Totes Gebirge 2022 Expedition Report

INTRODUCTION

Since 1976, Cambridge University Caving Club has explored and documented caves in the Totes Gebirge mountains, mostly in Kataster area 1623. The expedition enjoys excellent support from local Austrians including the Wilpernig family at the Gasthaus Staund'n'wirt, where we have our base camp, and the Verein für Höhlenkunde in Obersteier, a caving club based in Bad Mitterndorf. We have also formed a friendly partnership with the German Arbeitsgemeinschaft Höhle und Karst Grabenstetten (ARGE), with whom we have shared exploration of the Loser Augst-Eck plateau since 1992. We are exceedingly grateful for the warm welcome that is extended to us year after year!

In the early years of the CUCC expedition, most of the caves that were explored were to the south of the Vorder Schwartzmooskogel, close to the Loser Alm car park, including Stellerweg (1623/41), Eislufthöhle (1623/76) and Gemshöhle 1623/107. Since then, exploration has gradually moved north, along the Schwartzmooskogel (SMK) ridge. We focused for many years on Kaninchenhöhle (1623/161), then moved to Steinbruckenhöhle (1623/204), Tunnockschact (1623/258), and finally Balkonhöhle (1623/264; discovered by CUCC in both 2002 and 2005 but only explored from 2014). All of these caves (Stellerweg, Kaninchenhöhle, Steinbruckenhöhle, Tunnockschact and Balkonhöhle) together with many others are now connected into the 137 km long, 1112 m deep SMK system, the 17th longest cave in the world. Recent prospecting has concentrated on areas to the west and north of the SMK system, with the aim of discovering new entrances to extend SMK towards the Schönberg Höhlensystem. COVID-19 meant that there was no expedition in 2020 or 2021.

Figure 1 – The2022 expedition members and friends in front of Gasthaus Staund'n'wirt, the expedition's base camp since 1983 (photo Eric Landgraff)

