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CAVES NEAR SEYDEŞEHIR, TURKEY

by

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ABSTRACT

The Giden Gelmez Dağ region of the Western Taurus mountains near Seydeşehir, Turkey, was explored for caves. Seven new caves are described and a summary account is given of the other known caves. In the Tinas Tepe region, also near Seydeşehir, four previously unreported resurgences are described.

INTRODUCTION

The 1986 expedition by the University of Bristol Spelaeological Society to Turkey, in which two members of the Westminster Speleological Group took part, studied two separate areas in the Taurus Mountains. The one described in this paper is in the vicinity of Seydeşehir (Fig. 1), in the northern part of the Western Taurus. The other area, described by Hobbs (this issue), is around Dinar in the Lycian Taurus, some 160 km to the north-west of Seydeşehir. Our original intention had been to spend the whole time near Dinar but a serious dispute arose with the local officials (at Çivril). We were unable to obtain permission to explore for caves and had no choice but to move to another area. We chose Seydeşehir because we had with us a report (Skuce *et al*, 1977) of a previous expedition. No other information was available to us at the time and we had no maps.

Two distinct areas south of Seydeşehir were studied: Giden Gelmez Dağ (Fig. 2) and Tinas Tepe (Fig. 4). The first of these became accessible in the late 1970s when a road was cut through the mountains from Mortaş to Süleymaniye. French expeditions visited the area in 1979 (Gilli, 1979), and again in 1980 (Gilli *et al.*, 1981; Chabert, 1982) and 1984 (Gilli, 1984). On our return we were able to match many of the caves we found to sites reported by the French. Although the French reports describe the caves at some length, tackle requirements are often lacking and the locations of individual caves are poorly described. In many cases we were only able to identify a cave by its underground details. A brief account of all the known caves in this district, whether discovered by the French or ourselves, is given in the body of this paper.

The Tinas Tepe region, with easy access from a road built to a bauxite mine at Mortaş, has been visited by many expeditions. The camp site used by visiting cavers lies some 4 km south of the mine, in front of the impressive swallet entrance of Tinas Tepe Düdeni. A British expedition came here in 1976, published a summary account of the major cave sites (Skuce *et al*, 1977), and also reported a major resurgence near Gölyüzü (Surberde on some maps). We found four other resurgences and explored one small cave.

The best maps of the region that we have seen are German military maps of 1943, at a scale of 1:200,000. Fig. 1 is based on these maps; Figs. 2 and 4 are sketch maps.

GEOLOGY AND GEOGRAPHY

The Taurus mountains are known geologically as the Southern Anatolian fold zone (Taurids) and may be regarded as a continuation of the Southern Alps of Europe (via the Dinarides of Yugoslavia and the Hellenides of Greece). The fold zone continues to the east as the Zagros of Iran. The Taurus mountains are a major barrier between central Turkey and the Mediterranean coast. In the region of Seydeşehir the mountains form a continuous ridge about 2,000 m high, with occasional summits above 2,500 m. Only one mountain pass can be traversed with a vehicle.

Seydeşehir lies inland from the mountains at a more modest altitude of 1,050 m, being sited on shales of Ordovician age. These shales are overlain by transgressive Mesozoic rocks, mainly carbonates, which form the mountains to the south and west of the town. The major unit comprises 1,000 m of shallow marine limestones of Lower Cretaceous age. A bauxite deposit caps these limestones and is in turn overlain by some 300 m of Upper Cretaceous limestones. The youngest consolidated rocks are a flysch deposit (sandstones and marls) of Eocene age (Brunn *et al.*, 1971).

