Member of the dive team training in a Mexican cenote

SERGEY BAYKOV

10k on a Rebreather

— Making the Long Dive

Text by Sergey Baykov
Photos by Sergey Baykov and Anna Loznevaya

On August 14 in Dahab this year, our team of three divers dived a distance of 10km in eight hours using rebreathers. The purpose of this experiment was a practical test of human capabilities and the performance of rebreathers on a long dive, while under the influence of physical activity.

It was in autumn 2010 that my colleague, Sergey Gorpinyuk, proposed the original idea to me: to dive a distance of 7km. As to a location for the experiment, we chose the colorful Mexican cenotes (caves) because they have long passages, calm current and stable direction. In addition, they have markup distances and many exits. We needed only to mark the way in the caves with guidelines. The rebreather was chosen as a technical means for the realization of the project.

I was already certified as a Full Cave Diver, but at that time, I had just begun to dive on closed-circuit devices. Gorpinyuk, at that time, had already acquired some good experience diving with a rebreather. The task was clear, so two months later, I bought my rebreather—an Inspiration Vision, a good kit with which to embrace the dream.

After testing the new rebreather in January and February, we traveled to the White Sea in northwestern Russia to practice diving with the apparatus in cold water and in overhead environments. Two days we spent under the ice, with the air temperature at -37°C and one day we spent in flooded tunnels—it was good training!

To Mexico cenotes

Two weeks later we flew to Mexico. It was the beginning of March and the jungle was blooming. After the trip to the White Sea, saying that conditions in Mexico were comfortable was putting it mildly. The air temperature was 25°C, the water was 25°C, and the visibility was amazing. Plus the beauty of the cenotes was astounding.

But, as fate intervened, a long dive didn't happen. Firstly, it appeared, that diving in the local caves required CCR Cave Diving certification, even if the diver has Full Cave and CCR certificates.


SERGEY BAYKOV

Sergey Baykov and the first modification of his rebreather (left)

Test in the hard conditions of the White Sea (below)


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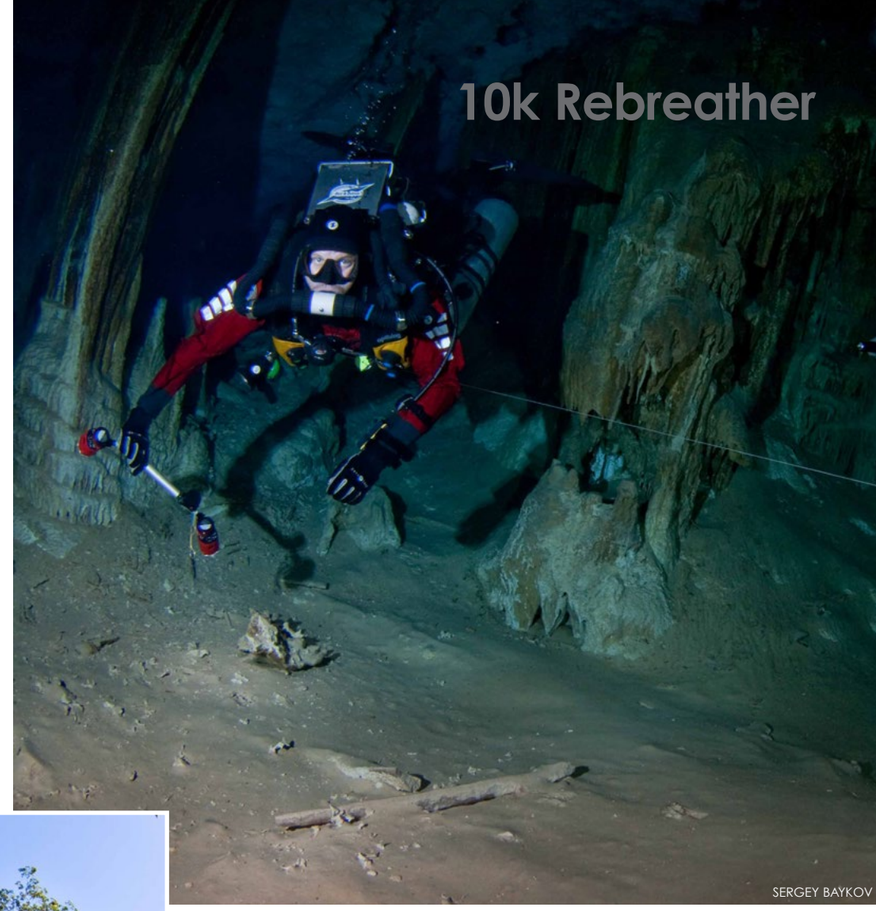
Training in a Mexican cenote (right)


