

Bulgarian-Chinese-Greek Speleological Expedition “Gaoligongshan’2011” – Yunnan Province, China

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Summary: During October-November 2011, 6 Bulgarian, 4 Chinese and 1 Greek cavers realized a joint Bulgarian-Chinese-Greek expedition to Yunnan Province. Within 20 days, 12 of which fieldwork, the expedition worked in two different areas about 400 km far from each other. Ten days were devoted to work in the Baoshan district, in particular on the territory of Gaoligongshan National Nature Reserve, which stretches along the China-Myanmar border. Six horizontal and 2 vertical caves were explored. 3 more caves were studied close to Kunming city. Among them are the longest caves explored during the expedition: Yenze Dong (Swallow cave) with 1’514 m and Da Shi Dong (Big rock cave) with 1’394 m length. During the expedition, 10 caves with a total length of 4’972 m and a maximum depth of 118 m were mapped. All objects were studied from a biospeleological point of view, and considerable zoological material was collected.

Key words: cave exploration, Yunnan, Gaoligongshan Mt., China, Bulgaria, Greece, lava tube.

Setting of the expedition area

Western Yunnan is situated in the southeastern part of the Himalayan Mountain Belt close to the Myanmar border (Fig. 1). There are some narrow mountain chains,

elongated in N-S direction. The Gaoligong Shan is the westernmost part of this mountain range. It is formed mainly in the eastern part of the Tenchong Continental Block, which is bounded to the East by the Nujiang Fault Line (Fig. 2).

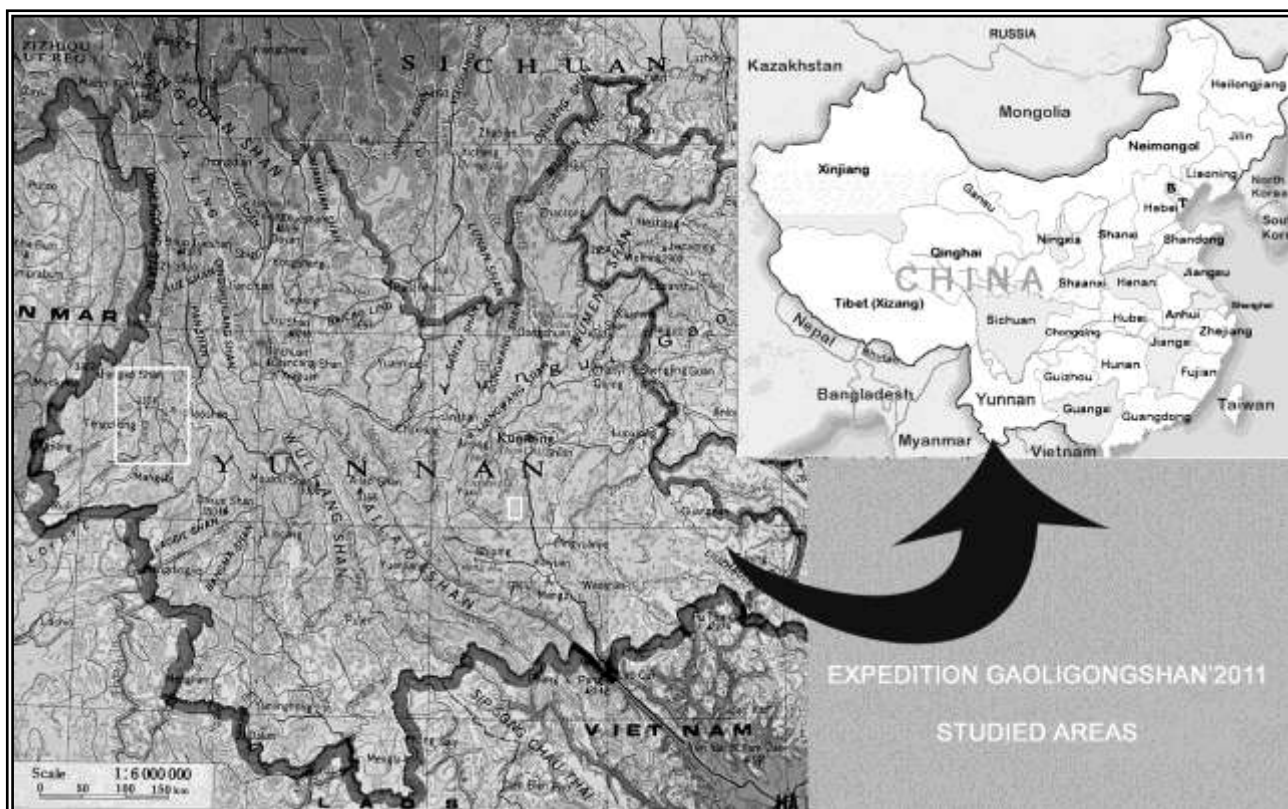


Fig. 1: Location of the studied areas during “Gaoligongshan expedition 2011”.

