

EDIT Workpackage 5 – Draft Unified Model Detail

This document covers the activities of the draft unified model. All the activities referred to of course generalizations drawn from all previous models so far. Note that the model is divided into two paths, separating out collecting activities from the other processes. It is difficult to place the collecting process in the linear flow with any consensus; the logistics of a collecting trip often place it naturally outside a step-by-step process, and collections can and do take place independently of a revisionary projects. For a unified model, collecting activities are best represented as a parallel activity.

Activity	Collecting activities/ Field work	This activity refers to collecting new specimens from the field. Collections are undertaken for a wide range of reasons, amongst others: <ul style="list-style-type: none"> - Collecting specific taxa as part of a project - General collecting to explore a poorly understood area - To improve the institute's collection - Collaboration with a partner institute - In-keeping with institutional goals - Gathering material for teaching - Or any combination of the above
Action	Arrange permits and practicalities	The permits required for collecting activities vary according to both location and the material under collection. Permits may be required for a number of reasons, for example: <ul style="list-style-type: none"> - To enter the collecting site at all. Whatever body maintains the collecting may restrict access, for safety or other reasons. - To remove material from the site. - CITES restrictions may apply to certain taxa <p>Most taxonomists tend to organise the trips themselves, often through a collaboration with a foreign institute.</p>
Action	Conduct collection	This refers to the actual collection. The activities here will vary widely according to the taxonomic group under study, and the purpose of the collection. It is hardly possible to describe a "general" collecting trip, as the methods and equipment will vary tremendously.
Action	Transport specimens home	Most collections will gather too much material to be taken back home by the taxonomist and will generally have to be sent back separately. Far flung collecting trips tend to use air or sea mail. Specimens may have to be treated before packaging, for example, dried, pressed, stored in alcohol. Most specimens will need to be accompanied by the relevant permits. This process can take sometime; items sent by sea-mail, for example, may spend months in transit.
Activity	Select a sub-group to work on	This activity represents the process of breaking down a large body of work into manageable chunks. Many revisions will involve the study of a large number of taxa, and potentially many more specimens. Large projects generally have to be approached piecemeal. The sub-groups are generally chosen on the basis of taxa or geography, or perhaps a combination of the two.

Activity	Search Literature	Researching existing literature in order to acquire a full understanding of previous work on the group. This refers to past revisions of the related taxonomic groups, and also more general work.
Action	Identify existing literature	Sources for identifying literature are numerous of course, and include: <ul style="list-style-type: none"> - Online search engines both subject specific, such as IPNI or GEO-REF, or general search engines like Google. - Personal knowledge of the field - Citations in other works. In this way one can follow a 'trail' back to the proto-log - Library search catalogues - Colleagues - Amateur / enthusiast communities - Published bibliographies of works in the field
Action	Gather existing literature	Acquiring a copy of the work. In many cases literature can be downloaded from the internet, usually from subscription websites such as the Zoological Record , or online journals such as Zootaxa . Some work can be found published for free. If not available online, an inter-library loan can normally be arranged. Many scientists also routinely distribute reprints of published work to colleagues. This is especially common in smaller fields, being much more practical. Some institutes will have a collection of reprints.
Activity	Gather specimens	This broad activity refers to the sourcing of existing specimens related to the group under study.
Action	Identify existing specimens	First the existing specimens need to be identified and located. Sources of specimen information include: <ul style="list-style-type: none"> - Publications will usually indicate the location of at least the type specimens used in the paper. - Online search catalogues such as fishbase - General search engines such as Google - Personal knowledge of a collector's career and the institutes they worked for - Colleagues Specimens may not always be available however. Some will not be available for loan due to fragility or other reasons. Others may simply be lost.
Action	Gather existing specimens	Once identified, the taxonomist needs to physically examine the specimens. This can either be done by travelling to the institute housing the collection, as is often the case where the specimen can not be sent out, or more commonly, requesting to loan the specimen. Institutional loan policy varies, though all will have some procedure for receiving and assessing loans, then processing the loan request. Differences may include ; <ul style="list-style-type: none"> - Charging. Many institutes will send out loans for

