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Author(s): Grenda, M.

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Remedial conservation of a severely deteriorated 19th century bound herbarium

Magdalena Grenda

Warsaw Rising Museum, Ul. Grzybowska 79
00-844 Warsaw, Poland

Email: grenda.magdalena@gmail.com

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Abstract

In 2012 the Rev. Krzysztof Kluk Museum of Agriculture in Ciechanowiec, Poland, sent their 19th century herbarium for conservation treatment. The condition of the object was so poor that it could not be subjected to any analysis or even digital documentation. The bound herbarium had broken covers, dismantled construction and weakened spongy paper support with a lot of tears and losses. The specimens were either seriously damaged, missing or under serious risk of destruction. Over a half of them had fallen off their places and could be found in the area of the spine, often mixed within pages. The owner wanted the object to be displayable and safe for handling. Close work between the conservators and ethnobotanist was required to ensure a full and complete understanding of the bound herbaria as a whole, but also the individual specimens. Sever treatment was undertaken including many typical paper conservation solutions and re-arrangement of puzzle-like assemblage of specimens based on interdisciplinary consultation. The description of the treatment is a pretext to consider the methodology and standards concerning the care and conservation of botanical material.

Keywords: Herbarium; Specimen; Remedial Conservation; Ethnobotany; Standard; Methodology; Biocultural Collections; Ethics; Ethnobotany

Introduction

This article describes issues concerning conservation treatment of a 19th century bound herbarium from the collection of the Rev. Krzysztof Kluk Museum of Agriculture in Ciechanowiec, Poland. The herbarium was not considered a scientific resource for taxonomists or ethnobotanists but rather a social history object illustrating the workshop of a 19th century pharmaceutist and the usage of medicinal plants. The methodological discussion and consequent conservation treatment aimed at preparing the historic object according to the needs of the owner with regard to possible future uses of the item were carried out to the correct conservation and ethical standards. Particular consideration regarded the applicability of paper conservation techniques to plant material and possible conflict between the contemporary theory of conservation and standards designed for the botanical material.

According to methodological procedure described by Appelbaum (2010), requiring definition and correlation of every concerned factor, the article describes the profile of the custodian, the treated object itself, the condition of the herbarium before treatment, methodological issues, definition of the goal of treatment, the course of treatment and conclusions.

Background to the Museum of Agriculture

The rev. Krzysztof Kluk Museum of Agriculture in Ciechanowiec, was founded in 1962, initiated by the Society of Ciechanowiec Aficionados. The institution is located in the historic park and palace of Starzeński family, dating from the mid-19th century. Consisting of eight departments devoted to Ethnography, Technology of Agriculture, Art and History, Rural Architecture, History of Plant Cultivation, Herbal Traditions, History of Farming and Veterinary Medicine the museum covers a large array of collections.

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The Department of Herbal Traditions was created in 1984, resulting from the large collections from Reverend Krzysztof Kluk, the author of the first important Polish ethnobotanic study (Kluk 1786-1788; Luczaj & Szymañski 2007). It is responsible for caring for the garden growing medicinal plants as well as displays focusing on herbal traditions, partly presented on a permanent basis, the department also held collections. These collections not only include herbaria, but also the unique tools and instruments used to produce and store herbal medicines, pharmacy furniture and all that could create a herbalist workshop.

The object: a 19th century herbarium

The origin of the herbarium is unknown. The previous owner found it in the attic of his grandfathers' house and there was no further information about the collector or it's history. One of the watermarks allowed the bound volume to be dated to after 1816. There was one other mark on the front cover; written in contemporary handwriting the inscription "KLUK" (Fig. 1). It is unlikely to have belonged to the Reverend Krzysztof Kluk himself, as he died in 1796 and the paper support for the specimens was produced 20 years after his death. There was no any further indication that the specimens were collected by this famous ethnobotanist. It appears that somebody wanted either to assign the herbarium to reverend Krzysztof Kluk to make it more valuable by suggestion of his authorship, or to attribute it to the whole institution named after the reverend. It might have been also an act of thoughtless vandalism.

Almost all of the specimens in the herbarium had handwritten captions, though the accuracy and character of the captions were not homogenous. Some of the names were written in Polish, some in Latin, and there were many sheets missing any information. Some species were assigned to a taxonomic group while the other ones would be given a longer description concerning the traditional uses and side effects of the plant.