SERGEY BAYKOV

10k Rebreather

To remedy the situation, we took three days to complete the additional course. During the training, we found out that the frames of our rebreathers were very cumbersome, and, in fact, we spent a lot of energy on overcoming the apparatus' drag underwater. Moreover, our experience with the equipment was not a good one.

However, the conclusion we reached at the time was that the trip to Mexico was not done in vain even though we had not completed the task we set out to accomplish. The "long dive" did not happen. But we did not let ourselves get bothered by the delay. The process of preparing was something we enjoyed.

Back to the drawing board

Periodically, we dived on our rebreathers, we made measurements and analysis of what was happening. I moved towards upgrading the supporting frame of my rebreather. The new construction allowed for the use of different tanks and, with the right approach, saved on weight as well as improved the streamlining of the apparatus.

I spent a lot of time making a plastic prototype, measuring millimeters of gaps and then made the product from stainless steel. I tested the prototype during one of our trips to Dahab in the spring of 2012 and I was satisfied with its performance. After that I made a titanium version, which was more robust and lightweight at 2.5kg.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The beauty of the Mexican cenotes was astounding. Above is an entry into a Mexican cenote

Still, for greater streamlining, I moved my rebreather's lung bags back to the shoulders. The idea was not new, but in the standard configuration of the Inspiration rebreather there were front lung bags. The manufacturers changed the trim, adding buoyancy to the shoulders and decreasing the buoyancy of the legs.

This problem was especially felt in a wetsuit. We had to exert more energy to keep the horizontal position of the body. Well, of course, it was extra physical work and effort. I should mention that I made the shoulder lung bags in 2014 and tested them over the summer in the Barents Sea and in the Baltic. Indeed, it turned out to be a good and necessary device.

Gorpinyuk also worked on the project. For example, in the summer of 2012, he made a long dive in Dahab—lasting six hours. He proved that a long dive was really possible.

Even then, he brought with him underwater some condensed milk snacks and water in plastic bottles, and he also worked out a surface detection system. Every hour he threw a buoy to the surface for three minutes.

I also checked the perfor-

Dahab Coast, Egypt (above); The Three Sergey's (top left) preparing for the long dive—Sergey Baykov, Sergey Zakhvatov and Sergey Gorpinyuk

mance of the rebreather. I dived in different conditions and with different lengths of duration underwater in various locations such as the Maldives, Egypt, the Barents Sea, the Baltic, local ponds, Orda Cave, and other locations.

Dahab

Conclusions were drawn and details were specified. And so it was on 14 August 2014 that we took the plunge for the "long dive" in Dahab.

