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Historical Landslides in Western Sweden 1700–1799 AD

Anton Larsson

Stockholm University

anton.larsson@ark.su.se

Abstract

During the 18th century (1700–1799 AD), the landslide frequency in Sweden appears to have risen dramatically, only to decline with an equal sharpness in the following 19th century. Due to the unique and thoroughly digitized cartographic archives of the Swedish National Land Survey, as well as likewise well digitized newspaper archives, a strong historical landslide database can be formed for the region of Western Sweden in the 18th century. This includes a vivid visual material in the form of the cadastral maps, which depict disaster and hazard zones with high accuracy when compared with LiDAR data and field tested. This papers presents the first part of a doctoral research project at Stockholm University centered on historical landslide events, showcasing the geocultural potential of the material at hand and the data it provides.

1 INTRODUCTION

This paper showcases the preliminary results of a study intended to create a historical landslide database (e.g. Devoli et al. 2007; Pereira et al. 2014; Raska et al. 2015) for Western Sweden. The study is part of a PhD research project at the Institute of Archaeology and Classic Studies at Stockholm University, which seeks to explore local community adaptation to landslide events 1000-1900 AD, and the impact of such events on archaeological sites. Presented here is one segment of this data, namely those landslide events which occurred in the 18th century (1700-1799 AD).

Previous efforts to create inventories of landslide events in Western Sweden (e.g. Sundborg & Norrman 1963, Hultén et al. 2006) have almost solely focused on the Göta älv (“River of the Geats”), and has only seldom included landslides from other, more minor waterways. With the river’s length of 93 km (58 mi), the largest drainage basin in Scandinavia, and highly unstable clay banks, this is perhaps not surprising, as it is a crucial waterway. Focusing solely on this particular river does however skew the general image of landslides in early modern Sweden and carries certain implications for the reliability of historical analysis. Additionally, these previous efforts have primarily reused tertiary sources, which in turn have used older local history publications (e.g. Ödman 1746; Holmberg 1867; Svenungsson 1930). The goal of this paper is to instead seek out contemporary sources and extract data from them, and to in doing so also study areas of Western Sweden located outside of the Göta älv river system.

2 GEOHISTORICAL BACKGROUND

The research area of this project has been loosely termed “Western Sweden”, which is here defined as the modern-day extents of Västra Götaland County. This region, which is subdivided into 49 municipalities and measures 25,247 km² (9,748 sq mi), contains several different historical provinces, namely the entirety of Bohuslän, most of Dalsland and Västergötland, and smaller parts of Halland and Värmland. Historically Bohuslän has been a Norwegian province while Halland has been a Danish province, the rest being predominantly Swedish territory. By the 18th century however the entirety of the modern-day county was under Swedish rule, following the Dano-Swedish Wars

and the Treaty of Roskilde in 1658 (Lönnroth 1963; Montell 1978).

The geology of Västra Götaland County is, due to its size and diversity, complex. It ranges from the rocky granite archipelago of Bohuslän to the hillocks of the southern Swedish highlands and the plains of the Central Swedish lowlands. The vast majority of landslides occurring within the region occur in three separate settings; the massive Göta älv which stretches from Lake Vänern to the ocean, smaller riverine valleys, and the western fjord systems. The common factor between these three is unstable glacial and post-glacial clay soils (Sundborg & Norrman 1963).

3 METHOD AND SOURCE CRITICISM

The data presented in this paper derives from four different types of historical source material; newspaper reports, cadastral maps, parish funeral records, and parish records describing extraordinary events. Following archival studies the identified landslide events have been localized and recorded using GIS. This follows previous studies into historical landslide events (e.g. Devoli et al. 2007; Pereira et al. 2014; Raska et al. 2015). Given the nature of the material at hand, the issue of source criticism must be addressed.

Many, if not all, 18th century newspapers published in Sweden have been digitized and made publicly available by the Royal Library of Sweden. Reports of noteworthy landslide events can be found within this material. As the journalistic profession was not yet formalized all reports were sent in to the newspapers by anonymous volunteers seeking to transmit knowledge of local geological events in their area. This early form of citizen science reflects the growth of Linnaean natural history in 18th century Sweden, through which amateur and novice naturalists became links in a new international scientific community searching for knowledge about climate, geography, and geology (e.g. Pihlaja 2005; Hodacs 2011; Pihlaja 2012).

The vast archives of the Swedish National Land Survey has likewise been thoroughly digitized and made publicly available. This material reflects both cadastral maps made for the purpose of agricultural land reforms which simply happen to report on landslide events within the mapped area, and maps made by state surveyors dispatched with the sole purpose of depicting especially noteworthy landslide events. Records belonging to local parish

churches have, like the newspapers and maps, also been extensively digitized. Only part of them are however easily searchable, and other parts have been lost to fire, making large spans of the century unavailable for study.

In summary, all available source materials are inevitably flawed in one way or another. They can be inferred to only report on a fragment of the total landslide frequency, and possibly follow quite biased patterns regarding for example geographical spread. Still, they provide valuable data, being the only available sources at hand.

4 THE LANDSLIDES

In total, it has so far been possible to identify and date 25 separate landslide events ranging from 1700 to 1799 AD in present-day Västra Götaland County. These are presented chronologically in table 1. Out of 25 events, it has been further possible to locate the site, down to the exact coordinates, in 20 cases. The remaining five cases localization has only been possible either to the parish or village level. The 25 events identified can be compared to the number of rockfall events identified in this study; zero. Previous attempts at creating a similar historical landslide database (e.g. Sundborg & Norrman 1963, Hultén et al. 2006) have only yielded three landslide events in the 18th century, and likewise no rockfalls.

