Using historical fish market data (1880 - 1914) to reconstruct fish composition changes of the Austrian Danube at the turn from the 19th to the 20th century

L'apport des statistiques des marchés au poisson de Vienne (1880-1914) dans la reconstitution des évolutions des peuplements piscicoles du Danube au tournant du XXème siècle

Gertrud Haidvogl[1], Christina Gruber[1] & Didier Pont [2]

[1] Inst. of Hydrobiology & Aquatic Ecosystem Management, University of Natural Resources & Life Sciences Vienna (BOKU), Max-Emanuelstraße 17, 1180 Vienna, Austria (corresponding author: Gertrud.haidvogl@boku.ac.at);
[2] Irstea, UR HBAN, 1 rue Pierre-Gilles de Gennes – CS 10030, FR-92761 Antony, France.

RÉSUMÉ

La connaissance des communautés piscicoles historiques est à même de faciliter la compréhension des conditions écologiques actuelles dans les cours d'eau. Bien qu'il ne soit pas envisageable de restaurer des situations passées du fait des modifications irréversibles des bassins versants (climat, débits solides…), la reconstitution de l'évolution des paysages fluviaux peut néanmoins faciliter l'évaluation et la restauration des systèmes fluviaux.
Dans ce domaine, l'une des difficultés essentielles pour les études historiques s'intéressant à la période de la fin du XIXème siècle réside dans l'absence de campagnes d'échantillonnage visant à décrire exhaustivement les peuplements piscicoles. Identifier les sources disponibles et tester leurs aptitudes à décrire les communautés piscicoles prévalant à cette époque est une tâche centrale en écologie historique.
Cette communication analyse les potentialités des informations contenues dans les statistiques du marché aux poissons de Vienne (1880-1914) pour décrire les évolutions intervenues dans les communautés piscicoles du Danube autrichien à la suite des opérations de chenalisation du cours d'eau. La comparaison des captures avant, pendant et après ces grands travaux met en évidence des modifications significatives de la pêcherie.

ABSTRACT

Knowledge about historical fish communities of rivers can provide valuable insights into ecological changes and present conditions. Reconstructing the long-term evolution of riverine landscapes can also help defining baselines for assessment and restoration although it has to be taken into account that it is hardly possible to return to a previous state because environmental factors such as bed-load input or climate and thus hydrology have changed.
One of the main difficulties for historical investigations is the absence of systematic fish ecological surveys which have been often started only in the second half of the 20th century. Identifying appropriate sources and testing their potential and limits is thus an indispensable task in historical ecology.
This contribution analysis the potential of Viennese fish market data from 1880-1914 to reflect the fish ecological conditions of the Austrian Danube at the end of the 19th and beginning of the 20th century. During this time the first systematic channelization of the river was accomplished. Our analyses showed that the species composition of fish delivered to the fish market was influence by channelization measures with a high significance.

KEYWORDS

Austrian Danube, fish market data, historical ecology, historical fish communities, Vienna

1 BACKGROUND

In the second half of the 19th and in the early 20th century systematic and large scale channelization measures were realised on the Austrian Danube. They mainly improved navigation, but in some sections, for instance in Vienna, also flood protection dikes were built. As a consequence habitat conditions were fundamentally modified. Contemporaneous fisheries management journals reported regularly that a decline of fish stocks and a change of the fish communities followed.

Systematic investigations of riverine fish populations were not done in Austria before the 1970s and historical records from fisheries are very scarce and sporadic. Therefore it is difficult to determine the alteration of fish communities based on sampled data. At the same time there is a wealth of historical records from societal activities that relate to fish trade and fish consumption.

The aim of this contribution is to investigate if historical fish market data can provide information about regional changes in rivers and their fish communities. Our case study focused on the Austrian Danube and the Viennese fish market.

2 SOURCES AND METHODS

Our main sources were fish market data from the period 1881 to 1914. The records provide the weight for single species. For most years monthly and annual data are available, for some years only annual data have been kept. The registers comprise the delivery to the central Viennese fish market and later also the delivery to “Nordsee”. This company which was founded in Germany in April 1896 opened shops in Vienna in November 1899. It was the most important trader of marine fish to Vienna.