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The Gaoligong Mountains (simplified Chinese: 高黎贡山; pinyin: Gāolǐ gòngshān) are a mountainous area at the southern end of the Hengduan Mountain Range, located in the western Yunnan highlands very near to the China and Myanmar border. It is located along the west bank of the Nujiang valley from Gongshan down in to Dehong Prefecture. As a part of Hengduan Mountains, Gaoligong Mountain is long and narrow and its terrain is south-to-north, higher in the north and lower in the south, with a relative height difference of more than 2'827 meters. The highest peak, Wona, is 3'916 m asl.

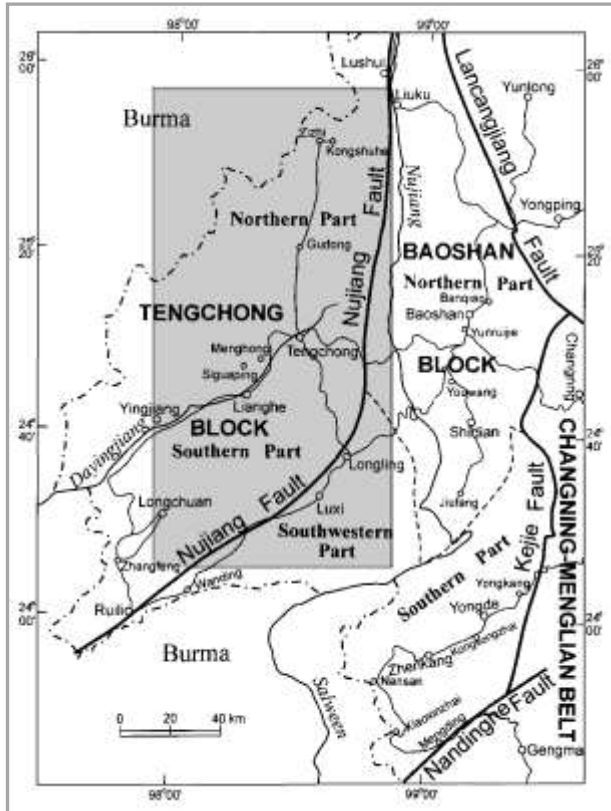


Fig. 2: Composite map of the Tengchong and Baoshan blocks (XIAOCHI, 2002). The observed area is shown with a dark rectangle.

The Gaoligong Mountain is declared as a National Nature Reserve. Together with another Reserves (Pienma, Yueliang Shan & Gongshan Scenic Areas), it covers a total area of 514'022 ha. It is about 9 kilometers wide from the east to the west, and 135 kilometers long from the south to the north. In 1992, the Reserve was classified as a Class-A reserve of international significance by the World Wildlife Fund (WWF); and it was included in the International Man and Biosphere Reserve Network by the end of 2000.

Geology

The explored caves are located in different geological and tectonic circumstances. The majority of the typical karst phenomena have developed in the Lower Permian carbonate deposits of the Dadongchang Formation. The formation contains limestones, dolomitic limestones and

marbles. The thickness of carbonate strata is about 400 m. The lower part consists basically of bioclastic limestones, and the middle and upper parts of more dolomitic limestones and some chert nodules and bands. The fossil fauna guides to suppose the age of carbonates to be Late Carboniferous to Early Permian, or more precisely Asselian to Wuchiapingian (GEOLOGICAL SURVEY OF YUNNAN, 1986). The top part of the Permian is unknown. In the northern part of Tengchong Block, on the western flank of the Gaoligong Shan Range, there are some dolomitic and argillaceous limestones that have been mapped as the Middle Triassic. Probably these carbonates also contain Lower Triassic strata (XIAOCHI, 2002). The dolomites and the limestones of the formation are intensively folded. In some areas, they are partially or fully transformed into marbles. Many contemporary and older fracture networks, brittle and ductile faults cut through the strata.