Condition of the item

The item was in very poor condition before treatment. The herbarium album has 50 unnumbered pages; originally there were 62 pages but twelve sheets must have been cut and only the rabbets remained in the last 3 folds. Although the total number of folds is 17, the number of the pages within one fold is not regular, varying from 3 to 5. On each page there are numbered handwritten names of the plants. The album was bound in half calfskin with corners, leather straps and block-printed paper, but the binding was so ruined that it did not function as a protection for the block of the album. The leather spine was missing, the covers were broken and only half the front cover remained.

The cardboard of the covers was stratified, showing fragmentarily a stack of handwritten notes used as a waste paper to form the boards. The sewing and threads were brittle and torn and the cover paper was heavily degraded, darkened, and weakened by heavy abrasion. Covered with stiff crust of animal glue folds were stiffened and broken. The paper sheets, made of greenish laid paper, were stained and discoloured. The staining was only partially concerned with the direct contact of plants and paper. The paper support was very dirty, spongy, with a lot of tears and losses. The losses were caused not only by abrasion of the edges, but were also the result of the pest activity (larvae holes). Numerous straps of a white laid paper remained on the pages, sometimes partially delaminating from the support, at times without accompanying specimen they were intended to hold. Most of the original colour of the paper faded.

The pressed plant specimens were in a different condition. According to the handwritten descriptions and brown stains in the paper support, that indicated former specimens' locations, there should be from 4 to 9 specimens on each page. Over a half of them had fallen off their places and could be found in the area of the spine, along with dead insects and the original straps of white laid paper that delaminated from the pages. During the treatment and

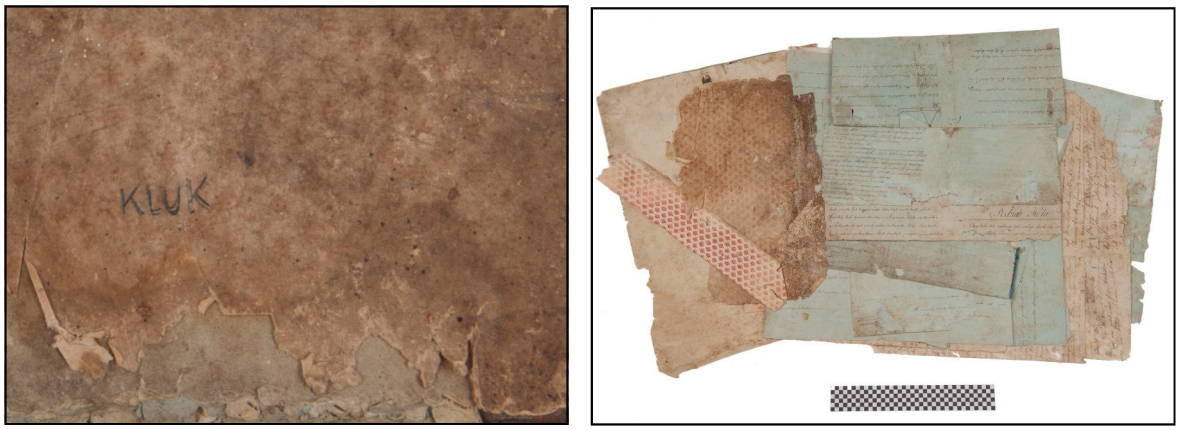

Fig. 1. The front of the bound herbarium (left), with the word 'KLUK' written. Right shows the poor condition of the loose pages.

ethnobotanic analysis the specimens turned out to be often disarrayed within pages. Dislocation and lack of stabilising support caused damages to brittle specimens, ranging from tiny cracks to breakages, losses or crushing. Less than half of specimens remained in their original position. A lot of specimens were missing.

