

# SwissCollNet - Call for proposals 2021

## Project description

<b>Project title</b>
Making visible: the reconditioning of the herbaria of Schaffhausen
<b>Main applicant information</b>
Dr Urs Weibel
Museum zu Allerheiligen, Schaffhausen
<b>Project description</b>

## Background

Description – to be removed from final proposal Beschreibung - ist aus dem endgültigen Vorschlag zu entfernen Description - à retirer du texte final
<i>Describe the initial situation that led to the project: what is the context in which your project takes place (in general such as in the collection landscape, in your institution(s), your needs, ...)</i>
<b>Hintergrund</b> <i>Beschreiben Sie die Ausgangssituation, die zu dem Projekt geführt hat: in welchem Kontext findet Ihr Projekt statt (allgemein, z. B. in der Sammlungslandschaft, in Ihrer(n) Institution(en), Ihre Bedürfnisse, ...)</i>

Making visible: this project aims to make the unique collection of herbaria in the Museum zu Allerheiligen Schaffhausen visible - through digitisation, revision and georeferencing, through facilitating and enhancing research and through events for the general public. The flora and vegetation of Schaffhausen is very diverse due to the natural conditions and the resulting diversity of habitats and land uses. It has fascinated generations of botanists and was one of the best studied in Switzerland between 1850 and 1980 (Becherer 1972). The study of Schaffhausen's Flora started with J.C. Laffon 1820 (first herbarium and first flora of Schaffhausen), and continued later on with the collections and regional floras of F. Merklein and J. Meister (both around 1885), E. Kelhofer (around 1915), G. Kummer (around 1940) and K. Isler-Hübscher (around 1980) (Klecak et al., 1997). All together represent a long time series of floral data. The biggest share of these various collections are housed in the Museum zu Allerheiligen, some of these as permanent loan from the Naturforschende Gesellschaft Schaffhausen NGSCH. For these reasons the Museum zu Allerheiligen house an important natural history collection, which is of high patrimonial and historical value for Schaffhausen but also, in addition, of high value for research, e.g. concerning changes of the flora and vegetation of a given region over a long time period. The collections of the Museum zu Allerheiligen (herbarium code: SCH) contain an estimated 40,000 herbarium specimens (580 fascicles), arranged according to the individual collectors. The specimens from 13 herbaria come mainly from the Schaffhausen region (approx. 25,000 specimens, 340 fascicles) and are

documented at least with location details and date of discovery. They cover the period between 1820 (J.C. Laffon) and 1980 (K. Isler-Hübscher). The condition of the different herbaria varies greatly. For example, the specimens of the Laffon herbarium have been completely revised, but they have yet to be mounted. In the case of the "Schaffhausen Herbarium" compiled by Walter Wiederkehr from various collectors, the individual specimens are sufficiently mounted, but not yet revised. All the herbaria stored in Schaffhausen have in common that the specimens have neither been inventoried nor digitised and georeferenced.

Historical herbaria are not only a source of data for questions of systematics or taxonomy, they are also an important source for tracing changes in the flora and vegetation of an area (Lavoie, 2013). Some older herbaria in particular were created in periods for which little data is otherwise available (cf. the data series of Info Flora, which does not go further than to 1930; [www.infoflora.ch](http://www.infoflora.ch)). For example, an evaluation of the Schaffhausen Laffon herbarium shows that at least 154 species, or 15.6% of the species in the canton of Schaffhausen, have become extinct over the last 180 years, with different habitats affected to varying degrees by species loss (Büttner et al., submitted).