Climate

The mountain lies in the central subtropical zone. Due to the large altitude difference of the Mountains there are three different climate zones, i.e. subtropical, temperate and cold temperate. From the foot of the mountain to its top there are 6 different types, namely south subtropical, mid subtropical, north subtropical, warm temperate, mid temperate, and cold temperate zones. The precipitation increases gradually from 737 millimeters on the east slope with an elevation of 755 meters to 1'763 millimeters on the west slope with an elevation of 1'440 meters to 3'904 millimeters at the top with an elevation of 3'210 meters. The explored caves are situated geographically in the northernmost part in the tropical karst area, but in fact they do not seem to correspond to this type of karst. They are relatively short, up to a couple of hundreds of meters. They lack the big volumes and the abundant presence of speleothems, which are the typical parameters of the tropical karst. This fact can be explained with the altitude (1'000 - 2'100 m) – a temperature factor which in combination with the latitude (~ N 25°) takes them out of the zone of active tropical karst genesis. We must not forget that the most favorable temperature for dissolution and redeposition of Ca(Mg)CO₃ is approx. 25 °C.

Chinese-Bulgarian-Greek expedition general data

The expedition was carried out from 21st October till 10 November 2011. The Bulgarian members of the joint team was A. Zhalov - SC "Heliciti" - Sofia - Leader; A. Stoev - SC "Puldin" - Plovdiv ; B. Petrov - National Museum of Natural History ; K. Bonev - SC "Vertilend" - Sofia; K. Stoilov - SSC "Academic" - Sofia. The group included a Greek caver L. Makrostergios from SC of Karditsa.

The Chinese side was composed by 4 Chinese cavers led by Zhang Fan, Liu Hong, hydrogeologist So Shu Xuan and Wang Jian who represents the Institute of Geography and China Exploration & Research Society (CERS). All explorations on the Territory of Baoshan County were kindly supported by the officers of Gaoligongshan National Nature Reserve Baoshan Management Bureau, led by its Director, Mr. Ai Huai-sen.

Within 20 days, 12 of which were fieldwork, the expedition worked in two different areas about 400 km apart from each other. Ten days were devoted to work in the Baoshan district, in particular on the territory of Gaoligongshan National Nature Reserve. Within that time, 6 horizontal and 2 vertical caves were explored (Fig. 3). The most interesting was the lava tube cave "Djin Dong" near Tengchong Town.

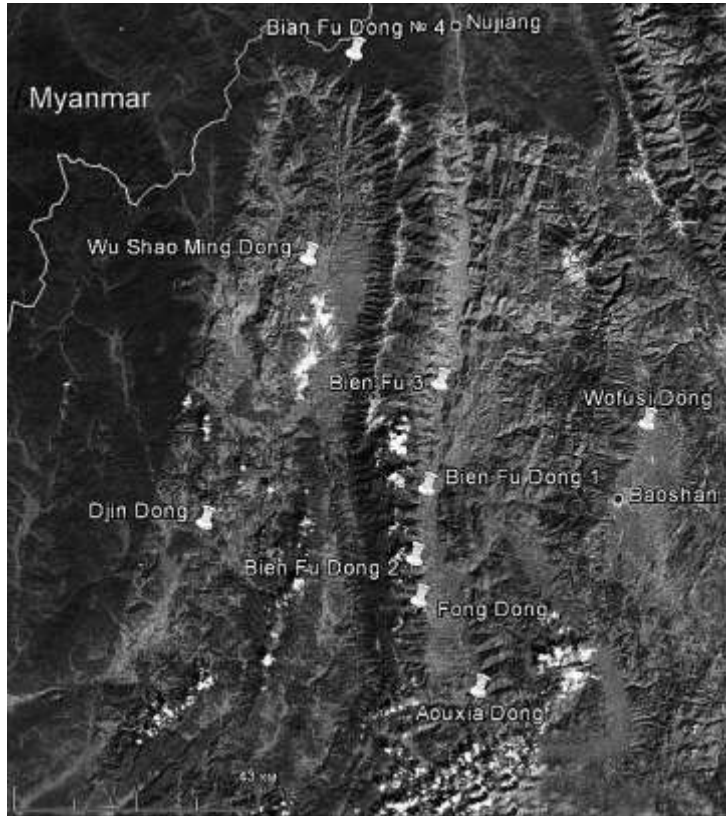


Fig. 3: Location of the explored caves in Baoshan County of Gaoligong Mountain.