Methodological issues of concern

According to the Standards in the Care of Botanical Collections (2014) any associated written data accompanying a specimen is as important as the specimen itself. A specimen with no data has no scientific value (but does potentially have other uses, such as educational, artistic, and general research). Data provides evidence of where the specimen was found, who found it and when it was collected, and several authors have stressed the importance of specimens with data (e.g. Bedford, 1999; Allaby, 2012; Salick, Konchar & Nesbit, 2014). Research must rely on defined and identifiable species that can be referred to, but how does it apply to items that do not contain complete information of the specimens collection and history? The inevitable question is: are these specimens without data condemned to be treated as a 'useless' for any serious research? Herbarium specimens have been used for research in numerous different areas, including, for example, anthropology, conservation and ecology to taxonomy, medicine and genetics (Magrez 2004; Crouch, *et al.,* 2014; Hart, Law & Jackson, 2014; Spooner, 2014). Herbaria can also be used as 'teaching collections' (Adams & Fritz, 2014), but this does not need a strict amount of data to qualify the item as 'valuable'.

Muñoz Viñas (2005) in his contemporary theory of conservation argues that neither conservation nor science is a clearly defined activity, though in relation to science, conservation aims at preserving the *true nature*, that relies mainly upon the material constituents. The 'ethno-historic pieces of evidence' are objects that work as historical evidence and form separate category of artefacts. However, any treatment is the matter of decisions that may affect the objects appearance and structure (Florian, Kronkright & Norton, 1990; Hill, 1999) and therefore is an act of interpretation (Muñoz Viñas, 2005; Appelbaum, 2010). The choice of sizing agents for paper or the other substances commonly introduced in paper conservation (e.g. deacidiying agents for acidic environments) as well as decisions to discard old mounts or elements of construction, may actually be a threat for sustainability (Muñoz Viñas, 2005).

The notion of sustainability is used here in the meaning of 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (Staniforth, 2000, cited here after Muñoz Viñas, 2005). A mistake in choosing the values to be preserved or discarded may result in *fabrication* of an artefact that is rather a visualisation of a state considered an 'ideal state' or, in other words, how a certain kind of object should look like state. This sort of situation can happen even when it comes to the treatment of a scientific specimen, particularly when it is not acknowledged as precious and of significant value for the collection, or the collection becomes out of fashion (Appelbaum, 2010). As Appelbaum (2010) describes, 'there is nothing intrinsic to an object that puts it in category. *We* do that.' This does not mean that it's safer not to treat the object.

According to the AIC Code of Ethics (2014), conservators should 'select methods and materials that, to the best of current knowledge, do not adversely affect cultural property or its future examination, scientific investigation, treatment, or function.' The Code underlines the functioning of the object at the same level as examination and scientific investigation; if the object is already in its autocatalytic phase, in which each step in the aging process promotes further aging (Appelbaum, 2010), the treatment may turn out to be necessary and inevitable. The future significance of the object can be unpredictable, thus the discussion about treatment should focus on the proper assessment of values and anticipated use of the item in the collection, keeping in mind the probable shift in valuing the object in the future. The shift of value may concern using the herbarium for DNA analysis or change of significance of the item for natural history collections in general. Possible changes must be taken into consideration during conservation treatment planning, which involves the choice of proper conservation materials that will not affect the qualities of the treated material.

The herbarium from Ciechanowiec needed to be assessed and treated according to the procedures raised above. The Museum of Agriculture is focused on the education and promotion of the traditional knowledge and thus in preserving the original values concerning agriculture and related fields. The diversified nature of the museum and its collections requires flexible planning, as there are a variety of different objects and this herbarium is only one of two in the entire collections. The specimens are accompanied with descriptions, but of different level and precision, and lack the completeness required for a typical scientific source. The data does not indicate were the specimen was collected, but some contain detailed description of the medicinal use and effects of usage, what places them among the group of exceptional cases of ethnobotanical documents (Bedford, 1999; Nesbitt, 2014). This small collection is not generally qualified as "scientific herbarium" and the poor condition of the item precluded safe handling or analysis, and it was decided that the treatment would not change the appearance of the object. There could be a conflict between choosing methods appropriate for the conservation of the support and the treatment suitable for the plant specimens; both required treatment because of disintegration of the object

and both seemed to be equally essential and valuable for the character of the object as a whole.

Defining the goal and plan of treatment
The herbarium was aimed to be treated for substantial analysis and exhibition. The conflict between the desired function and the item's condition before treatment resulted in decisions for treatment as follows:

1. The object should become usable; the condition before treatment did not allow safe handling or safe storage. The object was highly disintegrated, resulting in numerous loose elements, most of which were damaged. The damage was at all levels, from the outermost element of the binding to the innermost parts of the specimens and paper support.