## Scope and relevance

As explained above, Schaffhausen was considered one of the floristically best-studied regions of Switzerland (Becherer 1972) and the majority of herbarium specimens from the Schaffhausen region are housed in the Museum zu Allerheiligen, representing a unique time series of floristic data. However, the herbaria on which the Schaffhausen local floras are based have not been digitally indexed to date. The easily available historical floristic data goes maximally back to 1930 ([www.infoflora.ch](http://www.infoflora.ch)) with the bulk of data being much more recent. The last complete distribution maps of the flora of Switzerland (Welten and Sutter 1982) was based on simple occurrence of species in large survey areas. The information was therefore geographically very limited and imprecise. By digitising the herbaria collections of the canton of Schaffhausen in combination with the revision and georeferencing, thanks to the additional 10,000 or so data records, the spatio-temporal distribution of many species, especially rare and endangered ones, will become more precise. The visualisation of these herbarium records documents floral changes, which thus become accessible for scientific evaluations (e.g. changes in biodiversity, in land use climate change and so on; Pyke and Ehrlich 2010). Smaller herbaria often have important research collections of local floras which are not duplicated in larger facilities (Snow 2005). The project therefore aims to make visible the herbarium data by making them digitally available and in addition to establish contact and cooperation with researchers in order to already start first research projects. As a third part, the project aims to make visible the collection and its importance to the general public and political decision makers. Especially local museums are important for the connections with the general public, as these local collections represent the environment and surroundings known to them. We aim to enhance the knowledge of the collection in the general public. Therefore, the digitization project of the SCNAT offers the unique chance to valorise these herbaria collections at the Museum zu Allerheiligen at Schaffhausen and to make visible the collection.

## Detailed project plan

### Objectives

The main goal of the digitisation project of the Schaffhausen herbarium specimens (which will take the most time and financial fundings) is to digitise, inventories and georeference the most important herbarium specimens that were collected in the area of the canton of

Schaffhausen (or in areas close to the border). The main focus lies on the most important herbaria of J.C. Laffon (period 1850-1880, 1250 specimens) and G. Kummer (period 1920-1950, 5500 specimens). The herbaria of Laffon has already been completely revised in recent years. Depending on the progress of the project, the herbarium Samuel Bächtold (period 1900-1965, 6000 specimens), "Gymnasium Schaffhausen" (period 1880-1900, 4100 specimens) and the herbarium "Schaffhausen zusammengestellt von W. Wiederkehr" (period 1900-1940, 2600 specimens) will also be processed. The data sets will become part of the already existing database of the Museum zu Allerheiligen; the newly digitised specimens will be presented online. And, additionally the data will be made available to Info Flora and other institutions (e.g. SVHNC, GBIF). These digitised data form the basis for further evaluations and projects.

A second goal of the project is to interconnect with research institutions and establish research projects, e.g. on floristic changes over the time, given the good time series of the herbaria data in Schaffhausen. Initial contacts and discussions about possible research projects concerning the Schaffhausen herbaria data have already taken place (Dr. Ariel Bergamini, Head of the research group Ecosystem Dynamics, Swiss Federal Research Institute WSL). We strongly intend to start the research project after finishing the digitisation und georeferencing part and thereafter to publish the results in a suitable form (c.f. Büttner et al. submitted). The digitised data can furthermore be used for other evaluations regarding the flora and vegetation of the region and thus changes in biodiversity, from which recommendations for practice (i.e. nature conservation) can be derived.

The third objective is to enhance the interconnection between the society and the collection, by organising a series of events such as guided tours through the herbarium, by showing the digitisation process, by organising excursions and lectures for the general public and by inviting local media to participate (e.g. Schaffhauser Nachrichten); but also by organising lectures for members of the Naturforschenden Gesellschaft Schaffhausen

### Timeline

	2022		2023				2024	
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Re-determination, revision, re-conditioning	x	x	x	x				
Databasing		x	x	x	x	x	x	x
Data analysis,					x	x	x	x
Outreach	x	x	x	x	x	x	x	x

## Methods and equipment

### Implementation plan

In a first step, the existing herbaria were assessed and prioritised in terms of their local relevance, quality and scope (Appendix 1). The work steps required for the project were defined and the time required per work step was determined on the basis of research (Giraud et al., 2018) and empirical values from similar projects. At the same time, the work processes and required technical infrastructure were defined.

For efficient processing, the workflow is defined according to the table below.

