

### Hvor mange grotter finnes det i søndre Nordland

How many caves are there in South Nordland?

It has recently been reported that there are over 800 registered caves in Norway, with over 80 % lying in Nordland (Anon., 2007). However, these numbers must be massive under-estimates of the total numbers of karst caves that exist, especially if the number of unexplored caves is also considered. For example, prior to 2004, there were 728 adequately reported caves between Grong and Mo i Rana (excluding Plurdal), plus about 80 caves that are not adequately reported (Faulkner, 2005). All lie in south Nordland, except for 8 caves at Vallerdal in Nord Trøndelag. Only two of these caves, Toerfjellhola and Stor Grubblandsgrotta, approach a passage length of 2 km, and the mean cave length is only 80m. In the widely scattered karst areas south of Grong, another 28 caves have been reported, but there has been little systematic searching for caves in southern Norway, and probably many more wait to be found. The main caving areas in Norway are in north Nordland, which account for the great majority of the registered caves, so that the number of caves now known in Norway may lie in the range 1500–1600.

Because karst conduits are natural features of the landscape, their dimensions can range in size from the kilometre-scale down to at least the centimetre-scale. A roughly continuous distribution of decreasing size against increasing frequency might be expected. Thus, in theoretical terms, discussions based on mean numbers, mean lengths, mean volumes etc. might be considered to be without meaning. A rigorous treatment would use rank/size correlation plots (Ford and Williams, 1989, p 245) and a fractal calculus, as proposed by Curl (1986). In practical terms, however, it is found in south Nordland that such mean values are of some utility, when applied to distributions of explored caves with lengths of 5 m or more. Thus, a set of 40 newly explored caves would invariably have a mean surveyed length between 70 m and 100 m. This applies even when the set consists of caves from several different karst areas. Hence, there are some characteristics of the naturally formed caves and the behaviour and motivation of cave explorers and surveyors that combine together to create a simple model of cave existence, which can be used as a predictive tool. Estimates of the unexplored but explorable cave potential in south Nordland can be made by assuming that the cave frequency and dimension distributions for caves of  $\geq 5$  m length for the total length of (mainly stripe karst) carbonate outcrops now visited by cave explorers (which was 332 km prior to 2004) also apply for the total known length of all outcrops (which is 2565 km, mainly as mapped by the NGU). Taking data from Faulkner (2005), such a calculation leads to the estimates in Table 1. (Page 22)

The typical cave in south Nordland consists of a single passage that is less than 100 m long and less than 10 m deep. Because all cave passages remain within 50m of the overlying surface (except Ytterlihullet, at c. 93 m), they can be described as epigean and perhaps even as epikarstic. However, caves over a kilometre in length and over 100m in vertical range also occur in the area, and these can display extremely complex arrangements of inter-linked passages at several levels. The estimates in Table 1 show that there should still be many thousands of caves to find in south Nordland, with total passage lengths of several hundred kilometres. At a first level of understanding, they will be found clustered in groups that are scattered rather randomly at any altitude along stripe karst outcrops. (Faulkner, 2005, discusses extra factors that influence the existence and dimensions of the caves). The same logic may apply in other parts of Norway, especially north of Mo i Rana. This should provide local cave exploration opportunities for several centuries. However, the experience in south Nordland in 2004, 2005 and 2006, when about 50 extra caves were recorded and others were surveyed, is that the task is becoming more difficult, because much more walking has to be planned to reach previously-unvisited limestone outcrops. Potential cave sites may now lie several hours' walk from the nearest road, and total walking distances of 100-200 km may be needed to find 40 caves in a 3-week expedition.