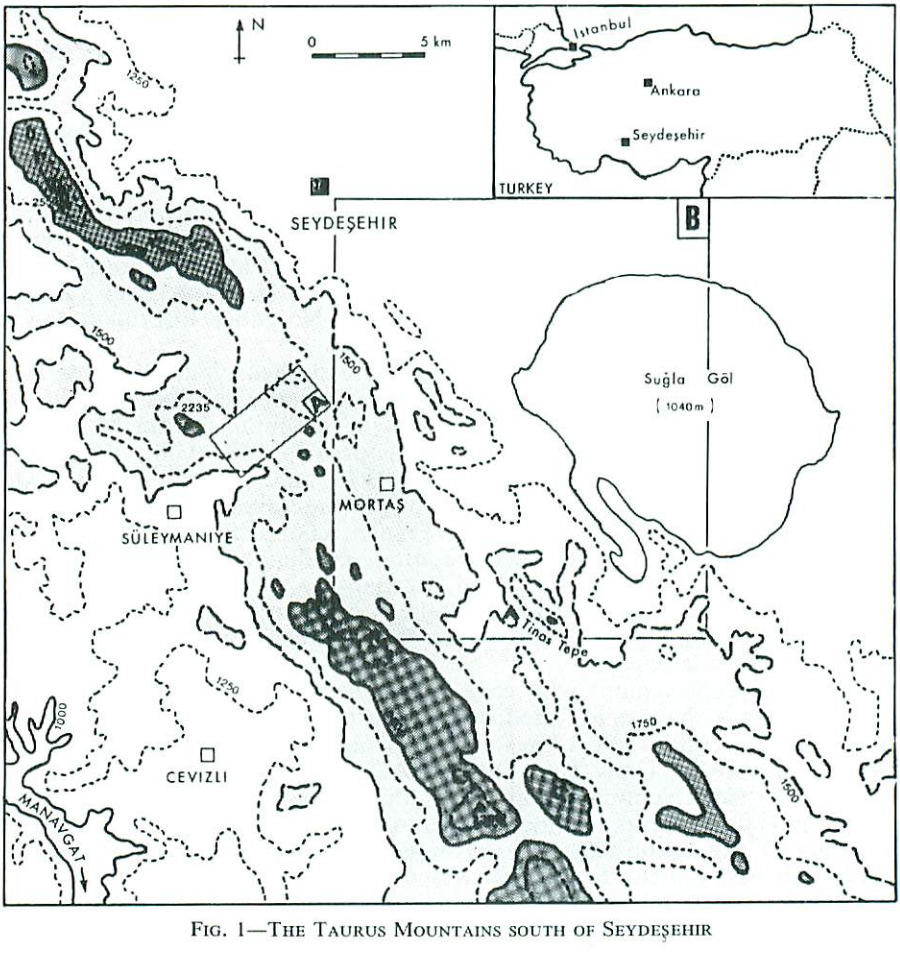

FIG. 1—THE TAURUS MOUNTAINS SOUTH OF SEYDEŞEHIR

Seydeşehir itself is an industrial town, processing bauxite into aluminium, and lies between a large lake, Beyşehir Gölü, and a smaller polje, Suğla Göl. Until recently the polje held a shallow lake but a few years ago this drained away completely and the lake bed is now agricultural land. Bounding the lake on its south-west side is the isolated mountain of Tinas Tepe (Tanas Daği on some maps), lying some 6 km from the main ridge of the Taurus mountains. Between Tinas Tepe and the other mountains the land remains quite high (c. 1,600 m) and has a major bauxite deposit near the surface. This is being exploited at the Mortaş open-cast mine already mentioned.

The only road through the mountains from Seydeşehir is of recent construction, opened within the last ten years. The road begins just north of Mortaş and is gravel surfaced, skirting the northern flank of the mountain Giden Gelmez Dağ before descending to Süleymaniye. (The French include the area north of the road in the Giden Gelmez Dağ karst region of their reports; our report follows this tradition.) Süleymaniye is located in a large valley, the head of the river Manavgat, which leads south through a spectacular gorge to the Mediterranean at the Gulf of Antalya. The Manavgat Gorge is famous for the resurgences of Dumanli whose combined flow is the largest in the world, ranging between 20 and 500 m^3/sec (Gilli, 1979).

The head of the Manavgat river is in rocks of the Beyşehir-Hoyran nappes which were emplaced by thrusting from the north-east and overlie the Eocene flysch. These nappes have been preserved in a major syncline, aligned north-south, developed within the underlying autochthonous rocks. The nappes have a complex sequence of limestones, sandstones and volcanic rocks whose ages range from Devonian to Cretaceous. Outliers from the main body of the nappe are preserved on the northern flanks of Giden Gelmez Dağ, in our area of study.

