled the mouthpiece out of my mouth when I was moving. After some effort, I ideally positioned the suitcase behind the narrow section and passed through, but my breathing was slightly less heavy. While lying in the crack, I observed a school of small, translucent fish with flat elongated bodies and tail fins. Why did I not see them earlier? Most likely, I was focused on the morphology of the sump and just did not notice them.

"Descending to 37m, I rested and regained my breath. I was supposed to leave the suitcase with nitrox here. Gauges indicated 150 and 160 bar; at the beginning, it was 280. Alarmingly, I had already utilized more than a third of mixture. Picking up the bag with guide line, which I had left yesterday, I left the suitcase be-



Samokhin emerges from the Two Captains sump in Voronya Cave



tech talk

Gennady Samokhin emerges from the water after his record deep dive in Voronya Cave

Voronya Cave

hind and started to breathe from the two trimix tanks, each with 290 bar. I then changed my dive computer from nitrox to trimix gas mixtures. Rising to three meters, I realized a second window was near the main one, but it turned out to be only a small niche.

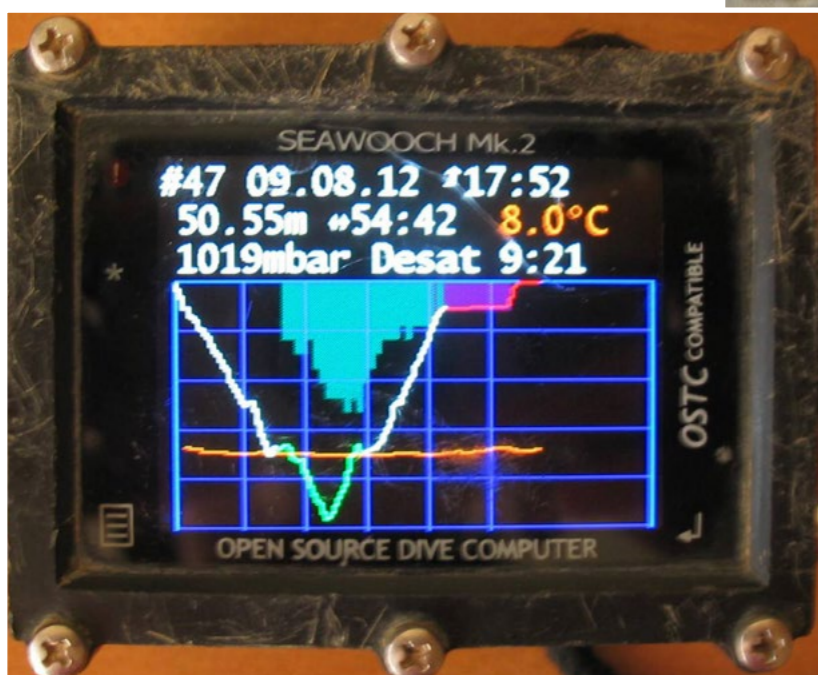
“The main window itself proved very tight. Adjusting tanks, I squeezed into the window and dived headfirst down to 45m, which was my deepest point in 2007. The trimix provided a bit of clarity in perception. The well was not vertical, but a 75- to 80-degree steep incline. The pass looked like an extended crack. Just after 2m, the passage flattened out before continuing in the form of crack 1-1.5m in height and 0.5-0.7m wide. When planning my dive, I set a maximum value at 65-70m. The runtime in one direction was 6-8 minutes. I went along the pass, constantly keeping an eye on the trimix dive computer and a second Aladdin dive computer I wore for redundancy, to better estimate my gas consumption as the dive progressed.

“I crawled for 10m, but the depth was only 46m. I moved primarily on the side, but occasionally, the passage allowed me to turn horizontally. The depth was

50.5m, which necessitated laying out an additional 40m of line from my last point. The furthest passage barely changed in morphology and continued as far as the light penetrated. Naturally, I wanted to dive as deep as possible, but gas supplies are not infinite and I had already used 40 percent. For me, this was the limit for the configuration used in this sump. It was time to turn back, but there was no place to turn.

Hatha yoga

“Stopping, I attempted various postures of hatha yoga. At last, I crossed my legs, maneuvered the fins from under my armpits to along my back and managed to turn around. Breathing a sigh of relief, I noticed a school of fish was near me the entire time.



Screen shot of the dive profile of Samokhin's record dive in Voronya Cave during the 2016 expedition



Coming out, I got up the well from 45 to 34m and got stuck into the tight window. With my head stuck up the window, I could see my suitcase with tanks, but I could not get through. I tried several postures, moved tanks on my sides here and there, but nothing helped! Finally, I

achieved the right position and dropped down to the suitcase.

“I then switched from nearly empty trimix tanks back to the nitrox tanks I had left behind. From here on everything was straightforward. Carrying all four tanks, I went to the 6m stop, breathed oxygen for nine minutes and came up. Seeing my friends made me very happy! (See video showing exactly that moment

here: <https://www.youtube.com/watch?v=hz7moUaaAM4>)

“We decided to sit a couple of hours. I periodically breathed oxygen in intervals of 10 or 15 minutes. Finally, it was time to go. Passing vertically 100-120m during the ascent, my elbow joints started to ache, which continued for two months afterwards. We finally arrived at camp after midnight to find no one had slept. Every-

one had been anxiously awaiting news of our arrival.

“The next day, I did nothing but drink tea, sleep, eat, drink more tea and sleep again. After that we headed for the surface with our massive amount of gear.” ■

To see a video on the Voronya Cave 2013 expedition, see: https://www.youtube.com/watch?v=hqfTk_jbHv0.