

## 2002 SYMPOSIUM PAPERS

### Lava Tubes of Harrat Kishb, Saudi Arabia

John J. Pint

Cave Unit Consultant, Saudi Geological Survey; thepints@saudicaves.com

#### Introduction

Prior to the year 2001, very few reports were made regarding lava caves in Saudi Arabia and no surveys are known to have been carried out. This situation changed in November of 2001 when Dr. John Roobol led an expedition to the vicinity of Jebel Hil Volcano in Harrat Kishb, a lava field located 300 km northeast of Jeddah. The explicit purpose of the expedition was to locate and survey lava caves, as well as to describe them accurately. The location of Harrat Kishb is shown in Figure 1.

The first expedition to Harrat Kishb

took place November 10-14, 2001, led by Dr. J. Roobol, J. Pint and M. Al-Shanti. The project took place at the urging of Dr. William Halliday, member and founder of the Commission on Volcanic Caves of the International Union of Speleology (UIS). By coincidence, Dr. Roobol had received, from geologist Faisal Allam, several photographs of cave entrances found some 6 km east of Jebel Hil in Harrat Kishb. Accordingly, the goals of the expedition were to locate the caves shown in the photographs as well as to precisely locate the collapse holes west of Jebel Hil which were observed by Roobol and Camp (1991) and thought

to be entrances to a lava tube.

After much searching, the photographed caves were located and one of them, Mut'eb Cave, was surveyed. In addition, the GPS locations of twelve collapse entrances of the Jebel Hil Lava Tube were taken, a difficult undertaking since 12 km of mostly a'a lava had to be traversed on foot.

A second visit to Harrat Kishb was made from February 2-5, 2002, again led by J. Roobol, J. Pint and M. Al-Shanti. Ghostly Cave was surveyed and a new cave, Dahl Faisal, was located and surveyed. The results of the Kishb Surveys were published in Roobol et al., 2002.