The climate of the Western Taurus is sub-humid to humid, with heavy winter snowfall but little precipitation during the summer months. The limestone mountains are karstic and have very little vegetation. On non-karstic rocks, and in places on the limestone, an open coniferous woodland has developed.

CAVES OF GIDEN GELMEZ DAĞ

The caves are identified, here and in FIG. 2, by a unique number comprising the year of discovery and a code number (either previously published or allotted in 1986). Missing numbers are evidence of duplicated recording in the past. The descriptions below are based on our own observations, combined with the French survey data. It should be noted that the survey length quoted is the total length measured, not just the horizontal component. The caves are listed according to their location in respect to Sakal Tutan Düdeni, the major cave of the area and one of the easiest to find.

79/1 Sakal Tutan Düdeni. Misnamed by Gilli (1979) as Kefen Esiği Düdeni no. 1.
Length 1,425 m, depth 303 m. Survey in Gilli *et al.* (1981).

Just before the pass, on the Mortaş side, the road makes a sweeping detour to cross a valley without losing altitude. Sakal Tutan Düdeni lies in the middle of this valley, about 0.5 km north of the point where the road crosses the valley floor. A drainage channel leads north-west past cave remnants in a cliff face, through a short unroofed cave passage into a cliff-walled enclosure. A slot in the wall opposite leads on to a pitch of about 40 m (the French route), descending the entrance shaft directly from the lowest point on its lip. From its highest point this pitch would be 62 m. Our preference was a small hole in the north wall of the enclosure which gave access to a 7 m pitch, followed by a short passage to a 35 m pitch.

From the daylight shaft a large bouldery passage descends steeply to the west and then turns south. Further pitches of 7 m, 13 m, 8 m and 8 m, plus two short climbs, lead into a tall and narrow canyon passage. This continues for some distance, still heading south, with further

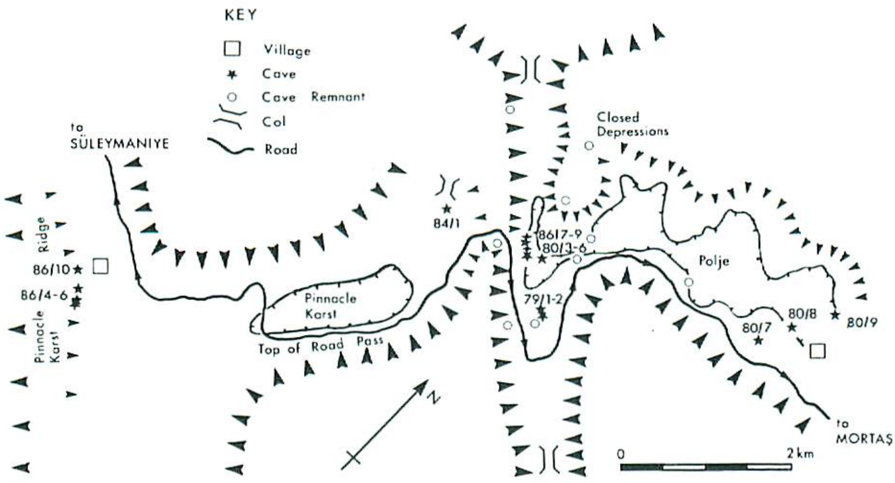

FIG. 2—CAVES OF GIDEN GELMEZ DAĞ (AREA A OF FIG. 1)

pitches of 7 m, 12 m and 25 m, this last pitch being broken into three stages. In the lower parts of the cave there are many gours. The lowest point is a lake-sump, 30 m long, which may be traversed with care to an inlet passage and upstream sump.

The cave was surveyed by us to a depth of 200 m at BCRA grade 3, and a very close correspondence with the French survey was found.

79/2 Sakal Tutan Deliği. Misnamed by Gilli (1979) as Kefen Esiği Düdeni, no. 2.
Length c. 490 m, depth 303 m. Survey in Gilli *et al.* (1981).

