Neolithic and Bronze Age pastoralism affect mountain forest dynamics in the Swiss Alps

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Introduction
Human impact has been identified as one of the major drivers of ecosystem change in recent decades. Here we link archaeological finds from the mountain pass Schnidejoch (2765 m a.s.l.) with palaeoecological data (i.e. fossil pollen, spore, charcoal and macrofossil analysis) from nearby Lake Ifigsee (2065 m a.s.l.) to study vertical mobility and the effect of early human impact in the Swiss Alps.

Conclusions
- Neolithic herdsmen from the Rhône Valley brought livestock over the Schnidejoch pass to graze the meadows around Ifigsee as early as 4800 BCE.
- Fire was used by people in the Neolithic to open timberline forests and create pastures for livestock.
- Anthropogenic land-use in the Neolithic had a negative impact on important forest species such as Abies alba, Pinus cembra and Larix decidua, and facilitated the expansion of Picea abies at 3500 BCE.
- Human impact has shaped the vegetation of the Alps for millennia. Traditional pasto-nalis has the potential to mitigate the upward shift of treelines due to climate change and preserve species-rich alpine meadows.

References & Acknowledgements


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Figure 1: Among the most spectacular finds from the melting ice field at Schnidejoch pass are a complete snow kit, leather shoes and leggings, dated to 2800 BCE. Picture: Historical museum Bern.

Figure 2: Combined evidence from archaeological finds and palaeoecological analyses for Neolithic and Bronze Age pastoralism in the Swiss Alps. Left: Schnidejoch radiocarbon dates and specific archaeological finds from a) the Neolithic period (4800 - 2200 cal. BCE) and b) the Bronze Age period (2200 - 1600 cal. BCE). We highlighted finds that suggest prolonged stays in the mountains such as c) a bowl made out of cypress (Cupressus sp.) wood, dated to 4500 - 4300 cal. BCE, d) a vessel made out of stone pine (Pinus cembra) and willow (Salix sp.) wood dated to 2000 - 1600 cal. BCE and e) rings made from plaited twigs of birch (Betula sp., left) and spruce (Picea abies, right), dated to 2000 - 1750 cal. BCE and 1550 - 1700 cal. BCE, respectively. Similar wooden rings are still being used in mobile fencing systems in the Swiss Alps, as shown in the historical photograph (f). Right: Palaeoecological data from lake Ifigsee. i) Pollen diagram of select taxa, microscopic charcoal influx and archaeological macrofossil charcoal. The age of the Neolithic and Bronze Age finds from the Schnidejoch is highlighted with horizontal grey bars. b) Correlogram and j) cross-correlation analysis showing correlations and leads/lags between microscopic charcoal influx and select pollen and spore percentages for the period 5000 - 3200 cal. BCE. The dashed lines mark the significance level (P<0.05). 1 lag = 29 +/- 7.5 years.

Figure 3: Left: Location of the Schnidejoch pass (2765 m a.s.l.) and Lake Ifigsee (2065 m a.s.l.) in the Western Bernese Alps of Switzerland. Right: Aerial view of the potential route taken by Neolithic herdsmen from the Rhône Valley to meadows at Ifigsee and Rawil.

Study sites

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