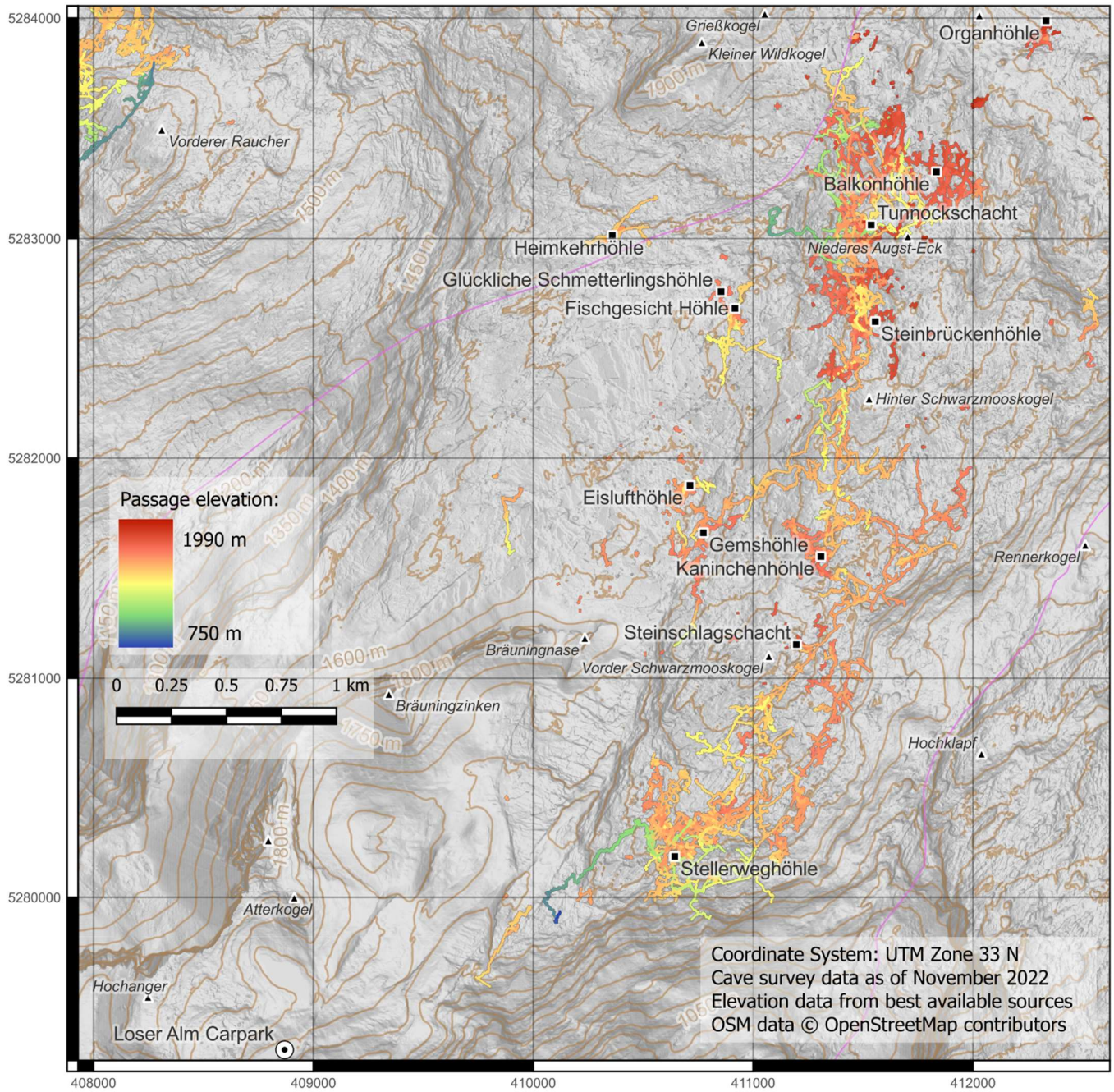

Figure 2 – Overview map of the SMK system. Note the Loser Alm carpark to the SW (bottom left) and the Schönberg system to the NW (top left). Between the SMK and Schönberg systems is Heimkehrhöhle straddling two Kataster areas, 1626 and 1623 (boundary shown in pink).

Exploration in 2022 was focused on two caves: Balkonhöhle and Fischgesicht Höhle (1623/290). Over 1.5 km of passage was discovered in deep Balkonhöhle, with trips requiring underground camping to reach the >500 m deep pushing front. Meanwhile, Fischgesicht Höhle (discovered in 2017) was connected to Glückliche Schmetterlingshöhle (1623/291), also discovered in 2017. 2.2 km of new passage was surveyed here, which extended the depth of this new system to 412 m (from its previous depth of 250 m). This year was extremely warm and dry, enabling the exploration of several pitch series (in both Balkonhöhle and Fischgesicht Höhle) that are likely to be unpleasant or even inaccessible in normal water conditions. Drought conditions in central-west Europe were made worse by anthropogenic climate change and the expedition took steps to minimise its carbon emissions, and all travel to and from the expedition was carbon offsetted.

Prospecting also led to the discovery of several promising cave entrances which we hope to explore in 2023.