The cave entrance lies 120 m south-east of Sakal Tutan Düdeni, according to the French survey, but the site shown to us by our Turkish guides is about the same distance in a north-easterly direction and is completely choked by a recent rock fall. These may be separate sites, so in FIG. 2 the French location has been used. This site we did not identify.

A fissure entrance is the head of a huge shaft 120 m deep. A short descending passage, for which a handline is required, leads to a second shaft of 126 m. Below this a small passage goes to a duck which has not been passed.

80/3 Geven Esiği Düdeni no. 1.
Length 140m, depth 65 m. Survey in Gilli *et al.* (1981).

About $\frac{3}{4}$ km north-west of Sakal Tutan Düdeni a very small drainage channel in the valley floor leads to a shaft of 32 m. A descending passage ends in a gravel choke.

80/4 Geven Esiği Düdeni no. 2.
Length 40 m, depth 23 m. Survey in Chabert (1982).

Located 100 m west of 80/3, a narrow canyon passage descends to a free-climbable 5 m pitch before becoming too tight.

80/5 Geven Esiği Düdeni no. 3.
Length 73 m, depth 35 m. Survey in Chabert (1982).

Located 80 m north-west of 80/4. After a climb down on to a pile of blocks, the way on is by climbing up 3 m and sliding down an incline to the head of a pitch of 8 m, where the cave becomes too tight.

80/6 Geven Esiği Düdeni no. 4.
Length 49 m, depth 18 m. Survey in Chabert (1982).

Located 90 m north-west of 80/5. A pitch of 7 m leads to a rift passage. A side passage leads to the bottom of the cave, which is obstructed by boulders.

86/7 Depth 30 m.

Located about 100 m north-west of 80/4 and probably quite close to 80/5. A hole at valley floor level gives access to a low chamber. Boulders were removed from the floor to reach the head of a steeply inclined pitch of 26 m. The cave then becomes too tight.

86/8 Depth 20 m.

Located 200 m north-west of 86/7. A large shaft, about 5 m across, drops 8 m to boulders. A tall chamber may be entered beneath the boulders.

86/9 Length 10 m.
Located 50 m west of 86/8, among rocks above the valley floor. The cave is a roomy, almost circular, chamber of 10 m diameter, sometimes inhabited by shepherds.

80/7 Cevizli Oluk Düdeni. Gilli's survey is labelled 'Cevizlioluk Deliği'.
Length 104 m, depth 54 m. Survey in Gilli *et al.* (1981).
Located 3.8 km from Sakal Tutan along the road towards Mortaş, in the foot of a depression with small cliffs to the west. This steeply descending cave has a pitch of 16 m and ends in a sump.

80/8 Evreağaç Düdeni.
Length 17 m, depth 10 m. Survey in Gilli *et al.* (1981).
Located among rocks between 80/7 and 80/9. A small pothole blocked by boulders.

