

Digitizing Insect-Plant Interactions: Lessons from the gall collection at the State Museum of Natural History Stuttgart

Jessica Awad[‡], Ann-Kathrin Mertz[§], Ingo Wendt[‡], Carlos Monje[‡], Lars Krogmann[‡]

[‡] State Museum of Natural History, Stuttgart, Germany

[§] University of Hohenheim, Stuttgart, Germany

Corresponding author: Jessica Awad (jessica.awad@smns-bw.de)

Abstract

As an interaction between insect and plant, galls present unique challenges to natural history collections. Traditionally, insects and plants are stored in different ranges within a museum, and a preserved gall may reasonably be placed in either one. Unidentified galls are especially difficult to categorize, as they may also be formed by non-insect agents (Roskam 2019). There is no uniform curatorial standard, which means that gall specimens do not always fit neatly into museum infrastructure. The gall collection at the State Museum of Natural History Stuttgart (SMNS) serves as a model to explore the challenges of incorporating ecological interactions into digital and physical infrastructure, as well as the benefits and uses of the resulting digital data.

The entomological collection at SMNS houses an estimated 1000 to 2000 uncatalogued gall specimens, collected over approximately 200 years. Preservation methods include herbarium sheets, envelopes, albums, file folders, cardboard boxes, and folded newspaper. Some galls are also pinned in the dry insect collection alongside their inhabitants. The oldest of these are from the personal collection of Karl von Roser, who collected around Stuttgart in the early 19th century (Fig. 1), although the exact collecting dates and localities are unknown.

The study set included all specimens from the local state, Baden-Württemberg (n=395). Data were digitized via the DiversityCollection application in the Diversity Workbench (Triebel et al. 1999). A new data range was created for galls. Specimens were assigned accession numbers in order by date of collection. Updated taxonomic identifications of gall formers and host plants were included. Unidentified specimens were also accessioned, which would not have been feasible with the pre-existing collection ranges. Representatives of sixty-eight gall-forming species were further selected for photographic digitization (Fig. 2).

Data standardization presented significant challenges. Both taxonomic and geographical nomenclature have changed over the last 200 years, so historical interpretation was often necessary. Geographical coordinates were approximated using Google Maps. This approach was labor intensive and required specialized cultural and linguistic knowledge. However, the end results were worthwhile, including many new faunistic records, discovery of surprisingly undersampled areas (e.g., the Black Forest), and creative implementations of the digital data (a computer game). Future streamlining of the process is needed to facilitate larger-scale ecological studies, such as understanding the effects of climate change and habitat loss on gall communities over time (James et al. 2018).

Keywords

natural history collections, digitization, plant galls, oak galls, gall wasps, gall midges, Germany, Baden-Württemberg

Presenting author

Jessica Awad

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Conflicts of interest

References

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Figure 1.
Drawer from the insect collection of Karl von Roser (1787–1861) showing gall specimens and their inhabitants, among other natural curiosities.

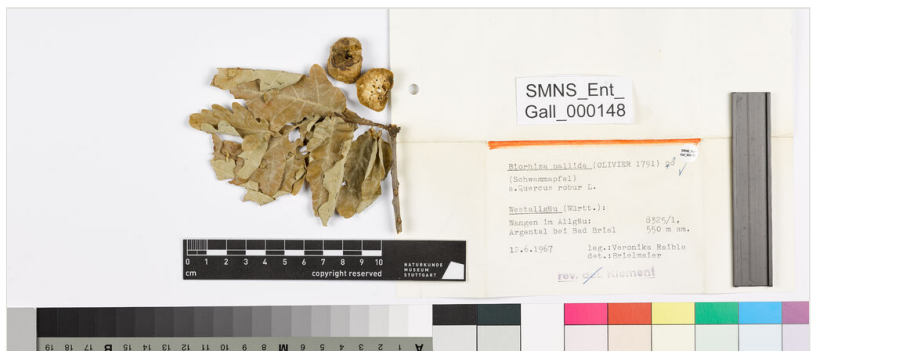


Figure 2. Photographic digitization of gall specimen, showing original label and newly assigned accession number.