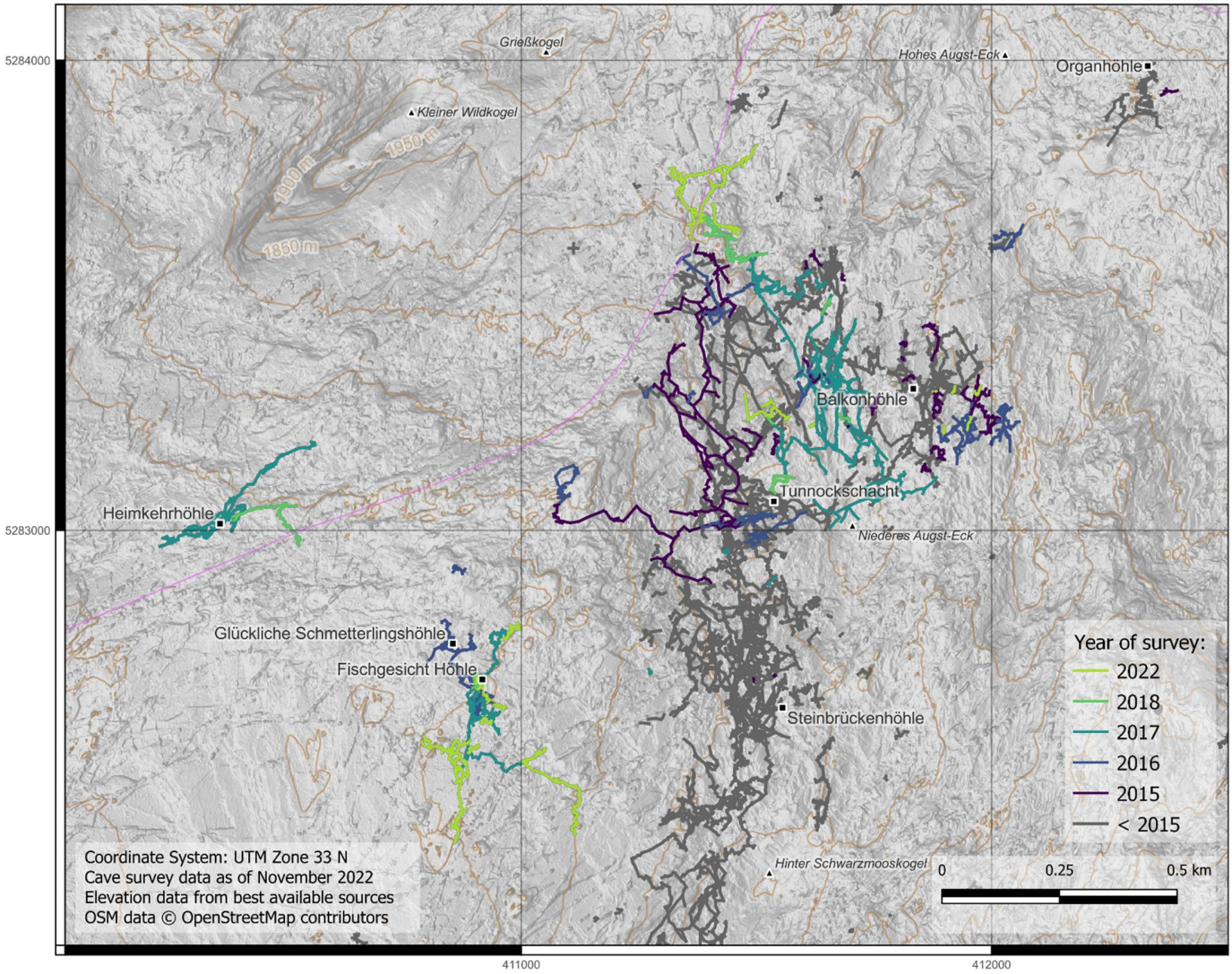

Figure 3 – Overview map showing date of survey (i.e., date of exploration) of passage at the Northern end of the SMK system and in adjacent caves

Balkonhöhle (1623/264)

Figure 4/5 – The entrance to Balkonhöhle, a rock balcony above a massive depression that has previously been choked with ice, but not in 2022.

Although it was first discovered in 2005, it wasn't until 2014 that the Balkonhöhle entrance pitch was fully descended. It was connected into the broader SMK system in 2015, and at two subsequent, deeper points in later years. Exploration of Balkonhöhle was concentrated in two areas this year: the relatively shallow (~200 m depth) Sloppy Seconds and the deeper area around Pitstop (~ 400 m depth).

Pitstop

Figure 6 – Chris Densham at the luxurious Pitstop underground camp (photo Nat Dalton)

In 2018, a series of pitches were rigged to a depth of 350 m, including an epic, 200 m deep pitch, Mongol Rally. A big swing into a large balcony ~60 m above the bottom of Mongol Rally gave access to an extensive horizontal level: Pitstop. Despite its promise this area only saw a few pushing trips in 2019, so it was high on the priority list for 2022. This year, following two long and strenuous day trips to explore the furthest extents of northern Pitstop, a laden trip set off to establish a camp to enable more efficient pushing trips.