The volcanism of the Tengchong Rift is predominantly andesitic, Pliocene to Pleistocene in age. It is related to the eastward subduction of the Burma microplate under the Eurasian plate near the northeastern side of the collision zone between the Indian and Eurasian Plates (ZHUIE & GUOYING, 1986).

Djin Dong

This is a lava tube cave (Fig. 4), formed by Pleistocene basaltic-andesitic lava flow. It is located 5.6 km W-NW from Teng Chong town and 0.350 km NE from a stone

kibbler factory, located in the Teng Chong Xian neighborhood, on the right side of the provincial road 317. The entrance is situated at 1'642 m asl in the middle of a vegetable field 1.2 km to the west of the massif of a proto volcano.

The main direction of the cave development is W-NE, so the gallery followed the way of the lava, flowing down from the volcano. The entrance is elliptic (6.5 x 4.5 m) and vertical. After a drop of 2.5 m the cave branches into two directions E-NE, where the passage is going upward, and West (downwards). The western passage is 210 m long and its depth is -24.3 m. The eastern branch is 518.5 m long with a height difference of +70 m. The main form of the gallery is oval, but in some places, it becomes triangle with dimensions in the range from 2-5 m width to 1.5-6 m height. The floor of the whole cave is covered by basalt blocks, coated by a thick layer of mud and guano. The cave is without decoration, but from some fractures in the ceiling, slightly enriched in CO₂ water drops in, which precipitates some centimetric stalactite embryos. It is wet and hot (temperature in the upper passage is 15.3 °C, while in the downward section it is 1-2 °C lower. Total length: 728.5 m, depth: 94.1 m (-24.3 / +69.8).

The expedition worked another two days in an area located about 60 km from Kunming, the provincial capital of Yunnan. The work was concentrated in the so-called Yenze Dong (Swallow cave). The cave is located 2.2 km SE from Houchang village (Ermu village) and S-SW from a local quarry.

Yenze Dong (Swallow cave)

The entrance is located at 2031 m asl in the SW side of an uvala 0.4 km long and 0.2 km wide, that has a long axis NW-SE. The entrance has triangle form and is 5.5 m wide and 3.2 m high. It seems that the cave is a temporary (periodical) sinkhole. The development of the cave is based on 3 main fissures with the following directions: E-W; NW-SE, and NE-SW. The first part is low grade and followed by a vertical passage of 3 pits (P1: -22 m; P2: -13; P3: -13 m). The native people intended to use the river for water supply, so they rigged the passage with iron stairs, pipes and electric circuit to make possible the water pumping. The stairs lead to the bottom river gallery. The depth here is 73 m. The first part of downstream passage is low and narrow; the depth of the river

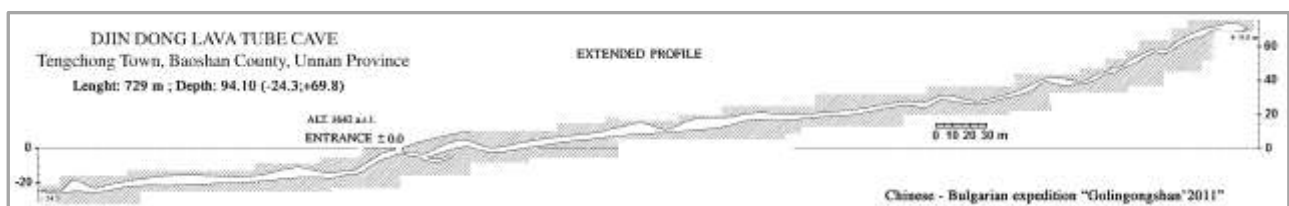


Fig. 4: Map of the Djin Dong Lava Tube Cave near Tengchong Town.

reaches 0.7 m. The next 80 m of the gallery are higher (max. 18 m) and wider (max. 8 m). In the vault arch of the end of the passage in the cave, there is a chimney. This is a connecting point with the upper level of the same gallery. Further on, the passage gets narrow again. In its end the gallery has two levels. In the lower one, the river jumps 3.5 m making little waterfall, runs for 30 more meters and sinks in a muddy sump! Here is the deepest point of the cave -95 m. The higher passage is dry and rises up. It leads to the biggest hall of the cave (55 x 25 x 3-6 m), where the cave branched. The left branch is well decorated by dripstones. The right gallery turns W and after 60 m stops in the edge of the pit (-15 m deep) which connects with the lower part of the same passage.