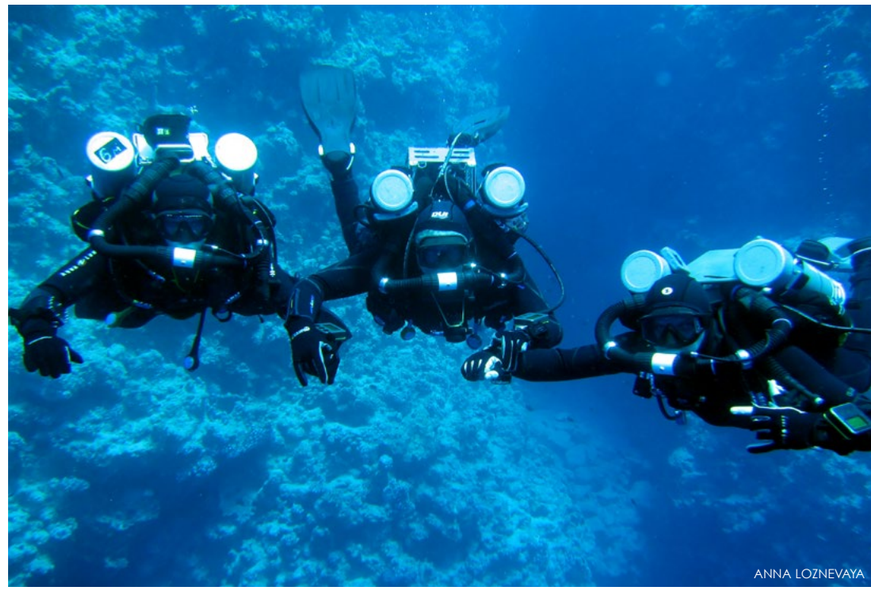
At that stage, Sergey Zakhvatov joined our team. He had been diving rebreathers since 2011. He was an athletic person with good sports facility. So The Three Sergey's with three rebreathers set out, with three different configurations of frames, to test the physical capabilities of both human being and machine, on a long dive, compounded with physical exertion.

Despite the fact that all the equipment was prepared and checked the day before, we woke early and met at 6 AM at the dive club, Planet Divers. Once again, we tested the rebreathers, spoke about the details of the upcoming dive and coordinated the dive with a security team, which included a dive boat and a safety-diver, whose task was to observe the sea surface and always be ready to rescue a diver in need.

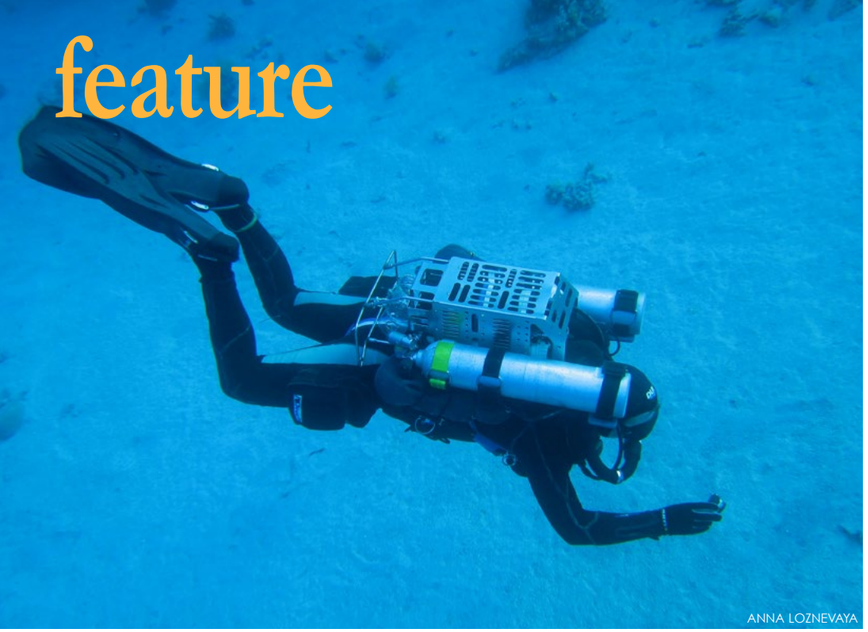
At 8 AM we embarked onto the dive boat. After a brief administrative examination by the police, we headed out to sea. We sailed northeast along the coast. If you've ever been to Dahab, you know that the boats are moored in the lagoon, and the place of our entry into the water was 15km from the dock.

Taking the plunge

The site we chose from which to start the dive was El Bells, which is the most northern dive point in Dahab. For one and a half hours, we journeyed into the wind (in Dahab the wind is almost always



LOWER LEFT TO RIGHT: Final check; Entry into the water; Photo op before the dive


ANNA LOZNEVAYA

Member of the dive team underwater (left) with clear view of altered rebreather rig from above; Emersion of dive team member, Sergey Zakhvatov (right); National Russian energy drink (below)

northerly) until we came to the dive site. We quickly threw on our rebreathers and jumped into the water. With us was Anna Loznevaya—a journalist from the local "Russian Club" and her assistant—who jumped into the water with the team. Their task was to take underwater photos of the beginning of the dive.