2. The object should be made suitable for display. The weakened condition of the binding and paper support made it impossible to display and there was the additional risk of exposing the herbarium to any light level. The loosened structure posed the risk of further loss of item's elements and any information.

3. As much as it is possible the object should be made safe to handle for information and for display as part of an exhibition. All parts of the object should be reintegrated and stabilised by full conservation treatment including remounting of the loose specimens. The re-introduction of the specimens would actually enable the analysis of the herbarium. It required that the conservator conducted a preliminary analysis and identified as many species as possible to remount them properly. The museum doesn't have a conservation studio to work directly with a conservator, so consultation with ethnobotanist was required to provide reliable information during re-matching the specimens to their original location. All information that could not be re-used in the object was to be separated and treated as an attachment to the documentation.

Treatment
The object was photographed showing general condition as well as in it's original page-by-page sequence. Photographing each page was necessary to enable later matching of dislocated specimens. The pH of the paper was measured demonstrating it was fairly neutral, varying from 5 to 6.3 (all pH measurements were done using Mettler Toledo SevenEasy pH-meter, calibrated with buffers of 4.01, 7 and 9.21 pH value).

The pages were numbered with a pencil to be treated individually. The sewing in the binding was cut and loose specimens and paper straps and from each page were removed and put into a separate envelope, which was numbered with the corresponding page number. The tiny crushed specimen particles, dust and dead insects were discarded due to the impossibility of matching them to their original host. Then the page was separated from the block. With all loose elements taken out, the pages and covers were dry cleaned with soft brush, latex sponge, scalpel, and soft rubbers, with great care due to the brittleness of the specimens that remained on the pages (see other reports on methods and issues of dry cleaning of herbaria Margez, 2004; Menei, 2005; Dauwalder, 2013). With plant specimens attached to some sheets, the whole sheet could not be cleaned, but it was possible to execute some local treatment. Brown staining in the folds' spines and on the edges of the sheets, which made the paper more brittle, was reduced with local washing with deionised water. The other kind of discolouration that was a result of direct contact of specimens and paper, was not considered as a sign of degradation of the support that should be altered; it was regarded as a kind of documentation of specimen, particularly in cases where specimen themselves were missing and the contour or characteristic shape of staining could help in matching the loose specimens.

Paper was deacidified with Bookkeeper spray from the back; it was not used on the front of the pages due to the potential risk of it reacting with natural dyes. Deacidification is common and popular practice in paper conservation (Giorgi, 2013), the possible effect of deacidifying agents used for conservation purposes on plant specimens is still not known. The paper support was reinforced with 2% methyl cellulose from the back, which prevented the specimens that were still attached to the pages from direct contact with the sizing agent. To minimize the number of the 'elevated humidity' stages of the treatment, the losses in the paper were infilled and tears were mended straight after introducing the methyl cellulose. The tears were supported with 9gsm Japanese tissue and the losses were infilled with 32gsm Japanese kozo paper, dyed with hellion dye to the greenish colour matching the colour of the original paper (Fig. 2). The paper for the infills was dyed prior to application. Japanese papers were adhered with rice starch paste with addition of antiseptic Aseptina M. After reinforcement and infilling the losses the pages were flattened under felt and weights. Using felt provided safe pressure for the plant specimens. The process of paper reinforcement was successful and did not damage the plants, although exposed the specimens to elevated humidity. The shifts in RH might accelerate deterioration of specimens (Florian, Kronkright, & Norton, 1990). In this case the paper support was extremely spongy and probably suffered from previous microbiological attack.

The other method to reinforce the paper that might have been considered would be removal of all specimens, and remounting them after paper conservation treatment. Although the risk of the plant

being damaged would be reduced, it would mean temporary total disintegration of the object that was already a composite of numerous loose elements. The decision to conduct the treatment without removing the plants that remained in their original location was a difficult compromise between the willing to keep as much original information together as possible and the safety of the separate elements of the herbarium. There was no noticeable difference in the condition of specimens after the process of reinforcement and drying. The pH of the paper after the process of paper conservation treatment raised to average of 8. The value of pH was slightly higher on the backsides due to the fact that Bookkeeper tends to have limited ability of penetration (Zumbühl & Wuelfert, 2001).