The first 25 m of the upstream passage are 9 m high. The passage is realized on the morphological level, 3-4 m above the river bed. The next 150 m of the cave meander. The passage is ~5 m wide and 2-3 m high. The river covers approximately the entire surface of the gallery, but it is not deeper than 20-30 cm. On its side, there are clay-sand deposits with different thickness. The walls and ceiling are covered by flowstones. Further on, there is a crossing marked by a small but deep (more than 2 m) lake in the right (South) side of the gallery. Upstream from the lake, a meandering, relatively low (1.20 m) and lightly rising dry gallery starts. It is covered by clay and sand. There are reliable evidences that in the rain period, this passage has a stream to the main river. The gallery

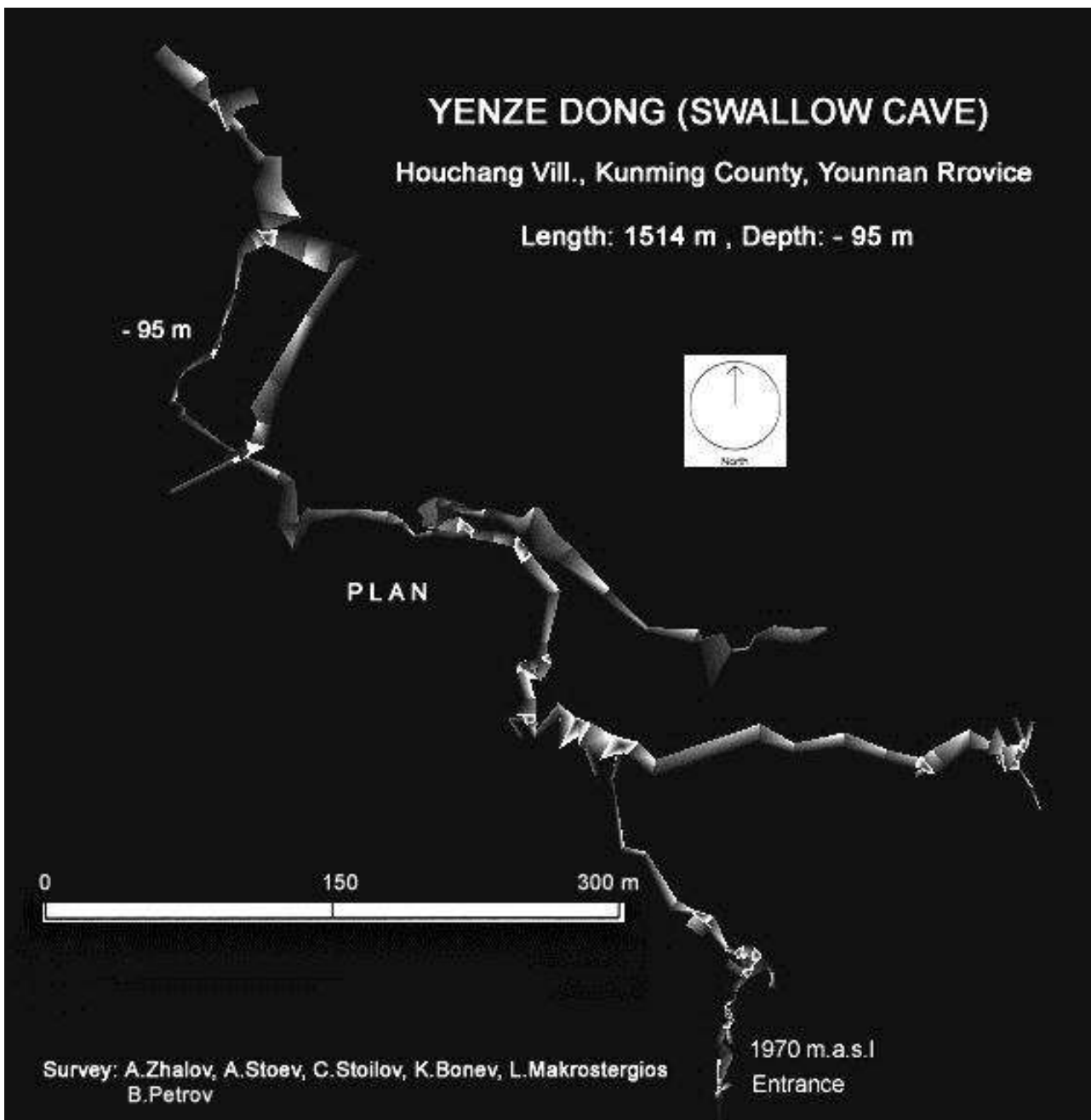


Fig. 5: Map of Yenze Dong (Swallow cave).

finishes with a little lake. Few meters before the end, the cave branches again. The opening of the passage is at the left, where a rising, narrow gallery (length 70 m) begins. The final few meters of the passage are horizontal and end with a pit (diameter 4 m, depth -15 m). The bottom is blind and this is the end of the passage.