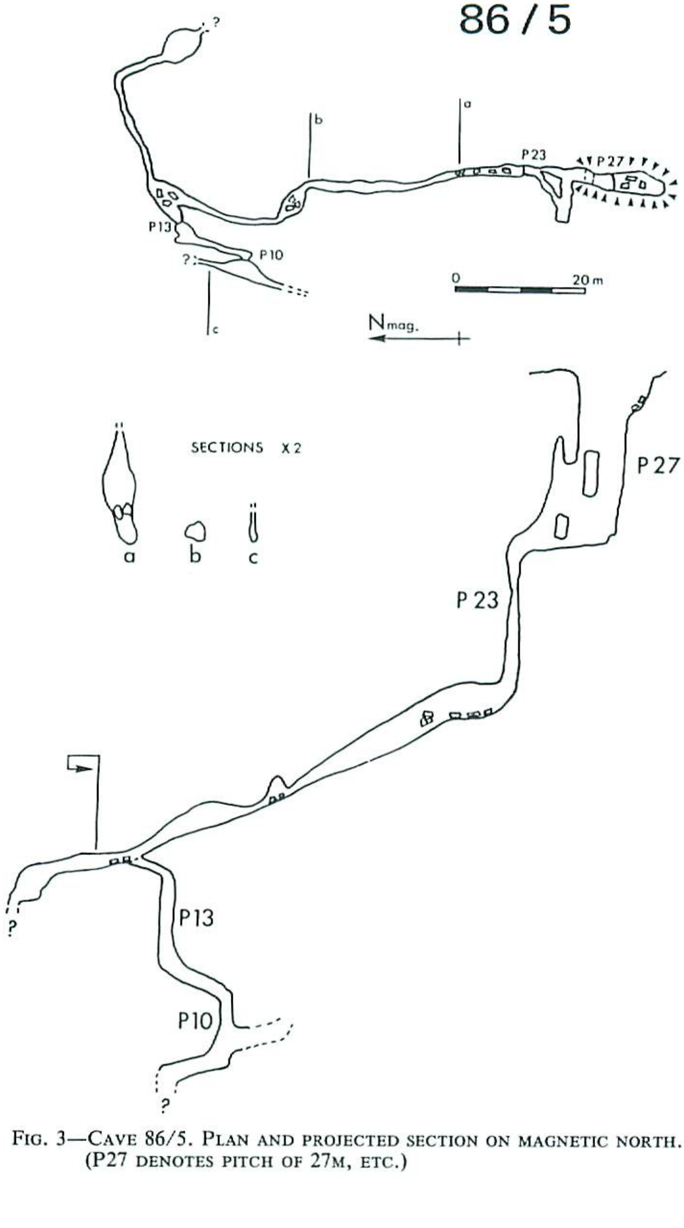

FIG. 3—CAVE 86/5. PLAN AND PROJECTED SECTION ON MAGNETIC NORTH. (P27 DENOTES PITCH OF 27M, ETC.)

80/9 Evreağaç Mağrasi.
Length 131 m, depth 15 m. Survey in Gilli *et al.* (1981).

Located about 1 km north from the road at Cevizli Oluk Düdeni, with a spacious and smoke-blackened entrance. This fossil cave is a shelter for shepherds, who have blocked off the passages at the back of the entrance chamber. The French followed one of these passages to a calcite choke.

84/1 Depth 34 m.

At the head of the pass the road skirts a closed basin of pinnacle karst. Near the eastern (Mortaş) side of this closed basin a rough footpath leaves the road in a northerly direction, heading towards a col between ridges. The cave described by Gilli (1984) was a 40 m shaft, 200 m from the road. The cave we found (almost certainly the same site) lies further from the road, in a bluff beside the footpath about 100 m from the col. A 32 m shaft is followed by a 2 m climb down to a choke.

86/4 Depth 25 m.

On the Süleymaniye side of the mountains, once the road has begun its descent, a spectacular ridge of karst pinnacles comes into view. A small village is well hidden between the road and this ridge. The cave lies about 0.5 km south of the village on the edge of the karst, and is a shaft 10 m in diameter, dropping 25 m to boulders.

86/5 Length 195 m (surveyed) + 30 m; depth 108 m to head of pitch 5. Survey Fig. 3

This is the deepest of this group of caves, lying at the end of a drainage channel some 300 m south of the village.

The entrance area of this cave is characterized by rock bridges. A roomy rift entrance pitch of 27 m gives a choice of two ways on. These quickly rejoin at the head of a narrow pitch of 23 m. A narrow passage leads via two chambers and a low crawl to a third chamber with two routes on. To the left a cylindrical pitch of 13 m leads to a tight rift and a further pitch of 10 m; at its foot another tight rift goes to pitch 5, an undescended drop of about 10 m. To the right from the third chamber a walking size passage leads to another chamber and pitch (undescended).

86/6 Depth 32 m.

The cave lies about 50 m north of 86/4. A shaft 15 m in diameter drops 32 m to a snow plug, the pitch being broken half way.

86/10 (Estimated) depth 40 m.

This conspicuous shaft lies just within the karst, directly opposite the village. A pothole of probably 40 m depth was seen but not descended, due to lack of time.