The little photo session took place and we started the dive at 10:00 AM. It was to be a 10m dive, the optimum depth for a nondecompression dive. The electronic rebreather itself supports PpO2 0,7ata, which is comparable to diving on EAN-35. Rebreathers use 6-liter tanks. In one tank is oxygen and in the other is air, a diluent gas, which is in this case a bailout or emergency gas. Six liters of compressed air is enough to ascend from a depth of 10m.

The configuration of our team was obtained fairly easily. We were swimming efficiently. Moreover, the current was on our side. And after 1.5 hours underwater, we reached the dive site called Canyon. Over the next 30 minutes, we swam to the turn at Abu Helal. It was about 3km

ANNA LOZNEVAYA

from the start of the route. We threw out the buoy and had a rest. Sergey Zakhvatov decided to have a snack—quality condensed milk from Belarus. The plastic packages were very useful for underwater eating. Sergey showed us that it was tasty!

We reeled in the buoy and proceeded further. On the way, we observed the amazing underwater world of the pristine dive sites—they were very impressive, with brilliant colors of coral gardens, gorgonians and other reef life.

Current issues

After some time, we figured out that the current wasn't helping us. How so? According to our calculations, it should have carried us four hours more. But nature has its own laws. And because of the topography of coastline, current can go in the opposite direction. As a result, for two hours we swam without current. We were still deploying the buoy every hour, and while it was on the surface, we had three minutes to rest.

Four hours after the start of the dive, we found that the current was still obstructing us. And the next four hours were spent swimming against it. Initially, the current was weak, but by the last hour it was very strong. We were underwater and could only guess where we were, but our security team saw us clearly via the buoys. According to the observation of the team, the first three hours we went half of the way, and over the next five hours, we covered the second half, because the current affected the time it took to travel the distance.


ANNA LOZNEVAYA

Scrubber warning

At the end of the seventh hour, Sergey Zakhvatov had a problem with his rebreather computer. A "Scrubber Warning" alerted him that the sofnolaym had worked out its time. (Sofnolaym is a powder necessary for the utilization of carbon dioxide). It can be possible to rate the performance of the absorbent by warming of the tempsteak (special temperature sensor, that is mounted inside the powder and shows in what place it is warming). One segment was still working and, therefore, we decided to continue to the dive, carefully monitoring Sergey Zakhvatov's state of health—watching for hypercapnia and so forth! Sergei Gorpinyuk took on this task. In the next half-hour, though, his computer had the same problem.


ANNA LOZNEVAYA

Diver underwater with view of altered rebreather frame

10k Rebreather

As I wrote earlier, we wanted to test the human body underwater, and so we continued our journey. The experience gained during the previous dives allowed us to adequately observe the situation. In the case of excess carbon dioxide, we could switch to open curcuit and safely go to the surface from the 10m depth. We do not advise others to repeat our actions! Experiments always involve risks.

The end point of our trip was near. It became clear after the passage to the dive site El Garden. Many places in Dahab we know by heart. After the next 30 minutes, my computer started to "swear" at me too. Perhaps it was the constructive improvements made on my equipment that made it possible to save power and, consequently, reduce the oxygen consumption and carbon dioxide production.

The final finish

Finally, we reached the dive site called Lighthouse—our last stop. Sergey Zakhvatov decided to float on the external side of the reef. I came up with him, and Sergey Gorpinyuk continued the dive until he reached the edge of the corals on the reef. After surfacing and getting back aboard the dive boat, we heard loud applause and photos were taken to commemorate the occasion. After 20 minutes, we were joined by Sergey Gorpinyuk.

The eight-hour dive was completed safely, with The Three Sergey's, three rebreathers and one very good idea accomplished. It was clear, we did the hard work, with our flippers finning 10km in 500 minutes. □