The necessary work steps were defined for each herbarium (appendix). The total work volume amounts to about 4110 working hours and is distributed among the individual work steps as follows:

Work step	Description	Execution by	Time required per herbarium specimen (min.)	Total time required (hours)
Re-determination, Revision	Identify the plant species and update the taxonomic name	Research assistant (experienced botanist)	5	458
Mounting	Mounting of the herbarium specimens according to valid standards	Technical staff (high school student, university student)	5	104
Inventory	Transfer the data from the herbarium label to the database (mandatory fields: Inventory number, current designation, original designation, date of discovery, place of discovery, collector, part of the collection, location)	Technical staff (high school student, university student)	6	675
Digitisation	Photographing (possibly scanning) the herbarium voucher and linking it to the database	Technical staff (high school student, university student)	0.5	56
Georeferencing	Determining the location (coordinates, accuracy) and entering it into the database	Technical staff (high school student, university student)	6	675
Check	Checking the database entry, especially the georeferencing	Research assistant (experienced botanist)	2	225
Outreach	Tours in the Herbarium, excursions, preparation	Research assistant, Project leader		60

The total volume of work corresponds to an annual working time of almost 90%, of which almost 15% are scientific staff and 75% are technical staff. This requires a project manager who, among other things, plans the work process, recruits and trains the staff, answers questions and monitors the quality of the work (15%).

Successful project work requires not only a sufficient number of good employees but also a clearly structured workflow of the individual work steps and a well thought-out work plan so that there are no empty or congested phases.

The work takes place in the collection rooms of the nature department of the Museum zu Allerheiligen on the top floor of the Kammgarn building. Directly adjacent to the herbarium room, the photo line and the workstations for the respective work steps are to be set up in the project or archive room.

### Equipment

A multifunctional archive scanner from "Walter Nagel" will be purchased for the efficient digitisation of the herbarium specimens. Existing components (repro station, camera) will be

used for this purpose. The new acquisition makes sense from the museum's point of view, as various other museum objects (including archival documents, glass slides, rocks) can be recorded in addition to other herbarium specimens.

The Museum zu Allerheiligen's database "Museum-plus RIA" (©zetcom Bern) is web-based, but not yet publicly accessible. In addition, it lacks a link to a georeferenced information system. Therefore, the location information is recorded in QGIS and imported into the museum database.

### **Digitization process**

*The digitization process is planned as follows:*

- 1. Primary registration: Inventory number, plant species (current determination and original information), finder, place of discovery (original information), date of discovery, determiner. The recording takes place in the Collection Data Management System "MuseumPlus" (© zetcom Berne), which is used in the Museum zu Allerheiligen*
- 2. Photography: Each herbarium voucher is photographed and linked to the inventory number automatically with the record. The new Sensishot (© WalterNagel) is used for this working step.*
- 3. The place of discovery is entered as a coordinate point including the accuracy of the information based on the respective map bases. The assignment is again made via the inventory number. The data input takes place in QGIS (©AGI Schaffhausen).*
- 4. The coordinates including the automatically attached geographical information (height above sea level, canton, municipality, field name) are imported into the museum database "Museum-plus".*

## **Human resources and collaboration**

### **Human resources and collaboration**

The project team consists mainly of two, today already known employees and still to be hired persons as well as supporting persons within the municipal and cantonal administration mainly in the field of database, georeferencing, IT. In addition, there are contacts with research institutes for data analysis and evaluation.

Urs Weibel Museum zu Allerheiligen Schaffhausen	Project Leader	U.W. will supervise the whole project, checking milestones and time schedule and collaborations within the museums and with other administration and research institute.
Michèle Büttner Florafachstelle Schaffhausen Museum zu Allerheiligen Schaffhausen	Research assistant	M.B. will conduct the re-determination and revision, but also supervise and support the technical staff.
NN	Technical assistant	Will conduct the mounting, databasing and georeferencing
Betty Sacher Museum zu Allerheiligen Schaffhausen	Collection Management	B.S. will assist with object handling and database input
Adrian Bringolf	Database assistant	A.B. will assist database inputs