Exploration began at Medusa's Maze, a complex section of drafty passages left open at the end of 2019. From here, further extensive horizontal passage (called Erechtheion) was discovered, ending at a 60 m pitch, Tartarus. This pitch was descended to another complex area of parallel passages and

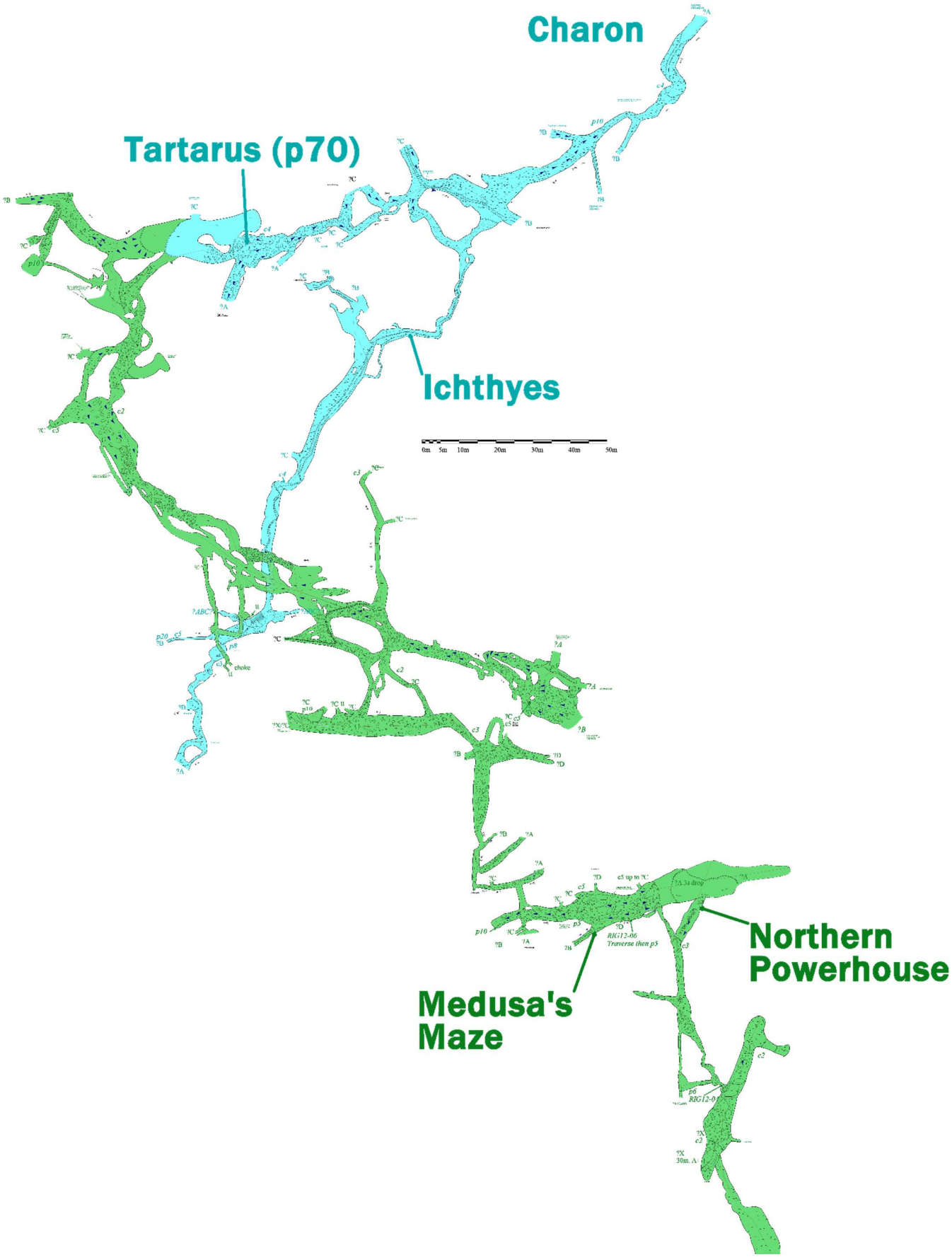

Figure 7 – Survey showing passage at the Northern End of the SMK system. Medusa's maze was the limit of explored cave at the start of 2022.