		<p>free, some need to apply a charge for this service.</p> <ul style="list-style-type: none"> - Assessing the loan. Institutes ask for different levels of information regarding the loan; details of the study, past work, references, etc. <p>Loaning is generally a lengthy process - typically it takes several months to receive specimens from request. This turn-around time is widely acknowledged throughout taxonomy, but it is not seen as an a real problem, just a fact of life. Other work can always be undertaken whilst waiting for specimens.</p> <p>One can also submit blanket requests for all specimens of a particular taxa, or for all unidentified material that is thought to belong to a taxa. These requests obviously involve more curatorial work.</p> <p>Specimens can also be found in private collections. Arrangements to view such specimens will be particular to the case.</p> <p>Many scientists will use existing travel arrangements as an opportunity to visit other collections, and examine any specimens they need to.</p>
Activity	Examine specimens	As with collecting activities, examination techniques depend entirely on the nature of the specimen, and will differ according to taxa. Examination tends to be an iterative process, with the focus becoming more detailed as the work continues.
Action	First visual examination	Almost all examinations begin with an initial visual assessment of the specimens, before any other examinations take place. Initial thoughts are formed as to the broad taxonomic grouping.
Action	Sort specimens	Physically sorting specimens into groups is a common practise. The process of sorting helps to highlight the differences and similarities between specimens. Viewing the specimens in their proposed group serves to bring the emerging taxonomic hypotheses into sharper focus.
Action	Detailed visual examination	<p>The process will now move onto more detailed examination, almost always using a microscope of some sort. This action examines the finer morphological features of the specimens, allowing further assessment of the emerging theory. Standard light microscopy is extremely common, with florescence and stereo microscopy also commonly available. Dissection may be performed to examine internal structures.</p> <p>The recording of results is very individualised; pen & paper, spreadsheets, and statistical software all serve as first points of entry for measurements. Some do not record results at all until the theory is complete. Images are often taken at this stage, commonly without assistance.</p> <p>That nature of the measurements taken will be particular</p>

		to the group. Morphological features, however, are almost ubiquitous in taxonomy.
Decision	Further analysis?	Aside from light microscopy there are a wide range of other examination techniques potentially available. Whether further techniques are employed here, and which ones, will depend on the nature of the group under study, the availability of the technique (and hence the resources available to the taxonomist), the level of certainty about the emerging theory, and the personal preference of the taxonomist.
Action	Further analysis	<p>Other examinations include:</p> <ul style="list-style-type: none"> - S.E.M. - T.E.M. - Chemical composition analysis - DNA analysis - Phylogenetic analysis <p>The examinations may be performed by the taxonomist, or by colleagues. The strength assigned to the various results differs between scientists. Phylogenetic analysis is a good example of this - some taxonomists use this as the basis of a theory, some to back-up a developed theory, others not at all.</p>
Decision	Assess emerging theory?	It is almost universally agreed that the development of the taxonomic theory and the examination are not separate events. The taxonomic theory develops with the examination, from the initial sorting of specimens through to the more detailed analyses. At some point though, a decision is made that the theory is complete and that no further examination is needed.
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?	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: <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	Many taxonomists have some level of curatorial responsibility in their institutes. Those that do not will still need to prepare specimens for storage and arrange for the return of loans. Curatorial work is very often performed by an assistant, with input from the taxonomist.
Action	Label specimens	All specimens need to be labelled prior to storage. This is the case for new specimens, and those subject to changes under the revision. Labels are often printed using a variety of software applications, or may be hand-written.
Action	Return loaned specimens/send out paratypes	Often the conventions of a collaborative project, especially one involving collecting activities abroad, will dictate that types or paratypes are sent to the collaborating institute for permanent storage there. Loans will also need to be returned. This will be possible by post or another method will be found. This step can also take many months to complete, especially if waiting for opportune travel arrangements.
Action	Place specimen in local collection	The newly labelled specimens is placed in the institute's collection for permanent storage.
Action	Update collection database	All collections will have some sort of database, be this an electronic database or a printed directory. This will need to be updated with the new information.