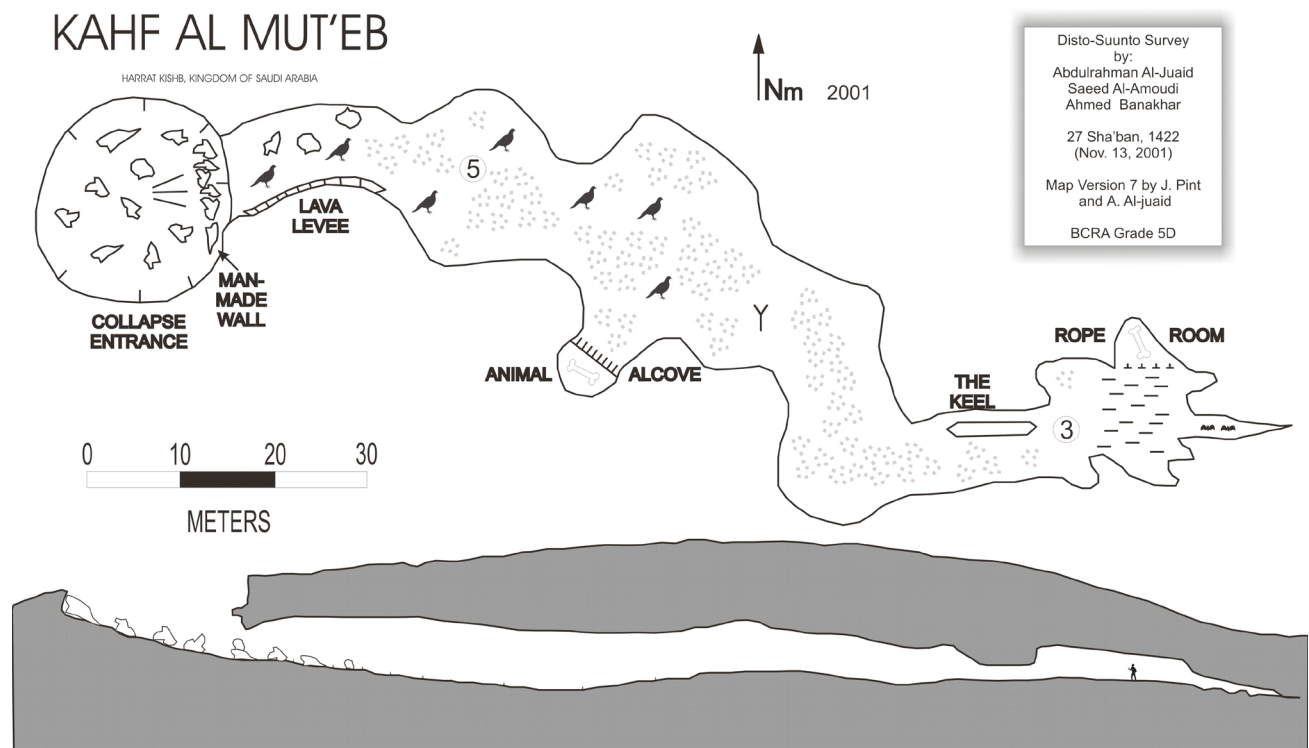


Figure 2. Map of Mut'eb Cave.