SITES IN THE TINAS TEPE AREA

To the north and east of Tinas Tepe mountain a number of resurgences were identified. These are shown in Fig. 4 and are numbered as follows:

No. 1. Fasih Düdeni has been recorded before (Skuce *et al.*, 1977) but is included here because of its importance as a flood resurgence. It is the most southerly of the obvious resurgences on this flank of Tinas Tepe, though the village of Arvana must also have a water supply. The original survey shows 75 m of large cave passage leading to a static sump at a depth of 20 m. The cave seemed to us longer and deeper, perhaps 90 m and 25 m respectively. We met two Turks in the cave, collecting water in buckets.

No. 2. 1 km south of Susuz there is a large rising, probably a flood or seasonal resurgence, for it was not flowing during our visit. The resurgence has thrown out a large quantity of rounded gravel, which is taken away by the lorry-load for building material. Water can be found at two points, one a shallow gravel-floored pool, the other a deep static pool with rock walls.

No. 3. At the southern edge of Susuz village and in the centre of the valley there is a small resurgence. It was not flowing during our visit.

No. 4. The main resurgence noted by Skuce *et al.* (1977) lies about 1 km south of Gölyüzü. Even in the dry conditions of our visit there was a sizeable stream flowing, measured at about 100 litres/sec. The water rises in at least three places. There is a very small cave in the bank behind the largest resurgence, about 2 m above water level. This was not explored.

No. 5. About 2 km north-west of Gölyüzü, a small stream rises by the road side and flows out into the Suğla Göl.

In the hillside, about 250 m above the level of Suğla Göl and directly above resurgence No. 5, there is a large cave entrance, stained by woodsmoke. The entrance is about 6 m in diameter and the passage chokes after 21 m.

No. 6. About 5 km south of Seydeşehir and just west of the Mortaş road, there is at least one large resurgence, a popular local picnic spot.

The south-west flank of Tinas Tepe has a continuous cliff line just below the summit. A large cave entrance can be seen at the foot of this cliff, if viewed from the Arvana track, one or two km south of Tinas Tepe Düdeni. Time was not available to explore it.

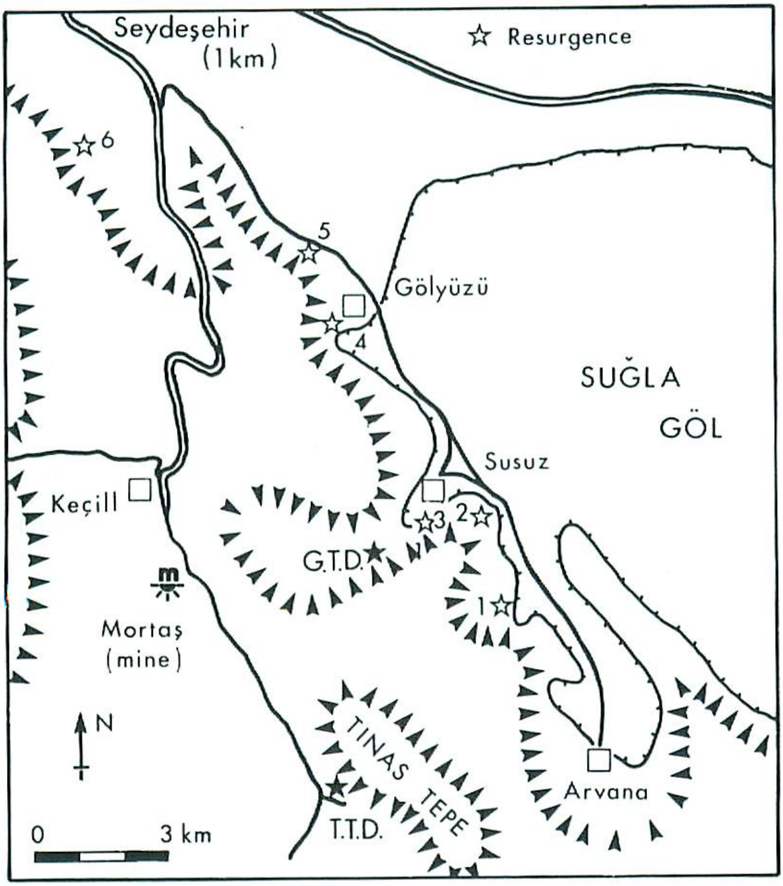

FIG. 4—RESURGENCES NEAR TINAS TEPE (AREA B OF FIG. 1)
T.T.D.: TINAS TEPE DÜDENI
G.T.D.: GÜVERCIN TAŞI DELIĞI

HYDROLOGY

Conductivity and temperature measurements were taken at several of the Suğla Göl resurgences (see TABLE 1). Though two of the risings were flowing and two were static pools, the conductivity results are all broadly similar,

