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Marin påvirkning og grottene ved Aunhatten og Langskjellighatten, Brønnøy

Marine influence and the caves at Aunhatten and Langskjellighatten, Brønnøy

Relict caves at Aunhatten and Langskjellighatten (Figure 1) in the Langfjord area of Brønnøy kommune were first described by Hoel (1906). They are all situated in a long, 100m-wide, outcrop of marble that runs beside Langfjord and its narrower inland continuation, Tarmaunbotnet. A parallel band of marble 100m to the west leads from Tarmaunbotnet to meet the first band near Aunhatten, from where the wider outcrop reaches Davidskjåvatnet. Underground streams in the area were noted by Helland (1907). The marble comprises Angled Stripe Karst with a mapped dip of 50-60°E within the Helgeland Nappe Complex of the Scandinavian Caledonides, which were glaciated repeatedly during the Pleistocene. The adjacent local bedrock consists of Cambro-Silurian metamorphic complexes of mica-schist, calc-silicate rocks and granites. Below Aunhatten, the lake Fjelldalsvatnet has no surface outlet. Its water runs underground and reappears 1.4km to the north at the resurgence cave Langfjordgrotta.

Hoel (1906) described three caves with large entrances at three different levels in a cliff below Aunhatten: Aunhattenhule 1, 2 and 3. They commonly reduce to 2m wide by 2.5-3m high after several tens of metres and partially terminate at fills of sediment. Hoel carefully calculated the altitudes of the cave entrance floor levels to be 105m, 116m and 132m. He also found three types of marine shell "on and in the wall" at the entrance to A2 and one type inside many bored holes at the entrance to A3. On the same day as his visit to Aunhatten, Hoel and his team also visited the 'through' cave Øverste Langskjellighattengrotta and Laveste Langskjellighattengrotta (which has three entrances) near the summit of Langskjellighatten, and calculated the altitudes of these cave floors to be c. 158m and 179-185m.

Later visits were made by the St. Pierre family in 1977, when they reached submerged caves at Davidskjåvatnet. Next day they walked down the dry valley from Fjelldalsvatnet to Langfjordgrotta beside the fjord. In A2, they pushed the young Andrew St. Pierre into the roof passage at the end, which he probably explored for 20m to the foot of a slippery traverse. More karst caves in Brønnøy were reported by Faulkner and Newton (1995), Newton (1998; 1999) and Faulkner (2005a). In 1998, André Rasmussen, David St. Pierre and I climbed Langskjellighatten and explored a third cave there: Sud Langskjellighattengrotta. A day later, David and I made notes at A1, A2 and A3, but were unable to climb into the roof passage in A2. However, we found a short fourth cave: Aunhattenhule 4. I returned in 2000 to obtain GPS and altimeter measurements at entrances and to make solo cave surveys, but still could not enter the roof passage at the end of A2 or a possible one at the end of A1. These projects were finally achieved with Nigel Graham and Alan Marshall with stronger maypoles as the last activity of the Final South Nordland Expedition in 2011.

Faulkner and Hunt (2009) discussed the various deposits in Neptune's Cave, which is situated 13km SW of Aunhatten at an altitude range of 93-126m. These included attached barnacles dated to 9840±9014C years BP and other shell deposits dated to 9570±8014C years BP. We proposed a timescale for the retreat of the ice margin across the Velfjord area and assumed a sea level curve for Neptune's Cave to show the time when isostatic rebound caused the cave to emerge above sea level. Similar data (Figure 13) can be used to consider the deglaciation and uplift of the Langfjord area, and the following deductions can be made:

1. Øverste and Sud Langskjellighattengrotta were above sea level when they became deglaciated. They experienced no marine erosion, or deposition of beach materials or marine shells, consistent with the phreatic profile of their passages, without enlarged entrances. Being in 'impossible' locations just beneath a summit ridge, they cannot have developed in the Holocene. They are likely to have formed by chemical and mechanical erosion and received sedimentation when submerged by ice-dammed lakes earlier during the oscillating Weichselian deglaciation.
2. The lowest parts of Laveste Langskjellighattengrotta were just below sea level when deglaciated. Assuming that the three main passages were earlier formed phreatically, the whole cave could then have been within the tidal range and experienced storm surges and winter freezing for up to 200 years. This would explain the larger size of the lowest part of the cave and the presence of the rounded boulders.
3. All the caves at the Aunhatten cliff were well below sea level when the ice margin reached them. Again, they were probably initiated phreatically before that. They were under the sea for 200-600 years and most mechanical weathering of the large entrances probably occurred as they passed upwards through the tidal range.
4. All the karst features at Davidskjåvatn are too high to have been covered by the sea after deglaciation. They are mainly shallow active conduits that represent normal interglacial phreatic speleogenesis, with an initiation early in the Holocene.
5. Langfjordgrotta is an extreme case, because this site at 10m altitude was below sea level until the final 2000 years of the Holocene (Figure 13). However, the flow of fresh water from Fjelldalsvatn after this lake emerged above sea level at c. 6400 would have been increasingly able to restrict marine incursion along the length of this (mainly unexplored) system. Hence, the conduit may have enlarged by normal interglacial phreatic dissolution and mechanical erosion for the last few thousand years.

This study confirms the Hoel (1906) conclusion that the large cave entrances at Aunhatten and Laveste Langskjellighatten were enlarged and sedimented by the sea. Their internal phreatic passages and Øverste and Sud

Langskjellighattengrotta were formed mainly by chemical dissolution earlier, probably when flooded during several oscillating cycles of Weichselian deglaciation. The active, mainly sumped, karst systems near Davidskjåvatn and Langfjordgrotta probably all developed primarily in the Holocene.