The Hasli Formation – an exceptional record of Early Pleistocene interglacial sediments in Northern Switzerland

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The Höhere Deckenschotter («upper cover gravels») is considered to be the oldest body of Quaternary sediments in Northern Switzerland (Graf 1993). It forms the highest of four morphostratigraphic units (top down: Höhere Deckenschotter, Tiefere Deckenschotter, Hochterrassenschotter and Niederterrassenschotter). The Höhere and Tiefere Deckenschotter units in Switzerland consist of glaciofluvial gravels with intercalated overbank and other fluvial sediments deposited in broad channels. They lie directly on Molasse or Mesozoic bedrock. Due to subsequent erosion, the Deckenschotter are preserved as relic deposits on top of hills. There is an ongoing debate about the age of the Deckenschotter as cosmogenic nuclide dating (Claude et al. 2017) has produced younger ages than those derived from biostratigraphic dating (Bolliger et al. 1996).

On the Irchel Plateau (northern canton of Zurich), the Höhere Deckenschotter gravels are well exposed along the edge of the plateau. Within these exposures, a characteristic layer of fine-grained, mostly beige or grey overbank sediments (Hasli Formation) can be traced across much of the Irchel Plateau. Based on mapping and high-precision surveying at five locations, the base of the Hasli Formation can be shown to be a floodplain deposit that dips slightly to the NW. Six profiles through the Hasli Formation have been excavated, documented and sampled in detail.

Lithologically, the Hasli Formation consists mainly of characteristic light beige silts and fine sands with sporadic cemented sand layers and carbonate concretions. In places the Hasli Formation also includes thin gravel layers. Thin lignite layers were also observed at Irchel Hasli. The Hasli Formation reaches its greatest thickness of c. 7 m at the south-eastern end of the Irchel Plateau, and its least thickness of c. 2 m in the central part and at its north-western end. Locally the Hasli Formation seems to be missing due to subsequent erosion.

A rich (several thousand specimens) and diverse molluscan fauna (>80 different species) has been recovered from all of the investigated profiles. In addition, small numbers of Chara and ostracods were also found. Small mammal teeth
were discovered at several sites, but only the already known site at Irchel Hasli (Bolliger et al. 1996, Cuenca-Bescòs 2015) has yielded a well-preserved and identifiable fauna.

For age determination, both the small mammal and molluscan remains provide important data. For the small mammals, the fauna from Irchel-Hasli falls into the Borsodia-Villanyia Superzone (Fejfar & Heinrich 1989), whose upper limit lies at ca. 1.8 Ma. In particular, *Mimomys ploiacaenicus* and *Mimomys reidi/pitymyoides* are marker species characteristic for the small mammal unit MN 17 (Mein 1989, ca. 2.6–1.8 Ma). This confirms the previous biostratigraphic study of Bolliger et al. (1996), although a further analysis of the first occurrences of the mammalian species in the assemblage allows a more precise age classification in the time range of ca. 2.2/2.0–1.8 Ma.

The molluscan faunas identified from the Irchel sites give important new biostratigraphical information for the first part of the Early Pleistocene. The presence of several key indicator species typical of Tiglian faunas strongly suggests that the Hasli Formation dates from between c. 2.2 and 1.8 Ma. The molluscs also confirm that the Hasli Formation represents a floodplain accumulation at the margin of a large meandering river.

The uniquely rich and diverse faunas from the Hasli Formation represent interglacial conditions that were significantly warmer than today, during the first part of the Early Pleistocene.

REFERENCES