The covers were dry cleaned and washed in deionised water. During the washing a bundle of the handwritten papers used as a waste paper for the cardboard was retrieved. The papers were cleaned from the glue residues and then deacidified with Bookkeeper spray. The sheets were sized with 2% methyl cellulose. Splitting the papers of the boards resulted in retrieving two pieces of the block-printed cover paper that was not degraded. The pieces provided the basis for the reconstruction of the paper for the new binding. The original leather fragments were cleaned with a Maroquin balm.

The next phase concerned reintegration of the herbarium's content. Firstly, the conservator attempted to match the specimens found on particular page to the captions on the same page. If the specimen didn't match to any location, the conservator searched for the right place on the other pages. Using the names given to plants, loose specimens were matched by identifying them. All loose specimens were photographed and sent to the museums ehthnobotanist to check which assisted in 90% of the specimens matched. A few descriptions proved to be insufficient or mistaken emphasising the caution needed. Only plant-to-staining matches that were easily matched were mounted onto the original place, any ambiguous matches were treated as attachments and were put in a separate acid-free envelope.

The approved specimens were remounted onto pages with 9 gsm Japanese tissue dyed to the greenish tone, adhered with rice starch paste with addition of antiseptic Aseptina M. The starch paste is used for reattachment for its good adhesion properties and reversibility (Hill, 1999; Margez, 2004; Menei, 2005). If there were original straps in the place of missing specimens, they were used to attach the plants to the pages. If no original straps were provided, specimens were attached with the straps of the 9 gsm Japanese tissue, which was also used to line the original straps that remained partially. In some cases, conservator added some additional Japanese tissue straps even if all the original points of adhesion remained (Fig 3). The decision depended on the behaviour of the specimen when turning the pages: if it tended to protrude and risk in breaking, it was secured by another point of adhesion. At the final stage of treatment, the block was resewn and bound in a new binding, reconstructed basing on the remains of the original binding. The paper was reconstructed in the computer image processing software and printed in a high quality laser printer office.

The conservator made a customised protective acid -free box, construction of which enabled to house both the object and all original attachments, stored in buffered paper envelopes. The owner was provided guidelines for the environmental conditions for storage and exhibition, with suggested temperature 16-18^{o}C and RH 50% ± 5, according to the usual standards for paper and ethnographic collections (e.g. Bedford, 1999; Timbrook, 2014). The conservator recommended that the page exposed to light at the exhibition should be changed once a month. Currently the herbarium successfully plays an integral role of the museum displays.

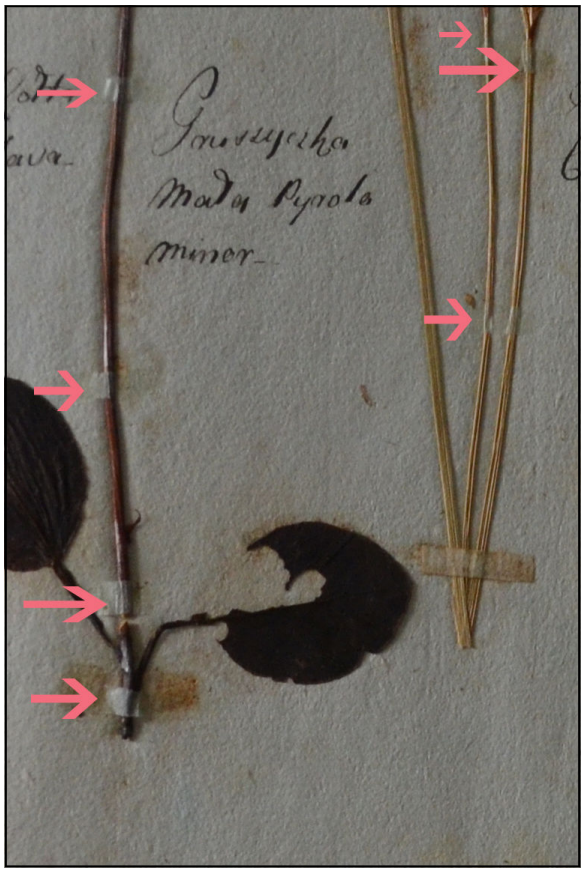

Fig. 2. The arrows show the points of adhesion of the dyed Japanese tissue.