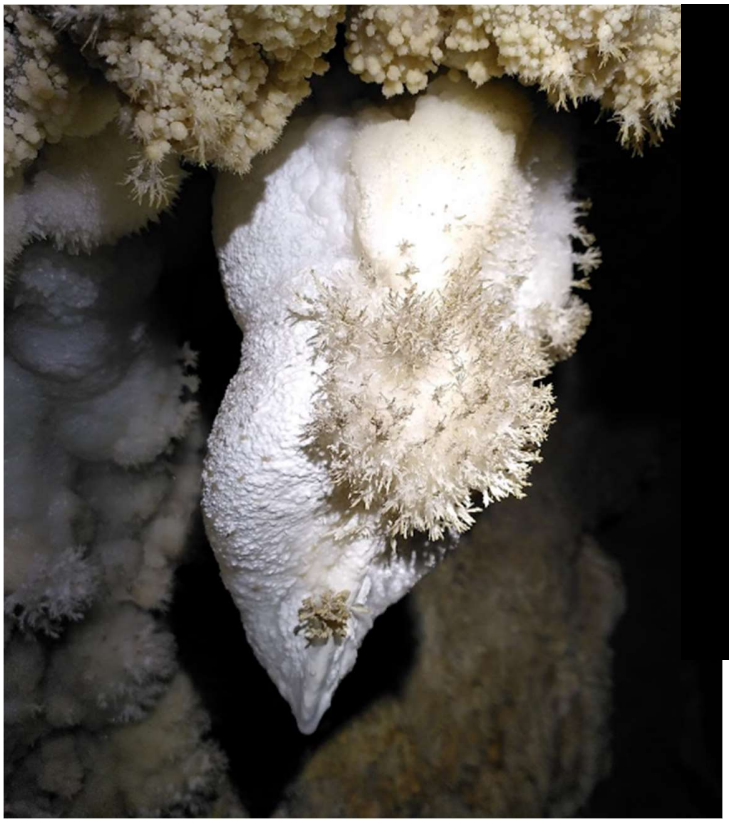

Figure 8 (left) – Unusual speleothem discovered below the Tartarus pitch. (Photo Nat Dalton)

Figure 9 (above) – point cloud of fish vertebrae generated by 3D scanning (found in Ichthys) (Scan Jono Lester)

the area. We also found a large collector streamway which (again) is rare for caves in the SMK system, especially considering the dry conditions of 2022. Due to the combination of cold drafts, thick mud and its complex 3D nature, exploration in this area was challenging. In the area called Icthyes, 3D laser scanning of the passage was undertaken using an Iphone, a ~ 0.4 m fossilised spine was also found and scanned. Below Tartarus, several undescended pitches were left as promising leads for future expeditions. The deepest extent of this area (Charon) is only 100m horizontally and 187m below the bottom of Grießkogelschacht (1623/232). This is a shaft that was explored by the ARGE caving group and that is not currently connected to the SMK system. It is likely that Grießkogelschacht (or a nearby cave) will offer an easier entrance to reach the deepest areas of northern Balkonhöhle, the most northerly part of the SMK system.

Sloppy Seconds

Several pushing trips visited the Sloppy Seconds area of Balkonhöhle, resurveying parts of this area and discovering more passages that dropped into the massive Galactica chamber.

Fischgesicht Höhle (1623/290) and Glückliche Schmetterlingshöhle (1623/291):

Since its discovery in 2017, Fischgesicht Höhle has followed the usual double edged sword pattern of caves explored by the expedition; the initial shallow horizontal levels have been exhausted and the cave has been pushed deep to become a relatively committing trip. Since 2018, exploration of Fischgesicht Höhle has been on hold for a number of reasons: the depression containing the entrance was snow filled in 2019, and subsequent expeditions were cancelled due to COVID-19. On the last day it was explored in 2018 over 200m were surveyed on a trip that was meant to be focused on derigging, and six top leads, each blowing a howling gale, were left staring east into blank space. Back at Base Camp, the data looked exceptionally promising: all the remaining leads pointed directly towards Steinbruckenhohle (1623/204), the 'key' to the SMK system which links the major caves to the south Kaninchenhohle (1623/161), Gemsehohle (1623/107 and Stellerweg (1623/115) with those in the North, namely Tunnockschacht (1623/258) and Balkonhohle (1623/264). If made, this connection would expand this part of the SMK system westwards towards the Schönberg system, along with adding over 1.5 km of passage to the total length of the system (this was the length of the cave in 2018).