Museum zu Allerheiligen Schaffhausen
-----------------------------------------

### Collaboration

- Amt für Geoinformation des Kantons Schaffhausen, AGI: Romedi Filli
- Swiss Federal Research Institute WSL: Dr. Ariel Bergamini, Head of the Research Group Ecosystem Dynamics, Research Unit Biodiversity and Conservation Biology
- Naturforschende Gesellschaft Schaffhausen; and Botanical Group of the Naturforschenden Gesellschaft Schaffhausen
- Regionale Flora-Fachstelle Schaffhausen
- Info Flora, Bern

### Impact

By thinking and planning digitisation, georeferencing, research and education together, we expect the project to have the following impacts (besides the ones mentioned above): The digitised data will of course be made available to Info Flora and, if necessary, to other institutions. The aim is for this collection to go online as the first tranche of the collections of the Museum zu Allerheiligen, the access to data will therefore be improved. Since the data is collected with the same GIS application used by the cantonal nature conservation office, among others, the data can be made available to the nature conservation authorities and therefore be used in nature conservation applications. In general the data made public will be nationwide interoperable, thus the research facilitated.

In a further step, the digitising the remaining specimens of Schaffhausen in the Museum collection (such as the collections S. Bächtold, Kantonsschule and W. Wiederkehr) can be tackled in a similar way by using the current project as flagship project to apply for fundings at various foundations. Furthermore the Schaffhausen specimens stored in the herbaria of other institutions (especially herbaria Z and ZT) could also be digitised. Likewise, published finds and data still undiscovered in notebooks can be recorded. Schaffhausen was considered one of the best botanically studied regions in Switzerland. The processing of historical data allows various evaluation on floristic change (including agricultural and forestry use, biodiversity, climate change). The digitization of the historical herbarium specimens lays the foundation for a possible update of the Schaffhausen flora.

As Lavoie (2013) points out, only few herbaria worldwide have been used for carrying out assessments of floristic change across time. With the research collaboration started and established during the project, we hope that further parts of the nature collection of the Museum zu Allerheiligen will be explored and that the research being published will show more detailed what existing nature collections can be used for.

By doing guided tours, excursions and lectures we expect an anchorage of the nature collection in the society of Schaffhausen, a deepened appreciation of such collections and an enhanced connection between people, nature and nature collections.

### **Data availability**

*It is a declared aim of the digitization project of the Museum zu Allerheiligen Schaffhausen to make the digitized and georeferenced data (including photographs of herbarium specimens) of the collections Laffon and Kummer visible and publicly available. This will be done via the following platforms:*

*1) The Museum database MuseumPlus has been in use at the Museum zu Allerheiligen for almost 20 years. Two years ago, a fundamental revision took place and the input masks for biological data (including herbaria) were created in consultation with InfoSpecies (e.g. Info*

*Flora and info fauna) to align the required data standards. This allows data exchange with national databases.*

*Although the Museum-Plus database is web-based, the museum collections are not yet publicly accessible. However, it is the museum's goal to make parts of the collection visible online. This is based on a corresponding digitization concept, which has been taken note of by the political decision-makers. Parts of the art collection owned by external foundations are already or will soon be online (<https://www.peyersche-tobias-stimmer-stiftung.ch/.html>). The present, approved digitization project forces the museum to make a targeted effort here in the coming months. The costs incurred will be generated from the current museum budget or from third-party funds and are not part of the submitted project. (Another option is to collaborate with the AGI and to use the existing "Geoportal" on sh.ch to make the data publicly accessible.)*

*2) Furthermore, the georeferenced data will be exported from the database (e.g. xlsx file) and transmitted to Info Flora; consultation together with Info Flora has already taken place; discussion about further details are needed and will take place in the course of the project. The transfer of the data corresponds to the same procedure as the around 20,000 data sets, that have already been transmitted in recent years, in these cases primarily entomological data (Collection F. Ris, E. Vogelsanger). Today, these are freely accessible, for example, at InfoSpecies.*

*3) By transferring the data to Info Flora, they will be made also available to GBIF via Info Flora.*