To illustrate the level of geotechnical detail sometimes provided in the historical material, a contemporary report of the 1785 Västerhed landslide (depicted cartographically in figure 1) will be presented in translation below:

“Among events that deserve the Public's attention and examination is undeniably the following: during the night between the 3rd and 4th of last December occurred, 1/2 [Scandinavian] mile from the city near Utby, on an outland there known as Västerhed, which now is said to belong to the city, an unusually large Landslip, which more resembles an earthquake; over 3 to 400 fathoms [534 to 712 meters] has it extended its length, and over 50 fathoms [89 meters] in width, and it appears, as if the coming spring flood will cause more to collapse, if not the Highest prevents the fall. Great tower of Clay, which appear like Pyramids of 10 to 12 per row, are found between mounds of cast-up turf and pieces of earth, and a large boulder which several Horses could not move, has been moved some 100 ells [59.3 meters] down with the soil.

The place otherwise looks like a deserted and burnt Village. God be praised! that no person or creature was then harmed. May the Lord keep such disastrous events away from our city and country” (Anonymous 1786).

5 HUMAN IMPACTS

Petrucci (2013) has, raised that it may be problematic to assess the damage caused by historical landslide events, but that it can certainly be attempted with some reliability. Although no full synthesis of the human impacts of landslides in 18th century Western Sweden can be made at the present, it has been possible to gain a preliminary overview of the various types of very direct and immediate effects that landslides had on local communities.

Throughout all currently known landslide events only three are known to have caused fatalities, namely those documented in parish church funeral records. The nature of this source material means that basic data is missing in all three cases, whether it be exact dates or exact location. Here is presented what little data is available. Firstly the man Sven Ahlman from Båljen in Hålanda Parish was killed by a landslide at an unknown date in 1753, being buried on 14 February (Hålanda kyrkoarkiv). Secondly the 36-year old sailor Måns, the son of Olof, was killed at an unknown location in Naglum Parish by a landslide on 13 September 1767 (Vassända-Naglum kyrkoarkiv). Finally the 27-year old man Anders from Västbjörke, the son of Andreas Andersson and Maja Persdotter, is recorded as having been killed by a landslide on 8 December 1774 (Norra Björke kyrkoarkiv). As neither of these landslides are known from other sources, and have not been possible to locate in the field, they would appear to have been fairly small-scale events, albeit with a human cost.

With the exception of the three recorded fatalities described above, it is also rare to find landslides that have directly impacted settlements. They do however exist. For example, in March 1775, at an unknown location somewhere south of Åkerström along the Göta älv in Hjærtum Parish, a landslide devastated a pauper's cottage. The newspaper report on this describes that the elderly couple living in the cottage survived only because they had awoken early to attend Sunday services in church, their few belongings being almost completely destroyed (Anonymous 1775).

There are several examples of rural infrastructure being impacted by landslides. For example, after the Gunnilse landslide that took place on 16 September 1730, the Lärjeån river was blocked off, leading to it being flooded many kilometers upriver. This flooding is cartographically recorded as having destroyed the bridge leading between the Gunnilse and Gunnared villages, a bridge used by the farmers to move cattle across the river, and many wooden fences that delineated the boundaries between neighboring villages (Lantmäteriet 1731).

Finally, the by far most common human impact of the landslides was the destruction of valuable agricultural assets. This ranges from the urban to the rural. One small-scale example of the prior comes from 11 June 1782 in the town of Uddevalla, where a landslide measuring no more than 10.5 m² (113 sq ft) saw an urban garden fall into the Bäveån river (Anonymous 1782). A far more drastic example is the landslide which occurred in Hulatorp by the Viskan river in Berghem Parish during the night between 4 and 5 March 1778, which destroyed an entire plowed field, damaged two more, and laid waste to a significant amount of livestock pasture, at reportedly high economic loss for the local farmers (Anonymous 1778).

1712/5/1	Hulatorp	Berghem
1724/12/30	Gunnarsby	Skredsvik
1730/9/16	Gunnilse	Angered
1730/-/-	Heden	St. Peder
1730/-/-	Heden	St. Peder
1731/-/-	Heden	St. Peder
1732/-/-	Heden	St. Peder
1733/-/-	Heden	St. Peder
1733/-/-	Heden	St. Peder
1733/-/-	Heden	St. Peder
1733/3/1	Ballabo	Västerlanda
1734/-/-	Heden	St. Peder
1737/12/-	Majoreberg	Herrestad
1750/-/-	Ödegärdet	Västerlanda
1753/2/-	Båljen	Hålanda
1759/12/21	Bondeström	Hjärtum
1767/9/13		Naglum
1774/12/8	Västbjörke	Norra Björke
1775/3/-		Hjärtum
1778/3/4	Hulatorp	Berghem
1782/6/11	Uddevalla	Uddevalla
1784/5/17	Anfasteröd	Ljung
1785/12/3	Västerhed	Gothenburg

6 CONCLUSIONS

This preliminary study has shown the great potential of using the available digitized archives, both in terms of newspapers, cadastral maps and parish records, to acquire data regarding historical landslide events in Sweden. 25 separate such events, the majority of which have been exactly localized, is for the 18th century a significant number. Although many more such events can likely be identified in the future by combing through less accessible materials, this represents a strong first step towards a better understanding of the region and its geological history, with possible usage in landslide management. In the final stages of this research project more detailed analysis of the available data will be carried out, focusing not solely on the 18th century but instead a larger timespan across the second millennium AD.

7 TABLE

Table 1. Preliminary landslide inventory

Date	Site	Parish
1703/9/15	Ålstad	Rommele
1708/3/-		Berghem

8 FIGURES



Figure 1. 1786 map of a rotational landslide that occurred at Västerhed, just north-east of Gothenburg, during the night between 3 and 4 December 1785 (Liedin 1786).

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