# MAJOR LAVA FLOWS (HARRATS) OF SAUDI ARABIA



Figure 1. Map showing the location of Harrat Kishb lava field in Saudi Arabia



## MAJOR LAVA FLOWS (HARRATS) AND CARAVAN TRAILS OF SAUDI ARABIA

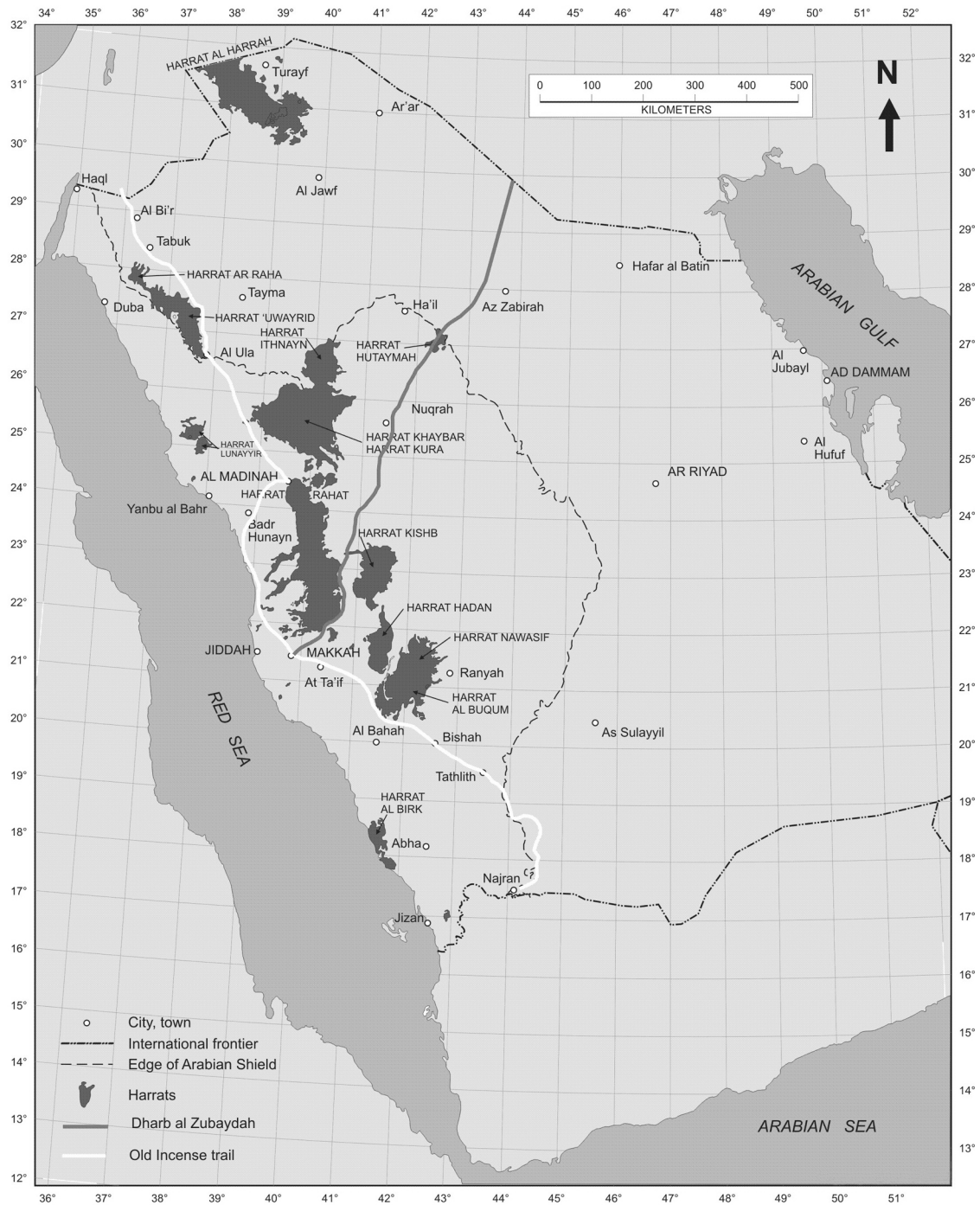


Figure 3. Map of two ancient caravan trails in Saudi Arabia, showing lava fields. After Hussein Sabir, 1991.

# KAHF AL ASHBAAH

(GHOSTLY CAVE)