Figure 10 – Unusual speleothem found in Fischgesicht Höhle (photo Rob Watson)

Fischgesicht Höhle has a character similar to a Dales pothole (minus the chilly water): a few larger pitches to start with, the odd meander, a few more pitches, some climbs, some nice phreatic passage, a succession of shorter pitches in a meandering rift interspersed with the odd larger chamber, and then a big pitch, all in fairly quick succession (in contrast to Balkonhöhle, which has a long romp along some very draughty and muddy phreas followed by a series of pitches around 300 m deep – far more alpine in character). Below the final pitch descended in 2018 (TK Max), at a depth of around 250 m, a major phreatic level is encountered. This level was thoroughly mapped in 2022, and several deeper shaft series were descended from it (Perseid Showers, Keanu Breeze, Mourning the Moths and Clap My Pitch Up).

Figure 11 – The well-stocked noodle bar below TK Max (Photo Rob Watson)

Clap My Pitch Up (named after witnessing a summer festival in Bad Aussee where the audience would clap a rhythm in response to music played by an Oompa band) is reached after trotting along a very spacious and draughty horizontal passage. A series of drops totalling 120 m are descended to a boulder-strewn chamber of impressive proportions (Apis Medicus). Leading off from the chamber is a meandering, downward passage, with a keyhole trench, with a small but significant stream present. This passage wasn't pushed to completion, due to tackle and drill batteries all being used up on the final trip but is only 60 m above and 120 m east of the Razordance sump. There are several extremely promising leads that were climbed at the far end of Razordance (Silk Road), which were only visited once in 2007. If Fischgesicht Höhle connected to Razordance this would offer a substantially easier way into this section of cave, but due to the nature of the cave this probably won't be an simple connection to make. Much of this exploration was done during a 3 day, impromptu, lightweight camp at the bottom of TK Max. This was undertaken due to the greater chance of accessing plentiful drinking water in the cave than on the surface (the cave has an excellent stream with a very fine tap feature).