Ahead from the crossing, there are 110 m of wide and comfortably high (2-3 m) passages, which lead to a room with a big column in it. Here the gallery turns to the left (North) and becomes low and narrow and impassable. Behind the column there is an appendix. The passage is developed as a narrow (1.30 m) and high (more than 14 m) fissure. Here is the end of the cave. The total length is 1'514 m. Depth -95 m.

The next explored cave there is **Da Shi Dong** (Big rock cave) and it became the second longest cave explored by the joint team. The cave is located 800 m S-SE from Houchang village (Ermu village) in the Kunming District. WGS Coordinates: N24.82090 E102.46514.

The entrance is opened on the cliff, formed at the SW slope of the blind valley (uvula -50 m wide x 80 m long). A little stream runs in the bottom, sinks just in front the entrance and joins a bigger underground river. The catchment area of the stream is large, so in the cave there is a danger of flood. The cave is developed along 3 main fissures with directions E-W, NW-SE and NE-SW.

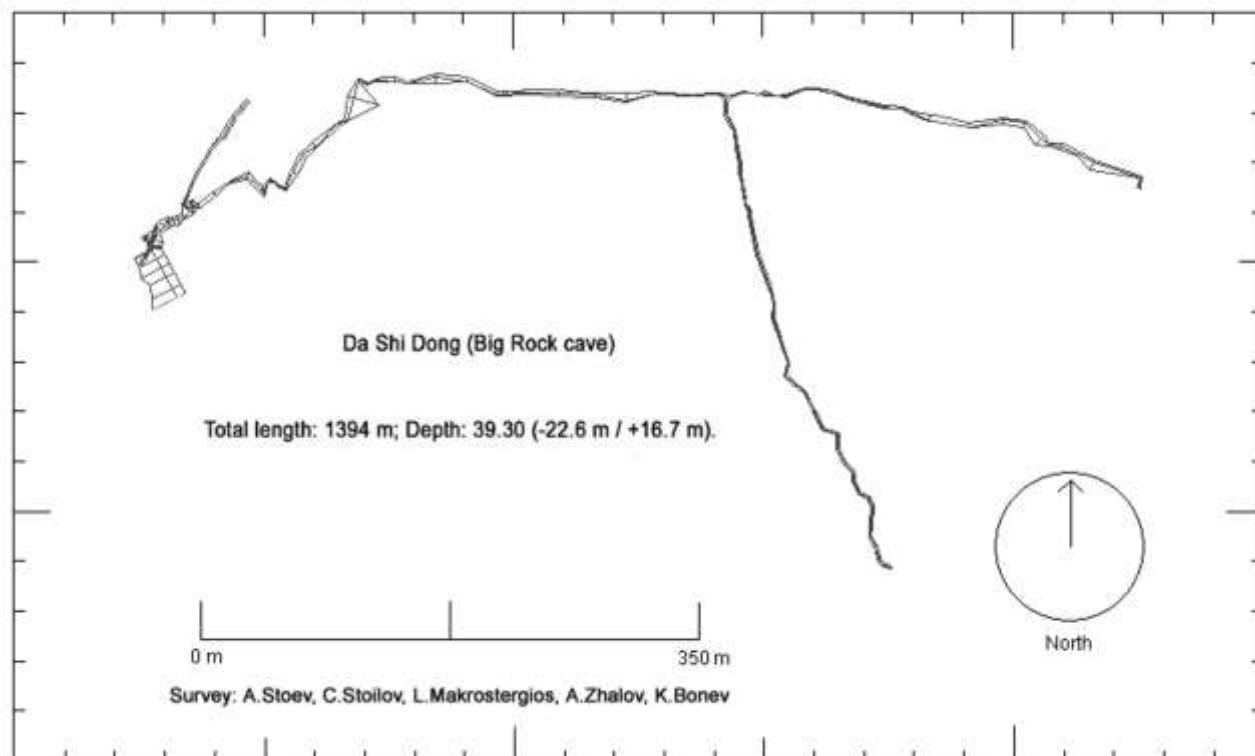
The entrance is 27 m wide and 17 m high and situated at 1940 m asl. It leads to a large passage (hall) 48 m long,