*4) The Museum zu Allerheiligen MzA is interested, to make the herbarium data available on a national platform such as SVNHC. The museum is therefore in contact with the persons in charge and will implement the necessary steps as soon as the platform and its requirements are known and ready for the import of data.*

### ***Use of data and outreach***

*On the one hand, the digitized data will be of use in nature conservation. They allow the identification of botanically valuable areas and the targeted search for special plant species as, for example, a basis for species promotion concepts. In the course of the following years, further local herbaria will be digitized in order to continuously improve the data basis. Historical data from the literature are already being used intensively in nature conservation in Schaffhausen (personal communication of the Regionale Flora-Fachstelle Schaffhausen); digitized herbarium data will complete the important knowledge on plant species occurrences.*

*On the other hand, by digitizing the two important regional collections and by making them publicly available the data can be used for scientific evaluations. The evaluations of the Laffon herbarium already available show a loss of around 16% of the plant species in 150 years. This corresponds to one species per year averaged over time. With the integration of the Kummer herbarium, which lies between the Laffon herbarium and today, the dynamics of change and the causes can be determined more precisely. These evaluations are carried out together with scientific partners; corresponding project designs have already been made with Ariel Bergamini, WSL, (April 2022). The resulting scientific article will be compiled and submitted following the project. (s. Büttner et al., submitted). The idea is to offer bachelor's and master's theses on this topic. For this purpose, further sources (herbaria, literature) are to be evaluated and supplemented with field recordings.*

*The following public events and publications are planned:*

*2022: Media conference on the project launch together with Council of States member Hannes Germann; Participation in the National Natural Science Collections Day with guided tours of the collections with focus on the digitization project; Article on the value of natural*

science collections for practical nature conservation in NL-Insight; Participation in "Bauhinia 400" (postersession, planned to submit, June 2022); Publication of the now accepted article on the local changes in the flora of Schaffhausen based on the evaluations of the herbarium of J.C. Laffon

2023: Presentation and guided tour of the herbarium of J.C. Laffon; Presentation and guided tour of the herbarium of G. Kummer; Participation and project presentation in the "Tage der Naturwissenschaften" organised by the Naturforschende Gesellschaft Schaffhausen; different activities together with the Botanical

Group Schaffhausen (e.g. revisitations of plant locations of digitized herbarium specimens).

2024: Public presentation at the end of the project and summary of the results in the "Mitteilungen der Naturforschenden Gesellschaft Schaffhausen"

## Outlook

In a further step, the remaining specimens in the Museum collection and the Schaffhausen specimens stored in the herbaria of other institutions (especially herbaria Z and ZT) could also be digitised. Likewise, published finds and data still undiscovered in notebooks can be recorded. Schaffhausen was considered one of the best botanically studied regions in Switzerland. The processing of historical data allows various evaluation on floristic change (including agricultural and forestry use, climate). The digitization of the historical herbarium specimens lays the foundation for an update of the Schaffhausen flora.

Likewise, other herbaria in the collections of the Museum zu Allerheiligen (e.g. collections on the flora of the Mediterranean region) should be digitised using the identical procedure.