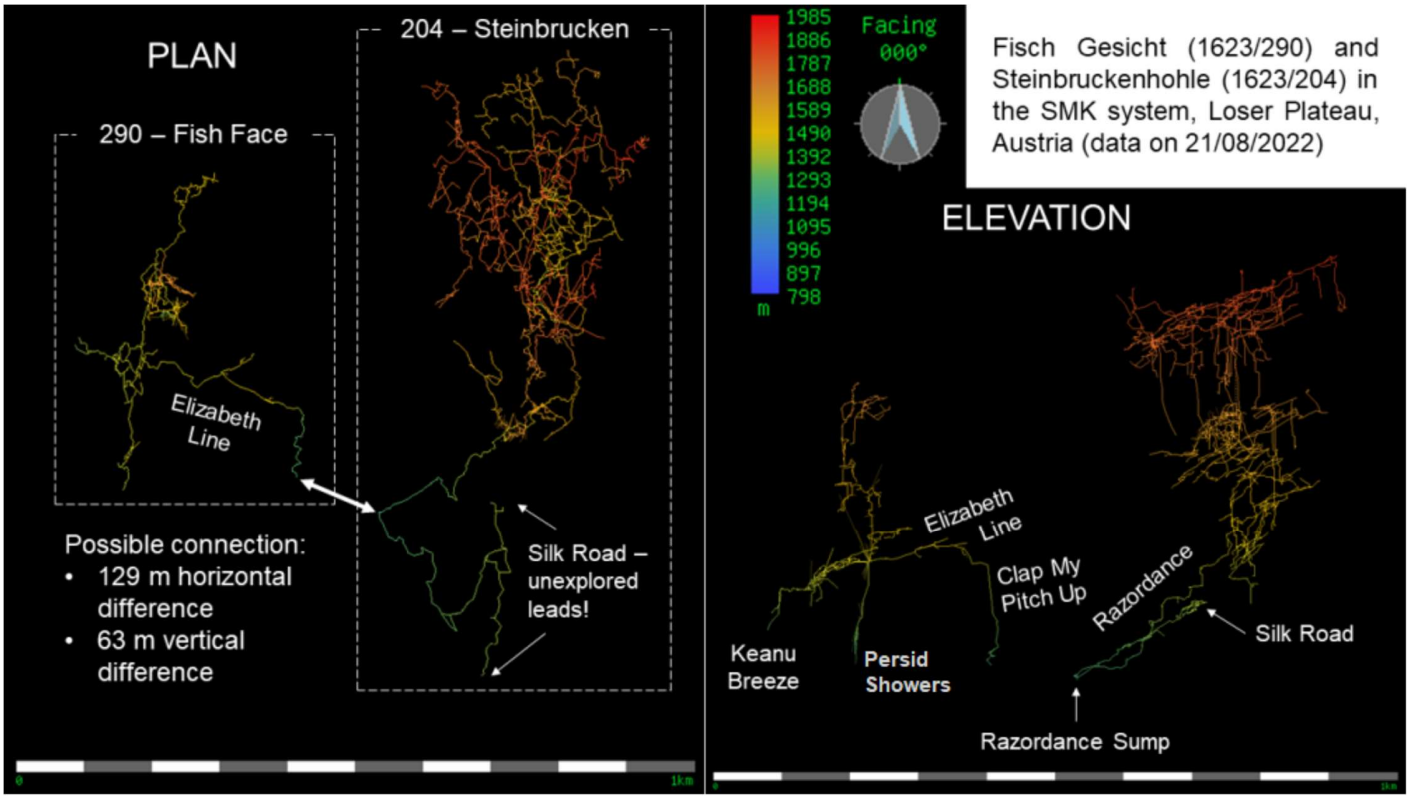

Figure 11 – Survey data showing Fischgesicht Höhle in relation to the broader SMK system (Steinbrucken)

Perseid Showers (named after a glorious meteor shower visible from top camp, with inspiration from a comment made when an unwilling victim complained about having a shower of rocks dropped on them) is an extension of TK Max, the ~60 m pitch above it, and separated only by a brief wiggle down a rocky chute. Over 160 m of pitch was descended over several trips with another ~ 40 m left to descend before another ledge, or hopefully the bottom. Currently Perseid Showers and Clap My Pitch Up finish at similar depths, but there is great potential for easily descending further in Perseid Showers, to drop below 400 m. The pitch drafts strongly outward and is a very promising and accessible lead for next year.

Various pitches explored this year were drippy (in dry conditions) and in wet conditions these pitches are likely to be impassable. Future expeditions will probably need imaginative rigging to avoid the water.

After several mishaps and multiple trips Fischgesicht Höhle was connected to Glückliche Schmetterlingshöhle via the Kresh Konnection, a large rift passage.

Innovations:

New organisational methods this year helped make the 2022 expedition more efficient and collaborative: a Kanban board was used to fairly distribute tasks amongst members and, together with Gantt charts, this gave good visibility to outstanding tasks. There were two training weekends (rather than the usual one) to ensure members had appropriate skills. Both enhanced

planning and multiple training weekends were extremely valuable due to the two-year break during the pandemic meaning that this year had many first-time expedition goers.

On expedition, 3D scanning was successfully trialled with an iPhone, but with outstanding questions remaining about how to integrate the outputs with traditional surveys. The expedition has historically struggled with a lack of photographs of explored passage. To try and mitigate this, the expedition invested in two communal 'tough' cameras. This caused the opposite problem; many photos were taken, but with folks lacking ownership of these. During the expedition, TunnelVR, newly developed software to create and show 3D versions of surveys using virtual reality, was also demonstrated, both to expedition members and also our Austrian friends.

Rope was washed, derigged and stored in the caves this year (a new approach), meaning that rope and gear was left in

Figure 12 – Rope washing at top camp, fortunately due to recent inclement weather, water was not short (photo Nat Dalton)