HARRAT KISHB, KINGDOM OF SAUDI ARABIA

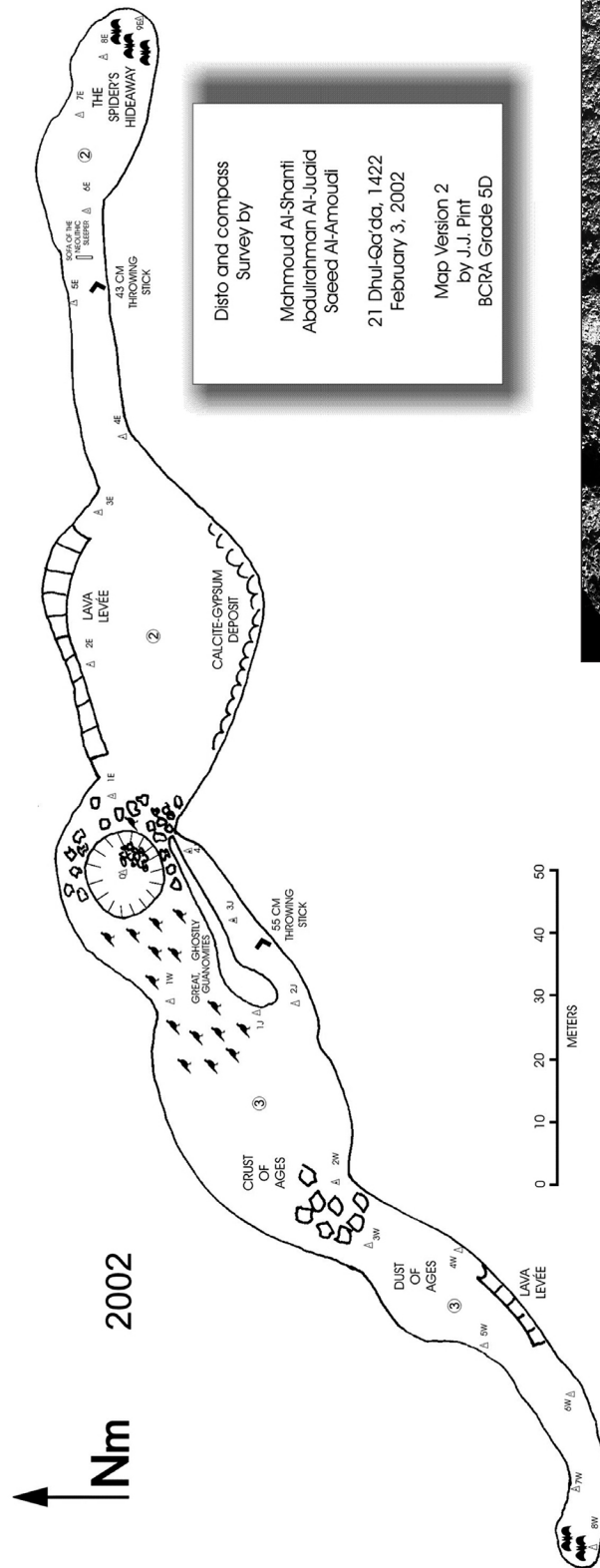


Figure 4. Map of Ghostly Cave.



Figure 5. Throwing sticks found in Ghostly Cave are flat on the bottom and curved on top to provide aerodynamic lift.



### Geology of the Hil Basalt

All the surveyed caves found in Harrat Kishb are located in the Hil Basalt, which is a basaltic lava field younger than one million years, with an area of 5,892 km<sup>2</sup>, centered about 270 km northeast of Jeddah. These deposits comprise both scoria cones and lava flows which were probably formed during a moist climatic period or pluvial interval and which are distinguished from overlying subunits because they are significantly eroded (Roobol et al., 2002).

#### Mut'eb Cave

Mut'eb Cave, or Kahf Al Mut'eb is registered as number 124 in Pint, 2002 and is located at 22°55'N, 41°24'E. Note: seconds of latitude and longitude have been omitted in this paper in order to help protect these caves from vandalism. The precise location of each cave is given in Pint, 2002.

**Geological setting.** The cave is found in a sinuous ridge of smooth, hard pahoe-hoe lava curving around an older, obstructing scoria cone in the volcanic deposits of the Hil Basalt.

**Description.** A map of this cave is shown in Figure 2. Mut'eb Cave is 150 m long. The entrance to the cave measures 3 x 7 m and is found on the eastern side of a collapse 20 m in diameter. There are remains of an ancient, man-made wall across the front of the cave. A single passage trends east, sometimes reaching a width of 20 m. The passage height varies from 3 to 5 m. Sand or clay-rich sediment cover the floor to an undetermined depth. The cave contains abandoned wasps' nests, mounds of rock-dove guano, animal bones, and bat urine stains on the walls and ceiling. A 40-cm-long cord composed of long plant fibers, with one knot in it, was hidden beneath a flat rock at the eastern end of the cave (Roobol et al., 2002).

**Comments.** Because a man-made structure is found at the entrance to this cave and because an apparently ancient artifact was found deep inside, it is suggested that the cave be investigated by archeologists. Note that Mut'eb Cave, in Harrat Kishb, is located approximately 55 km east of the celebrated Darb Zubaydah, a well-marked trail complete with shelters, water wells and reservoirs one day's march apart (See Fig. 3). The trail led from Baghdad to

