

EDIT Workpackage 5 – Model 14 Detail

The taxonomist in this case is a lichenologist working in the Slovakian Academy of Science in Bratislava. She works in particular on the Leptogium group of the lichens. As measured by active researchers, Lichenology in Europe is one of the smaller sciences. There are many areas where detailed work is yet to be completed – and many areas where the most recent work can be over a century old. As a result of this the taxonomist enjoys considerable freedom in the main direction of her work. In addition to taxonomic research, she also teaches and serves as curator of the cryptogam collection in the SAS.

This model is based largely on the current Leptogium project, a revision of this genus, though the activities can also apply to revisionary taxonomy in general.

The taxonomist's responsibilities fall roughly into the following categories :

Taxonomy	30%
Biodiversity work	30%
Bio monitoring work	10%
Teaching	10%
Admin	10%

The following table describes the individual steps of the process model in detail.

Event	Starting trigger	As mentioned above, the taxonomist is able to choose the direction of her work in this field. This freedom extends to individual projects also, and personal interest is the main factor in selecting which sub-group to work on next. This direction is shaped by the necessities of a scientific career; the need to publish, and practicalities such as funding and the availability of students to work on the project alongside her.
Activity	Select a sub-group to work on	The group under study in this case is Leptogium, chosen largely out of personal interest. The goals of the project will be set at this point; questions posed that the study will hope to answer; gaps in knowledge that will be addressed. Examples might include an assessment of the current taxonomic structure of the group, establishing the geographical range of various species, and consideration of various ecological factors into the above. Approximately 80% of the work will be focussed towards taxonomic work, the remaining 20% towards ecological aspects.
Activity	Search Literature	Undertaken to acquire an understanding of past work in this group; both the taxonomic aspects and any other related issues.
Action	Identify literature	Literature is found largely via the internet: <ul style="list-style-type: none"> - Specific sites such as that of the Botanical Gardens in Oslo or the American Bryological and Lichenological Society - Google, especially for recent work - Index Herbarium may indicate where to

		<p>search further</p> <p>Older papers may not be available online. Additional sources include</p> <ul style="list-style-type: none"> - personal knowledge of the field - knowledge of the collector and their place in which they worked - consultation with colleagues
Action	Gather literature	<p>Copies are requested from the institute housing the paper; the paper will usually be sent digitally as a pdf, and there is usually a charge for this. Alternatively, the taxonomist may visit the library, especially if existing travel offers such an opportunity.</p> <p>The taxonomist commonly sends out reprints to colleagues upon publication, and herself possesses a collection of recent papers</p>
Action	Prepare summary of literature	<p>Compile a list of the papers published that includes;</p> <ul style="list-style-type: none"> - names - authors - publication date - taxonomic description <p>This list serves as a concise review of the existing literature and is used to sort the papers into categories, based on taxonomic group. This produces a profile of the species under study and identifies any gaps in the current understanding; Is every species described properly? Is anything missing? Does every species have a type specimen?</p> <p>This list is compiled in MS Excel, which is sufficient for these purposes.</p>
Activity	Collecting activities/ Field work	<p>Collecting trips take place for two reasons; project specific work, and work arising from requests.</p> <p>Project specific collections are designed to address specific taxonomic questions and are planned in advance for approval by the HOD. The departmental car is loaned for travel, which must be shared between departments. As lichen collecting can take place at any time during year, season-specific collections would take precedence at certain times of the year. This presents no real problems however.</p> <p>Requests are related to biodiversity work. Bodies such as the Slovakian National Park can request various sets of information, such as a survey of lichen distribution for example. Public transport is used for trips such as these.</p> <p>Upon return, specimens need to be dried out for storage in order to prevent</p>
Action	Arrange permits and practicalities	<p>Permits from the Ministry of Environment are required for collecting activities, and it is possible to</p>