In order to identify the provenance of fish we consulted different historical documents. Based on this information we selected 15 potential Danube fish. Comparing the monthly delivery data with closed seasons for fishing as determined in the fishing laws from Lower and Upper Austria confirmed this pre-selection but also the fact that especially larger quantities of pike-perch or catfish had probably other origins. Further, it can be assumed that also Danube Salmon was traded from tributaries in addition to catches from the Danube.

To investigate morphological changes in the Austrian Danube during our study period we digitized the increase of water engineering structures, the disconnection of floodplain water bodies and the change in river width between 1880 and 1914 for the four main Austrian Danube basins in Eferding, Machland, Tulln and Vienna.

In order to test if changes in the fish species composition delivered to the fish market can be linked to channelization measures and subsequent habitat changes we did a canonical correspondence analysis.

3 RESULTS

In the 35 years considered 65 different fish species were brought to the Viennese central fish market, among them 27 freshwater species, 7 migratory species such as salmon or sturgeon and 31 marine species. The total delivery amounted to about 600 tons in 1881. By the 1910s this number had increased to some 2.200 tons. This growth was mainly because of the import of marine fish after 1900. During the whole period carp had by far the biggest share (44 %) but it was traditionally imported as farmed fish for instance from Bohemia and eaten especially during lent seasons and at Christmas. Marine fish contributed 35 % and potential Austrian Danube fish roughly 10 %. More than 7 % of fish were pike-perch which was brought to the market not only from the Danube but also from further distances. The rest were salmonid fish from tributaries (mainly brown trout and charr) which do at least not occur in larger quantities in the Danube, typical lake fish or non-Danube diadromous fish such as river lampreys, shads or European sturgeon.

In the beginning of the 1880s more than 200 tons of potential Danube fish were supplied to the fish market per year. By the end of our study period this value declined to about 60 tons per year. Looking at single species different patterns can be identified regardless if they were brought in large quantities such as crucian carp, tench, bream or “whitefish” (i.e. cyprinid fish in general but mainly nase) or if

only small amounts were delivered as it was the case in particular for the Danube Salmon. Some species were supplied especially in the first years, for instance pike, crucian carp and Danube Salmon, while others were more frequent in the second period such as the barbel or cyprinid fish in general among we can assume large quantities of nase as one of the most common Danube river cyprinids. A third group of fish showed varying amounts during the years without clear pattern of in- or decrease.

The correspondence analysis allowed detecting changes in the composition of fish species by finding patterns and correlations between the years. A first period lasting from 1881 to 1887 was characterized by the dominance of crucian carp and pike as typical floodplain species. The year 1890 was particular with large amounts of perch. A second period can be identified from 1891 to 1905 with the gradual disappearance of Danube Salmon, a sharp decline of crucian carp and pike as well as larger amounts of ide and zope in specific years. During the last period from 1906 to 1914 chub and pike-perch dominated whereas the latter was mainly brought from other places and only for a part from the Danube. The analysis demonstrated also that river engineering works influenced the composition of potential Danube fish at the Viennese fish market with a high significance. This was in particular true during the last ten years of our study period.

4 CONCLUSION

Our analysis proved that fish market data show ecological changes of regional river habitats. During 1881 and 1914 the amounts and composition of Danube fish delivered to the Viennese fish market shifted from typical floodplain water species to indifferent or farmed fish or to fish which were traded from further distances. Species composition and weights were significantly influenced by river channelization. The latter resulted in a disconnection and a decrease of floodplain water bodies as typical habitats of e.g. pike or crucian carp. In principle the water engineering measures may have altered also fishing practices because the disconnection of floodplain waters from the main channel could have prevented the easy access to such fishing places. However, while one finds numerous complaints about the decline of fish populations in fisheries journals there are no reports about the need to modify fishing practices.

Looking at the fish market data on the whole reveals in addition profound societal changes. The total amounts of fish traded at the market tripled in our study period because of the import of marine fish. This became possible only due to new transport means. For Vienna as continental metropolis mainly the establishment and improvement of railway transport was relevant. Only these new transport options enabled giving up local fish as food resources and shifting from multiple river uses which included local fisheries to the preference and promotion of very particular uses. As for many European rivers this was at the end of the 19th century also for the Austrian Danube the development of the river as navigation route.

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