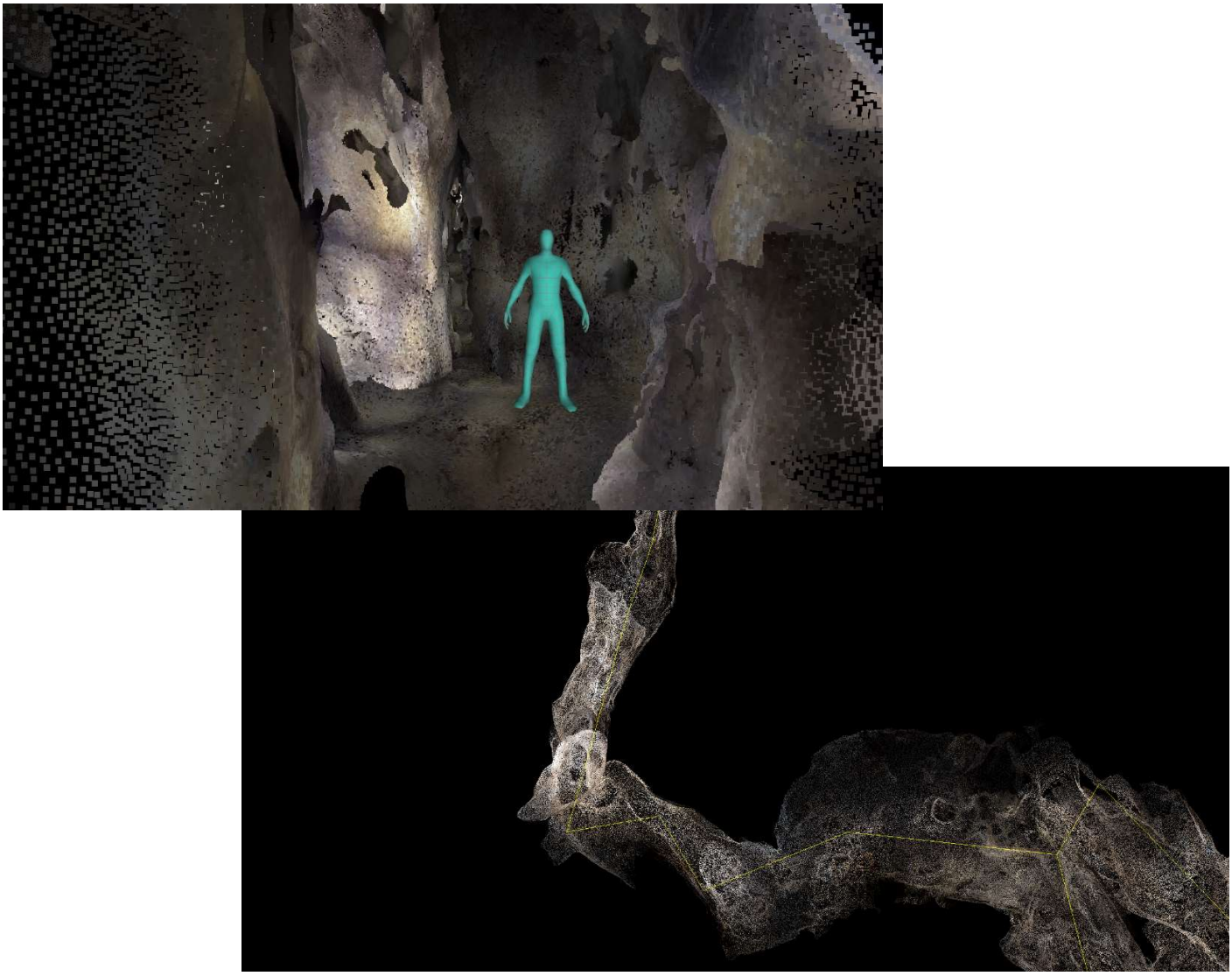

Figure 13 & 14 – 3D point clouds generated by scanning of passage using iPhone; note integration of traditional center line on bottom image ((Scan Jono Lester)

Austria, rather than being unnecessarily transported across Europe. This minimised the cost and also carbon emissions of cars travelling back to the UK.

Conclusion

Over five weeks the 2022 expedition discovered and surveyed more than 3.8 km of passage in the Totes Gebirge mountains by a team of 37 cavers. Despite challenges caused by a Europe-wide heat wave, over 10 cavers who had not previously been on expedition learnt how to cave safely in unexplored, alpine caves.

Exploration of passage in Balkonhöhle (below the Tartarus pitch) extended the SMK system northwards, unexplored leads were left and these will be revisited by future expeditions. Large pitches descended or partially dropped this year in Fischgesicht Höhle will likely lead to another horizontal level, present in the broader SMK system, but not yet broken into for this cave. Fischgesicht Höhle is now only ~150 m from connecting into the SMK system (between Apis Medicus and Razordance. It is highly likely that within the next five years, Fischgesicht Höhle will connect into the SMK system.