# DAHL FAISAL

## HARRAT KISHB, KINGDOM OF SAUDI ARABIA

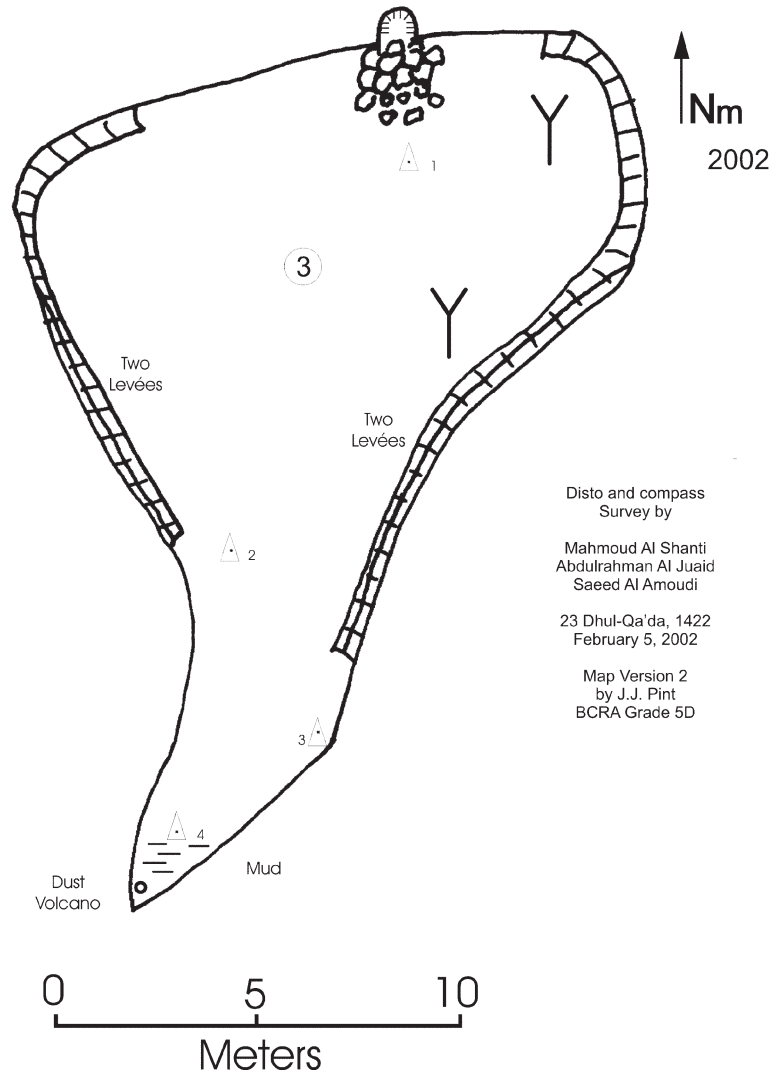


Figure 6. Map of Dahl Faisal.

Mecca and was built by Queen Zubaydah, the enterprising wife of Caliph Harun al-Rashid around the beginning of the ninth century A.D.

#### Ghostly Cave

Ghostly Cave or Kahf Al Ashbaah is registered as number 123 in Pint, 2002 and is located at 22°55'N, 41°25'E.

**Geological setting.** The cave is found in a flat area of basaltic pahoe-hoe lava in the volcanic deposits of the Hil Basalt.

**Description.** The cave is 320 m long. The entrance is a collapse 10 m in diameter with a 7 m drop to a flat floor below. The passage leads off east and west. Up to 50 stalagmite-like mounds of rock-dove guano are found just inside the entrance to the western passage along with the remains of a stone wall partly buried beneath bird guano. The cave passages have a maximum width of 30 m and vary in height from 1 to 3 m. Both passages have white, calcareous patches on the ceiling and a thick layer of

powdery dust on the floor. This consists mainly of calcium, potassium and phosphate. Bats are found at both extremes of the cave. Two flat, L-shaped wooden throwing sticks were found in dark areas of the two passages, resembling similar instruments depicted in Neolithic rock art found in Saudi Arabia. See Fig. 3 and 4. (Roobol et al., 2002)

*Comments.* Man-made constructions and two ancient throwing sticks were found in this isolated and difficult-to-enter cave. Digging in the sediment which completely covers the cave floor may produce historically or archeologically important finds. As noted in the comments on Mut'eb Cave, Ghostly Cave is located approximately 55 km east of the celebrated Darb Zubaydah (see Fig. 3).

#### Dahl Faisal

Dahl Faisal is registered as number 162 in Pint, 2002 and is located at 23°11'N, 41°27'E.

*Geological setting.* The cave is found in a nearly flat-lying "whale-back" lava flow of the Jabal Zuwayr volcano. This

volcano and its flows consist mainly of basanite and alkali olivine basalt with small volumes of hawaiite, phonotephrite and phonolite and are located in the northern portion of the Hil Basalt.