~20 m wide and 12-17 m high, covered with boulders and clay. Multiple smaller entrances are visible in the rocks. Further on, the passage begins to get lower and leads to a little room (1.30 m high), the first crossing of the cave. Here the little stream appears, runs through 77 m of narrow passage, and ends in a sump. There is a typical big clay plug, so probably the gallery continues, but only the water can go through.

In the NE side of the room, the main gallery of the cave starts. Its total length is 676 m, but in the middle of this distance, the cave joins a branch with 355 m length, with a SE direction. Both galleries go upstream and with a small slope. About 250 m from the entrance, there is a 5 m drop with water on the bottom (water is about 1-1.5 m deep). The NE gallery alternates between large halls with high ceiling (up to 22 m+) and huge formations, and narrow passages following the river.

The SE gallery is much smaller with only few bigger halls and a lot of very narrow passages. On many places it looks like it will end and you need to crawl in the water a lot. There is a vertical chimney (7-8 m easy to climb), with a waterfall. Halfway up the chimney, there is a lot of household waste, so it should be connected (and close) to a place, where the water comes in and local people use as a dump. Total length: 1'394 m; Depth: 39.30 m (-22.6 m / +16.7).

During the expedition 10 caves with a total length of 4'972 m were mapped. The data of the all surveyed caves is listed in Tab.1.



No.	Cave name	Altitude (m a.s.l.)	Length	Depth
1	Aouxia Dong cave	724	195	-8.3
2	Yenze Dong 2 (Swallow 2)	1970	20	-
3	Bien Fu Dong № 2 (Bat cave)	1296	429	-24.4
4	Bien Fu Dong № 3 (Bat cave)	987	95	+22
5	Bien Fu Dong № 4 (Bat cave)	2091	272	10.80 (-7.9 m / +2.9)
6	Fong Dong (Windy cave)	1774	46	-17.6 m
7	Lava tube Djin Dong	1642	729	94.10 (-24.3 m / +69.8)
8	Wu Shao Ming Dong	2092	255	-118.1
9	Yenze Dong (Swallow cave)	1970	1'514	-95
10	Da Shi Dong (Big rock cave)	1940	1'394	39.30 (-22.6 m / +16.7)
	Total		4'972	

Table 1: List of the surveyed caves during the expeditions (all data are in meters).

Biospeleology

The Bulgarian zoologist B. Petrov explored all objects from a biospeleological point of view. He carried out also research on the species composition of bats in all visited and explored caves. Rich biospeleological material was collected from all 13 caves visited by the expedition. The invertebrates were collected with soft tweezers from different microhabitats (under stones, rotten logs, clay, guano, water, etc.). Only a limited number of specimens was collected and stored for further identification. Larger series were taken only from those species which were observed to be abundant and common within the studied caves. Preliminary investigation of the collected material showed that it includes a number of probably undescribed troglonites and trogloniles. The list of potential new to science taxa of invertebrates includes about 10 species. Two species are woodlice, one species of snails, one species of spiders, one chernetid and one chthoniid species of pseudoscorpions, one laniatorid and one

cyphophthalmid harvestmen, two or three species of millipedes and one or two species of cave leaches. Other organisms recorded include centipedes, springtails, rhabdophorid crickets, pselaphid and carabid beetles, cockroaches and other. No cave-limited stygobites were collected from the surveyed aquatic habitats. Generic and even the family identification of many specimens are still pending examination by taxonomists.

Acknowledgements

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