Mapping the unknown
Depth soundings of Swiss lakes in the 19th century

ICA Commission History of Cartography
Utrecht Workshop Controlling the waters
Martin Rickenbacher

Overview

• Some statistics: Switzerland and its lakes
• From the first unofficial soundings …
• … to the soundings for cantonal maps …
• … and to the systematic sounding for the Topographical Atlas of Switzerland
• Conclusions
• And today?
Some statistics Switzerland and its lakes

28 Swiss lakes bigger than 1 km²

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Profil des Sees und Terreins von Ansoldingen

«nivellirt im May 1771»
Johann Jakob Brenner (1711/12–1775)
Scale 1:1200
115 x 37 cm

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Plan von Ansoldingen und der beýden Seen daselbst

1771
1:3000
75 x 73

5 + 2 = 7 profiles with totally 45 soundings
Surface $0.38 + 0.14 \rightarrow 0.52 \text{ km}^2 \rightarrow 87 \text{ soundings per km}^2$
Underwater topography not indicated (only the soundings)
Maximum depth: 63 / 47 Bernese feet
(18.5 / 13.8 metres / NM25 15 / 14 m)
Motivation of the surveyor (Johann Jakob Brenner) unknown
No evidence neither in the Council’s manuals …
… nor in the documents of the Economic Society of Berne
Test area for a bigger project: the sounding of the Thuner See
zu Grunde gelegt Aö 1771 durch Joh: Jac: Brenner Basileensis»
210 x 72 cm
Scale 1:5000
Unfinished (blank description fields)

Longitudinal section: 55 soundings (18.5 km → every 340 m)
4 cross sections: 45 soundings (6 + 11 + 16 + 12)
Short profiles / single points: 51 soundings (18 + 33)
151 soundings on 47.74 km² → 3.2 soundings/km²
Maximum depth: 121½ «Berner Klafter zu 6 Schuhe» (213 m)
Horace Bénédict de Saussure (1740–1799)
Voyages dans les Alpes I, Neuchâtel, 1779

11 depth indications (5 of them not to be localized)

Maximum depth 950 pieds du Roi $\rightarrow$ 308 m (310 m)
Carte des principales sondes du lac léman

Carte du fond des lacs de Neuchâtel et de Morat
Carte du fond des lacs de Neuchâtel et de Morat

Lake ground represented by hachures
Underwater topography named
20+5 profiles and 20+7 single depths \(\rightarrow\) approx. 1100 soundings
Carte du fond des lacs de Neuchâtel et de Morat

1859

Carta della profondità del Ceresio
Carta della profondità del Ceresio

With text information on the dimensions of the lake of Lugano, its hydrological connections, height information, dangerous winds and the depth

Carta della profondità del Ceresio

1859
ICA Workshop Utrecht
12.07.2019

Carte topographique du Canton de Genève
1837–1838
1:25000
soundings and «filage»

Topographische Karte der Schweiz 1:100000
Only «filage» and height of the water surface
Topographische Karte des Kantons Zürich

«Wild-Karte»
1:25000
1210 soundings in the Zürichsee
Sounding machine constructed by engineer Zuppiger
1853–1855
First use of depth lines

Topographische Karte des Kantons Zürich

Hans Heinrich Denzler
(1814–1876)
1853 Pioneer of the first cantonal lake soundings (Zürichsee)
1854–1862 First engineer at the topographic survey of the Canton Berne
1862–1866 Director of the Topographical office of Berne
1866–1873 Director of the cadastre of the Canton Solothurn
Topographic survey of the Canton Berne
Journey through time

Topographic Atlas of Switzerland

Philipp Charles Gosset
1838–1911
First engineer of the Federal topographical office charged with the soundings of lakes
Instruction for the depth soundings of the lakes
Manuscript by H.H. Denzler
Experiences gained with cantonal projects were applied on the federal level

Manuscript map 1:25000 of the Lac Léman with the altitude of the sounded points. The contour lines were gained afterwards by interpolation to represent the underwater topography. The soundings 308, 309 and 311 indicate a cone, which was not confirmed a dozen of years later with the following soundings executed by engineer Hörmann.
Gosset’s sounding of the frozen Oeschinensee on March 25, 1874

Until 1901: Results of Gosset’s survey

1901: New survey by Dr. Max Groll published in 1902 (Text 1903/1904)
Topographic Atlas of Switzerland

Jakob Hörnlimann
1846–1933
1876–1921 engineer topographer at the Federal topographical office
He is the «hero» in sounding the Swiss lakes for the Topographic Atlas of Switzerland

Table of the soundings of Swiss lakes for the Topographic Atlas

More than 27’100 soundings from 1880 – 1900
1st problem: exact position of the boat
Solution: plane table / optical distance measure


**2nd problem: altitude of the sea level**
Solution: hydrographical observations

**3rd problem: sounding of the depth**
Solution: sounding machine
Topographic Atlas of Switzerland

Sounding machine Type E. Belloc / J. Le Blanc

Topographic Atlas of Switzerland

Historische Instrumentensammlung, Inv. Nr. 3100
**Mapping the unknown**

«Dans la carte terrestre, [...] les courbes sont dessinées en présence du terrain. Dans la carte hydrographique l’on ne voit pas le terrain; le coup de sonde tombe en aveugle, [...] les courbes horizontales sont tracées au juger, dans le réseau des coups de sonde. Aussi, pour l’établissement d’une carte hydrographique exacte, faut-il multiplier indéfiniment les sondages.»

François Auguste Forel (1841 – 1912)

In the terrestrial map, the curves are [...] drawn in the presence of the terrain. In the hydrographic map you do not see the terrain; the probe stroke falls blind, [...] the horizontal curves are traced to judge, in the network of the soundings. Also, for the establishment of an accurate hydrographic map, it is necessary to multiply indefinitely the polls.

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**And today?**

[Image of a map]
Thank you very much for your attention!

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