Outline

**Silenced rapids and waterfalls – bypassed reaches in Swedish regulated rivers**

Vi visar registret och diskuterar brist på strömhabitat och konnektivitet. Visar hur lite miljöåtgärder som finns (minimitappningar, data från Åtgärder i Vatten) etc. Satsa på Ambio med flashiga bilder.

**Introduction**

* Majority of river systems globally are fragmented and regulated by dams
* Dams imply damming upstream areas (river reaches, lakes and former terrestrial areas), and reaches downstream are often bypassed as flow pass through tunnels and canals to hydropower stations
* Bypassed reaches with reduced or no discharge are common
* Led to degraded ecosystems with reduced ecosystem functions and biodiversity losses
* Often former rapids, an ecosystem type that has both become rare and degraded. Example
* Insufficient knowledge of relationship between flow parameters and ecology in bypassed reaches
* Needs for ecological rehabilitation and restoration of streams and rivers
* Aims:
* Questions

**Methods**

*Building of the database*

* Identifying bypassed reaches. Data from SMHI, County Administrations and Water authorities.
* Characteristics of the reaches
* Flow data
* Data reviewed by representatives from county administrations
* Collated biological data

*Data analysis*

* Description of data analyses made, see below

**Results**

*Descriptive statistics of bypassed reaches*: mean, medians, ranges, histograms of variables

Number of bypassed reaches

Length

Fall height

Slope (longitudinal)

Mean annual discharge based on run-off

*Geography*

Map of Sweden with all reaches. Size of markers representing natural discharge and/or length of reach

Geographic distribution: frequency per county, vattendragsregion and ecoregions (of some version)

Altitude

Catchment area upstream of reach

Catchment area of main catchment (huvudavrinningsområrde)

Position in the catchment: Horton’s order; stream order; relative stream order (stream order of reach/stream order at catchment mouth), catchment area of reach/catchment area of entire catchment

*Hydrological variables*

Proportion of reaches with minimum flow release

Magnitude of minimum flow release

Flow from tributaries: presence/absence, magnitude of flow in relation to natural discharge

Presence/absence of flow in relation to geographic and descriptive variables

Magnitude of flow release in relation to geographic and descriptive variables

Frequency and magnitude of large spill events (for subset of reaches)

*Biological data*

Proportion of reaches with fish data

Proportion of reaches with macroevertebrate data

Relationships between presence of biological data and geographic and descriptive variables

Correlation matrix

NMDS

**Discussion**

* Where is minimum flow release missing?
* Opportunities and limitations for ecological rehabilitation of bypassed reaches: Cases where flow release will have large impacts on hydropower production, needs for structural modification of the channel,
* Need for more knowledge
* Recommendations for ecological rehabilitation