*Description.* Dahl Faisal is 22 m long. The cave is entered through a smooth, 3-m-long pipe, 80cm diameter at its narrowest point, oriented at a 60° angle. This appears to have formed when the cave was created. Below the entrance tube lies a heap of rocks apparently piled up by people using the cave in the past. Dahl Faisal consists of one room, 17 x 22 m, with a maximum ceiling height of 3 m. Sediment of unknown depth covers the original floor. The cave contains basaltic stalactites, stalagmites and lava levées. Desiccated animal scat apparently from wolves, hyenas and foxes was also found. See Fig. 5. (Roobol et al., 2002)

*Comments.* Dahl Faisal is located 60 km east of Darb Zubaydah and about 70 km southeast of Mahad adh Dhahab, an operating gold mine and reputedly the site of one of King Solomon's Mines. See Fig. 3. Carbon-14 dating of wood from fires used for smelting suggests that the mines are 3,000 years old. This information, together with historical studies, indicate that gold, silver and copper were indeed recovered from this region during the period considered by some to be the reign of King Solomon: 961-922 B.C. Evidence of human use and the proximity of the cave to known historical sites, suggest that it could contain artifacts.

#### Jebel Hil lava tube

This lava tube extends westwards from Jebel Hil. Along its length are aligned small rootless shields, collapse holes, subsided areas and one area of local updoming. Twelve such features were located, one of which is shown in Fig. 6. The lava tube is up to 20 m high and the depth of its floor beneath the surface varies from 28.5 to 42.5 m, measured by Disto Laser Measuring Device at each hole. The surface features of this lava tube were mapped and described, and they suggest that the tube is at least

3 km long. However, the cave itself was not entered. A detailed map and description of these features are given in Roobol et al., 2002.

#### Other caves located on Harat Kishb

Two other lava caves, First Cave and Bushy Cave were also located during the Kishb surveys. The entrance to First Cave is a collapse 20 m deep in what appeared to be a lava tube. It was not entered due to apparent instability of the entrance walls. Bushy Cave is a nearly round room 12X13 m, possibly formed by a gas bubble. It was sketched, but not surveyed.

#### Conclusions

The fact that six caves were located on the first attempt to find and study lava caves in Saudi Arabia should encourage more attempts to carry out vulcanospeleological projects in this country, which has over 80,000 square km of lava fields. The fact that three apparently Neolithic artifacts were found in two of the caves studied suggests that an archeological study of Saudi lava caves may produce interesting results.

The SGS open-file report on the Caves of Harat Kishb can be downloaded at <http://www.saudicaves.com/spspubs>. The trip report and photos are at <http://www.saudicaves.com/kishb/kishb.htm>.

#### References

- Pint, J. 2002: Master list of GPS coordinates for Saudi Arabia caves: Saudi Geological Survey Confidential Data File SGS-CDF-2001-1.
- Roobol, M.J. and Camp, V.E., 1991: Geologic map of the Cenozoic lava field of Harat Kishb, Kingdom of Saudi Arabia: Saudi Arabian Directorate General of Mineral Resources Geoscience Map GM-132, with explanatory text 34 p.
- Roobol, M.J., Pint, J.J., Al-Shanti, M.A., Al-Juaid, A.J., Al-Amoudi, S.A. & Pint, S., with the collaboration of Al-Eisa, A.M., Allam, F., Al-Sulaimani, G.S., & Banakhar, A.S., 2002: Preliminary survey for lava-tube caves on Harat Kishb, Kingdom of Saudi Arabia: Saudi Geological Survey Open-File report SGS-OF-2002-3, 35 p., 41 figs., 1 table, 4 apps., 2 plates.



Figure 7. Collapse Structure 6 of the Jebel Hil lava tube, looking west, showing the upper part of the lava tube with geologists standing on the roof. Photo courtesy J. Roobol.