## Figures & tables (optional)

Herbarium	Zeitraum	Region			Bezeichnung	Anzahl Fragikel	Anzahl Belege	Zustand	Bedarf	Revisieren (5 Min)	Montage (7 Min)	Inventarisierung (7 Min)	Digitalisierung (3 Min)	Georeferenzierung (7 Min)	Kontrolle (2 Min)	zeitl. Aufwand für Revisieren (Std)	zeitl. Aufwand für Montage (Std)	zeitl. Aufwand für Inventarisierung (Std)	zeitl. Aufwand für Digitalisierung (Std)	zeitl. Aufwand für Georeferenzierung (Std)	zeitl. Aufwand für Kontrolle (Std)	zeitl. Aufwand (Std)	Priorität
		SH	CH	EU (inkl. MH)																			
Johann Conrad Laffon	1850-1880	x				15	1250	revidiert M. Büttner 2019	0	1	1	1	1	1	0	146	146	10	146	42	490	1	
Johann Conrad Laffon Moosherbar	1840-1880	x	x	x		1	500	CH-Material revidiert um	1	0	1	1	1	1	42	0	58	4	58	17	179	1	
Gymnasium Schaffhausen	1880-1900	x	x		Region SH und CH	82	4100		1	1	1	1	1	1	342	478	478	34	478	137	1'948	1	
Dr. Bühler	1900	x	x			2	400		1	1	1	1	1	1	33	47	47	3	47	13	190	1	
unbekannt	1900	x				2	300		1	1	1	1	1	1	25	35	35	3	35	10	143	1	
Herbar Schaffhausen (Zusammenzug W. Wiederkehr)	1900-1940	x			Schaffhausen	35	2600		1	0	1	1	1	1	217	0	303	22	303	87	932	1	
Fritz Specht	1920	x				1	180		1	0	1	1	1	1	15	0	21	2	21	6	65	1	
Karl Isler-Hübscher	1950-1980	x	x			1	50		1	1	1	1	1	1	4	6	6	0	6	2	24	1	
Samuel Bächtold	1900-1965	x	x			67	6000		0	0	1	1	1	1	0	0	700	50	700	200	1'650	1	
Georg Kummer Herbar Flora Schaffhausen	1920-1950	x				90	5500		1	0	1	1	1	1	458	0	642	46	642	183	1'971	1	
Florula Schaffusiensis	1890	x				2	100		0	0	0	1	1	1	0	0	0	0	12	3	15	1	
Kryptogamen J.J. Vetter, Kelhofer, Kummer et al.	1850-1900	x	x			3	250		1	1	1	1	1	1	21	29	29	2	29	8	119	1	
Sulger-Büehl, Stein am Rhein	1920	x				1	40		1	0	1	1	1	1	3	0	5	0	5	1	14	1	
Jakob Hübscher	1900-1930	x				2	120		1	1	1	1	1	1	10	14	14	1	14	4	57	1	
Hans Wieland	1890-1920	x	x			2	150		1	1	1	1	1	1	19	18	18	1	18	5	71	1	

Fig. 1: Compilation of the herbaria with Schaffhausen specimens in the Museum zu Allerheiligen. Among others, the Kummer and Bächtold herbaria are in the possession of the Naturforschende Gesellschaft Schaffhausen NGSCH and are on permanent loan to the museum.

## References (mandatory)

Becherer, A. (1972): Führer durch die Flora der Schweiz mit Berücksichtigung der Grenzgebiete. Schwabe, Basel.



- Büttner, M., U. Weibel, M. Jutzi, R. Holderegger (submitted): A 200-year-old herbarium testifies regional species decline.
- Giraud, M., Q. Groom, A. Bogaerts, S. de Smedt, M. Dillen, H. Saaenmaa, N. Wijkamp, S. Philips, S. van der Mije, A. Wijers, Z. Wu (2018): Best practice guidelines for imaging of herbarium specimens. Icedig.eu (doi.org/10.5281/zenodo.3524263)
- Klecak, G., T. Wohlgemuth, J.J. Schneller (1997): Regionale Florenwerke und ihre Bedeutung für die Rekonstruktion räumlicher und zeitlicher Dynamik seltener Pflanzenarten. *Botanica Helvetica*, 107/2, 239-262.
- Lauber, K., Wagner, G., Gygax, A. 2018. *Flora Helvetica*. Haupt, Bern.
- Lavoie, C., 2013. Biological collections in an ever-changing world: herbaria as tools for biogeographical and environmental studies. *Perspectives in Plant Ecology, Evolution and Systematics* 15, 68-76. <https://doi.org/10.1016/j.ppees.2012.10.002>
- Pyke, G H, Ehrlich P. 2010. Biological collections and ecological/environmental research: a review, some observations and a look to the future. *Biological Reviews* 85:247-266.
- Snow, N. 2005. Successfully Curating Smaller Herbaria and Natural History Collections in Academic Settings. *BioScience* 55(9):771-7791