		<p>get a broad collecting permit that covers all foreseeable geographical regions from the Ministry. However the varying management of the Slovakian forests brings an additional administrative burden. Most forests are not maintained by the Slovakian National Park, rather private companies and foresters. Additional permissions will be required to travel on the land here, and this can take time. Taken collectively, the administration required to arrange all permits is a burden.</p> <p>Typically accommodation will be whatever is suitable, economical, and closest to collecting sites. This can range from field stations to local hotels, to old shepherd's huts.</p>
Action	Conduct collection	<p>The specimens are located by sight, and collected by hand. Often lichens will be hidden under foliage so areas must be searched thoroughly (for this reason collecting in winter months can be difficult). Notes are taken in the field, including;</p> <ul style="list-style-type: none"> - basic description - substrate - species of organism found on - specific location; bark fissure, old/young branch, buttress etc - general surrounding location - soil type in areas - light levels; open area, shaded copse - GPS location - altitude <p>Specimens are packaged for transport in a paper envelope.</p>
Action	Transport specimen home	No special arrangements are required for this; either the specimens will be transported back in the departmental vehicle, or posted.
Action	Quarantine specimens	All incoming specimens are refrigerated for two weeks to kill off any harmful organisms. Once a year the entire collection is freeze-treated as a precautionary measure.
Activity	Gather existing specimens	A broad activity representing the gathering of existing specimens for examination.
Action	Identify existing specimens	<p>Sources include:</p> <ul style="list-style-type: none"> - The existing literature may give specimen location - Personal knowledge of the collector's career and workplace - Consultation with colleagues - Google <p>Specimens tend to be stored in European herbaria.</p>
Action	Gather existing specimens	Once identified, a loan form is completed and emailed, or posted where necessary, to the curator of the collection. Loaning is rarely refused except in

		particularly early or fragile specimens. In this case an image may serve as a replacement.
Activity	Examine specimens	Examination focuses on three sets of characters; <ul style="list-style-type: none"> - morphological (external structure), - anatomical (internal structure), - molecular. <p>Examinations will be discussed with colleagues before and throughout to gather useful knowledge; for example, which primers may be used in DNA analysis.</p>
Action	Initial visual examination	Perform a 'first-pass' examination to familiarise with the collected specimens.
Action	Dissection under binocular microscope	Specimens are dissected under the stereo microscope to reveal internal structures
Action	Detailed examination under light microscope	Further examination under the light microscope reveals finer structures, and allows fine quantitative measurements such as spore size
Action	Molecular analysis	Such as examination of DNA strands. Molecular analysis is performed by the taxonomist.
Action	Chemical analysis	Examination of chemical composition of specimen.
Action	Produce character grid for analysis	For use in the various statistical analyses.
Action	Perform statistical analysis of characters	Various statistical methods are used, such as <ul style="list-style-type: none"> - cluster analysis - principal component analysis - ordination analysis <p>Uses SYNTAX program for statistical analysis</p>
Activity	Prepare paper	The process of compiling a scientific paper and arranging for publication. The taxonomist frequently collaborates on work with a number of colleagues, and also members of the amateur community. The involvement and particular contribution of each colleague varies project by project, and publication credits will change according to this.
Action	Compile manuscript	Prepare the various sections of the scientific paper, and compile according to the editorial guidelines of the intended journal. Typical sections include: <ul style="list-style-type: none"> - Taxonomic treatment. The basis of a revision. - Distribution maps - Comparison tables summarising main features - A taxonomic key - A discussion of previous work - A discussion of the main findings and any other related work - Graphs and tables illustrating other findings - Photographic images of the specimens, usually prepared, occasionally in the wild - Illustrations indicating the main features