TABLE 1—*Conductivity and temperature measurements at the Suğla Göl resurgences*

Resurgence	*Source of Sample*	*Conductivity* μS/cm	*Temperature* °C
No. 2	deep static pool	340	9.1
No. 3	shallow static pool	374	10.6
No. 4	the risings	367	7.9
No. 5	the rising	392	11.8

ranging from 340 to 392 μS/cm. Measurements were also taken at Tinas Tepe Düdeni, a large swallet high on the other side of Tinas Tepe mountain where a tiny stream of 0.1 litres/sec was sinking. The water on the surface cannot be traced back, but probably derives from one of the many small springs that may be found on the flanks of the Taurus ridge. Of a series of measurements at Tinas Tepe Düdeni, the highest readings (up to 431 μS/cm) were in rock-floored pools of the surface stream where a calcite mud was being precipitated. Underground the readings were 342–346 μS/cm at 7.1–7.3°C. These conductivity values are quite low for water that is close to saturation with calcite, but with so little soil in the Taurus mountains the amount of carbon dioxide in the groundwater is much reduced. For comparison with a British cave system see O'Reilly and Bray (1974). Cave development at Tinas Tepe Düdeni is dormant during the summer, and probably for most of the year, but the cave has a large catchment and in spring when 2 or 3 m of snow begins to melt the cave must be an impressive sight in flood.

Skuce *et al.* (1977) believed that Tinas Tepe Düdeni drained to Güvercin Taşi Deliği (FIG. 4). This is quite possible, but Skuce goes on to suggest that the water then travels under the Susuz valley to resurgence No. 4 at Gölyüzü. A more likely destination is one of the Susuz resurgences (Nos. 2 or 3), the water seeping away into the sediments of the lake floor in summer time.

Gilli *et al.* (1981) considered that Sakal Tutan Düdeni drained to a resurgence at Değirmenlik near Süleymaniye, on the evidence of radiolaria microfossils found at both sites. The radiolaria derive from rocks of the Beyşehir-Hoyran nappe, an outcrop of which may be found near Sakal Tutan. There are a few other outcrops of these rocks, so it is still possible that the water drains elsewhere. East towards Seydeşehir or south-east along a fault towards the drainage basin of Tinas Tepe Düdeni are possible (but less likely) options.

CONCLUSIONS AND FUTURE PROSPECTS

The two caves at Sakal Tutan (79/1 and 2, each 303 m deep) share the position of second deepest cave in Turkey, the deepest being Düdencik near Cevizli at 330 m. These depths seem very small, considering the thickness of the limestone and the topography. One cause of this apparent paucity of deep caves is the difficulty of access into the Taurus mountains. There are few roads, and expeditions have not yet explored far from them. The French have stayed mainly on the south side of the Taurus ridge, concentrating their efforts in the Manavgat valley. Much of the north and central parts of the ridge have yet to be investigated.

The stratigraphy of the limestone succession may also be an important factor in limiting the development of deep caves. With a gentle, often undulating, dip, any impermeable layer will hold up cave development, causing vadose pothole systems to reduce to wet and shallow-angled cave passages. Examples of this are Sakal Tutan Düdeni and Tinas Tepe Düdeni. The bauxite bed is the most obvious of these barriers; faults may be the means by which cave systems escape its confines. With so many major resurgences at the foot of the mountains there is reason to believe that most caves eventually breach these impermeable layers. There are, however, many small springs at higher altitudes.

In some caves we found natural belay placements for tape slings and climbing nuts. We had tackle stolen from the entrance pitch to one cave, 86/5, fortunately not when we were underground.

ACKNOWLEDGEMENTS

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