Conclusions

The album was reinforced and secured at different levels which allowed it to be used again: it was prepared for safe handling and a protective box made of acid-free materials provided stable and easy storage both for the album and all other original elements of the item. The conservator's analysis and documentation shed some light on the object's history and gave a basis for further substantial research. Thus a new resource for ethnobotanic studies appeared in the collection what would not be possible without the preliminary ethnobotanic analysis. Unaccompanied by interdisciplinary cooperation, the treatment would not be complete. Documentation of every stage of treatment proved to be essential as it enabled tracking of the specimens changes during the treatment. Should there be any need to make future changes, it is easy to remove a specimen if required.

The conservation treatment described here is an example of a complicated, and perhaps disputable, intervention. The look of the herbarium changed dramatically. There are few published case studies on working on bound herbaria (e.g. Magrez, 2004; Menei, 2005; Dauwalder, 2013) so promoting the work will enhance the discussion and awareness of the problems concerning the care and conservation of plant-based materials.

Discussion about the standards, raised during the Clothworker's Standards workshop at the 29th Annual Meeting for the Society for the Preservation of Natural History Collections in Cardiff, proved there are still areas and subjects to be revised and discussed, e.g. standards for exposure conditions and stratification of the standard (depending on funds and size of an institution). As a conservator, the author would add that there is a need for further research on the relations between in conservation, mostly concerning paper conservation field, and conservation of plant-based materials. Relations understood both as the impact of technical materials and methods used during the treatment, and the possible influence of the contemporary theory of conservation on the decision making when it comes to the treatment of herbaria or other biocultural collections. The methodological background and treatment solutions should be always correlated with the needs of the owner, including any possible future uses of the herbarium. Difficult as it may seem to the conservator, the treatment should be coherent with the nature and the structure of the object down to the molecular level, but this also needs a further research.

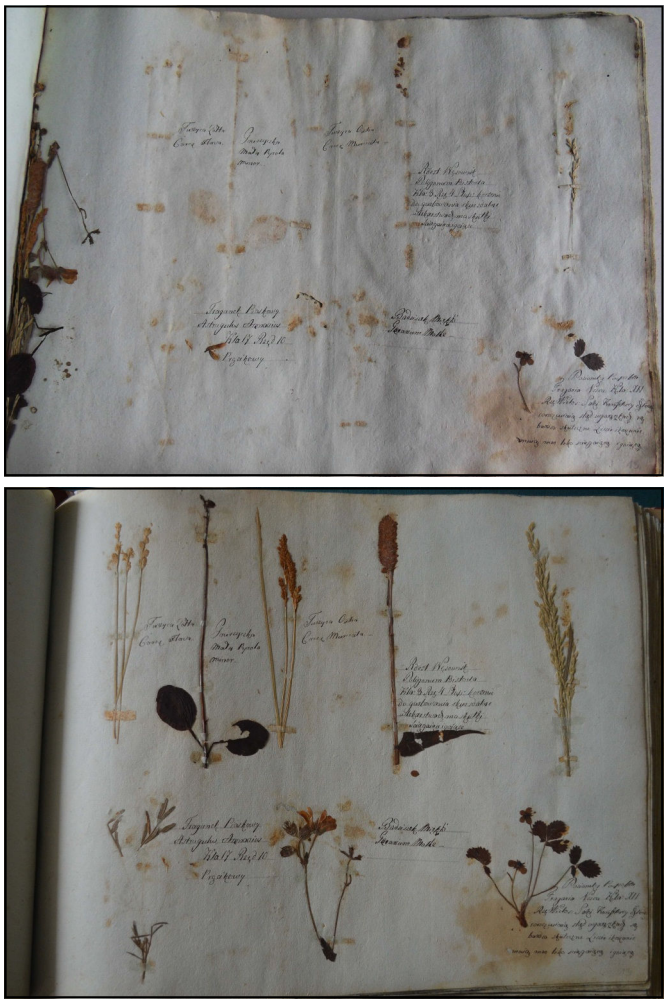

Fig. 3. (Top) A sheet from the herbaria with the loose specimens and dirt covered paper. Note the loose specimens have accumulated towards the centre of the album.
(Bottom) The same sheet after conservation. Where possible specimen have been reattached to their original places.

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