

## Tjoarvekrággje 1993 - 2007

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Tjoarvekrággje (Tjorve), with a mapped length of 20,586 meters and a depth of c. 497 m the longest cave of Scandinavia, was discovered by Torbjörn Doj and Johannes Lundberg July 29, 1993. Since then, some 70 cavers from Norway, Sweden, Poland, Switzerland, UK, and France, have participated in its exploration. Their work over the fifteen years since its discovery is summarized in this paper.

Tjorve is found in one of four marble stripes in Bonå, Sørfold kommune, Nordland. The "Tjorve marble" belongs to the Fauske nappe (the same nappe as Okshola-Kristihola and Råggejavri-Raigi), and falls within the definition of stripe karst. There are five known entrances to Tjorve. The highest and westernmost entrance is Trolløren (T2, Ställuuxsa, at 586 masl); further east we find Østdøren (559 masl), Trang Fødsel (558 masl), The Classic Entrance (T1, 542 masl), and, further down, Tjuvsprekka (392 masl). Three of the entrances with their first few hundred meters of passages seems to be invasion systems, while most of the cave is developed in one layer of the 50-60 m thick marble. Of the two other entrances, Tjuvsprekka seems to be a very short invasion system, leading straight down to the "Tjorve level", and Østdøren is an opening where the Tjorve level approaches the surface. Even if the marble layer is not very thick, it is not horizontal but sloping some 25 to 40 degrees to the south and southeast (apparently following the local folding), adding depth to the system. The highest known point in the cave is today survey station U38 (622 masl), also the northernmost point, while the deepest point is MA18 (128 masl). MA18 is close to both the southernmost point (L26) and the easternmost point (ME18). The resurgence, Kildegrotten, is at 84 masl. There is a short cave, Stoppenålen (496 m long and 190 m deep; leading straight toward Tjorve but without obvious connections) with the entrance at 672 masl. In a vertical profile one can discern at least four levels in the cave, possibly corresponding to ancient water tables that has been step-wise lowered by glacial erosion during the glacial periods. If this model holds true, Tjorve must have developed under a long time-period, perhaps originating already in the Tertiary. Morphometric parameters (sensu Klimchouk, 2006) of Tjorve shows an interesting pattern. The passage density (44.8 km/km<sup>2</sup>) and the cave porosity (1.0 %) is intermediate between the values of confined and unconfined settings, and areal coverage (20.8 %) is close to the values for confined settings. Values for the uppermost part of the cave like Galleriene/Pannekaken (cave porosity: 4.0 %, areal coverage: 31,2 %) is closer to or within the values for confined settings. These intermediate values might also reflect a cyclic development of the cave over several glacial-interglacial cycles.

Ever since Tjorve was discovered, it has been tradition to map while exploring, a tradition that has been followed surprisingly well. During the 15 years of mapping, nearly 3000 survey lines have been recorded. All the original survey data are administrated with an Excel file, developed for the Tjorve project. From this file, export can be done to, e.g., Compass and Therion. All the original sketches and notes are scanned and, together with the Excel file, are distributed on CD to the seven members of the project group ("Tjorve-7", i.e., Torstein Finnesand, Svein Grundstrøm, Torbjörn Doj, Bjørn Egil Johansen, Roy Solbakk, Knut Davidsen, and Johannes Lundberg). The survey is done to BCRA grade 5, and includes some 191 loops. The last few years have seen an increase in re-mapping and checking of loop-misclosures. One of the major problems when mapping in Tjorve is the often ill-defined walls due to the sloping marble, and many times the distance to the walls have only been very approximately estimated. The labyrinthine nature of Tjorve, with numerous side passages, also add to the challenge. There are still probably many more km of passages unmapped and unexplored in Tjorve, and we encourage all interested cavers to take part in future explorations!

The cave does not contain many speleothems. However, one noteworthy is the tjorvomitt, so far only known in Scandinavia from Tjorve. It confirms with dogtooth spar, although its genesis is still unclear. There are some bones from small animals (mice etc) found in several places in the cave, and also from larger animals (bear and, probably, wolverine). Some of the bear remains have been dated to c. 2000 ybp. One prominent feature of Tjorve that no visitors can miss is the abundance of clay. The clay deposits are especially prominent in the phreatic tubes, but can be found in most other places, including on break-down rocks. These clay deposits indicates that the entire cave have been water-filled, most recently perhaps in the late phase of the last glacial period. There are also several up to one meter thick layers of amphibolite (and/or schist), sometimes preventing the water streams to dig deeper into the Tjorve marble. Some of the pits in Tjorve (e.g, in the T1-system) are found where the stream has eroded through these layers.