		<ul style="list-style-type: none"> - References and a bibliography <p>The various sections will be prepared using the appropriate software. Compilation is with MS Word.</p>
Action	Friendly review	This is an informal review of the manuscript by colleagues, arranged to gather comment on the paper before submission to a journal.
Action	Revise paper	Revise the paper in the light of comments and suggestions.
Action	Submit to journal	The manuscript is submitted to the intended journal, usually by email, again in accordance with the editorial guidelines.
Action	Paper accepted?	<p>This action is of course external to the taxonomist's work process, but important as it's results will affect the direction of the project. There are 4 possibilities:</p> <ul style="list-style-type: none"> - Accepted outright. It is relatively uncommon for a paper to be accepted entirely without revision. - Minor revision. The paper is accepted subject to minor revisions. These can be presentational or concerned with the subject matter. - Major revision. Significant changes are suggested. These may be related to the findings or other key aspects of the paper. The journal may also feel that the paper needs a different approach to fit within it's subject boundaries. - Rejected outright. Also relatively uncommon, and can be related to suitability to a particular journal, or simply the quality of the paper
Activity	Curation activities	Specimens are generally stored intact with the material on which they were found; to remove them would destroy the sample.
Action	Prepare specimens for storage.	All specimens need to be dried before permanent storage, otherwise they would rapidly decompose. If necessary, specimens are also pressed
Action	Label specimens	Labels are manually produced with MS Word, then printed, cut-out and applied to the specimen envelope with glue.
Action	Return loaned specimens	Loaned specimens are returned from whence they came. Specimens will generally be sent with a copy of any publication in which they were used.
Action	Place specimen in collection	Specimens are place in the local collection for permanent storage
Action	Update collection database	This institute uses a centralised Access system as a collection and bibliographic database. This database also has then facility to produce publication-quality distribution maps.

		Not all specimens are databased. Due to a current space shortage, not all specimens are stored in the main collection. A forthcoming move to a larger facility will allow the storage and databasing of these specimens.
Activity	Prepare paper	The process of compiling a scientific paper and arranging for publication.
Action	Compile manuscript	<p>Prepare the various sections of the scientific paper, and compile according to the editorial guidelines of the intended journal. Typical sections include:</p> <ul style="list-style-type: none"> - Taxonomic treatment. The basis of a revision. - Distribution maps - Comparison tables summarising main features - A taxonomic key - A phylogenetic tree / cladogram and it's data matrix - A discussion of previous work - A discussion of the main findings and any other related work - Graphs and tables illustrating other findings - Photographic Images of the specimens, usually prepared, occasionally in the wild - Illustrations indication the main features - References and a bibliography <p>The various sections will be prepared using the appropriate software, or occasionally manually; photo-plates for example. Almost all taxonomists compile the manuscript using MS Word.</p>
Action	Friendly review	This is an informal review of the manuscript by colleagues, arranged to gather comment on the paper before submission to a journal.
Action	Revise paper	Revise the paper in the light of comments and suggestions.
Action	Submit to journal	The manuscript is submitted to the intended journal, usually by email, again in accordance with the editorial guidelines.
Action	Paper accepted?	<p>This action is of course external to the taxonomist's work process, but important as it's results will affect the direction of the project. There are 4 possibilities:</p> <ul style="list-style-type: none"> - Accepted outright. It is relatively uncommon for a paper to be accepted entirely without revision. - Minor revision. The paper is accepted subject to minor revisions. These can be presentational or concerned with the subject matter. - Major revision. Significant changes are suggested. These may be related to the findings or other key aspects of the paper. The journal may also feel that the paper

		<p>needs a different approach to fit within it's subject boundaries.</p> <ul style="list-style-type: none"> - Rejected outright. Also relatively uncommon, and can be related to suitability to a particular journal, or simply the quality of the paper

General points:

- The profile of taxonomy in general could be improved
- It is essential that separation of taxonomy and nomenclature is maintained whatever direction the science chooses to go in the future
- Methods of promoting taxonomy might include
 - o Further collaboration with ecological issues, as opposed to the production of purely taxonomic works
 - o Highlight the services that taxonomy provides to the scientific and wider community
- One of the most important items on a wish-list would be the scanning and online availability of literature, especially older works that may be difficult to attain