

Invertebrates: sorting invertebrate samples

Version 1.0



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Introduction

Sorting invertebrate samples is the first step to making sense of the diversity of invertebrate species collected from various habitats. In general, define what type of information you need from your sampling and then begin the process of grouping the invertebrates for subsequent identification. Ultimately, we are aiming for a deeper knowledge of New Zealand's invertebrate biodiversity. As a general rule in biology, we find a high number of rare species (those with low abundance) but only a few species are abundant (common). In other words, 'most species are rare' due to a few species monopolising a resource at the expense of many species, which then divide the resource into smaller proportions. This is called niche partitioning.

Collecting invertebrates can be fun and quite easy and is always rewarding since you never know what will turn up. Once the collecting is complete, the sorting and identifying of specimens is labour intensive and requires a methodical approach. Although time consuming, specimen sorting can be enjoyable because it is the start of interesting and often new scientific information. This document describes a step-by-step sorting process by deciding early what type of information you require from the total sample and then following the subsequent steps.

Finally, while it's valuable to process samples quickly to save time and money, all invertebrate specimens collected should be kept for future reference, even if they are simply kept in a jar called 'others', with a card recording date, location, habitat and collector name included.

Step 1: Collecting

For what purpose are you collecting invertebrates? Depending on the type of information required from the invertebrate sampling, the sorting task can be quite different. Table 1 provides eight broad purposes for invertebrate sampling with a brief description of the type of sorting required.



Table 1. Invertebrate sampling categories and description of the specimen sorting process

Sampling aims/objectives →	Ecological information	Survey & inventory	Long-term ecosystem monitoring	Taxonomic/biogeographic information	Size class information	Conservation management response	Rare species surveys	Ecological impact assessment
Collection description:	Sampling for population biology (species abundance), community composition (e.g. trophic guilds), ecosystem role of invertebrates (e.g. functional groups of species and biomass).	Either a fast survey of an area never previously sampled or a routine but rapid sampling of a given site for baseline data on what invertebrate main groups exist (e.g. Tenure Review surveys, land swap appraisals).	Comparing invertebrate composition through time at fixed sites and discrete time periods.	Collecting specific invertebrates for species descriptions or targeting specific groups for information on their evolutionary and geographic pattern.	Collecting invertebrates by size and mobility for information about rodent (and other) predators (e.g. likely predator guilds and biomass proportions).	Collecting and sorting specimens into groupings that reflect a management operation (e.g. pest poisoning, trapping, weed removal). Target groups might also include size classes, life cycle stages or proportions of flying to non-flying invertebrates.	Invertebrate samples are collected for specific taxa. The sampling method is, itself, a sorting step. Collecting generally uses a specific method (e.g. a light trap) and therefore omits many other groups.	Alternatively called rapid biodiversity assessments. Often conducted in respect to development proposals which will have effects on ecological values at a site. Thorough sorting required but usually of a limited, one-off quantity.
Sorting description:	Comprehensive sorting. Many containers required.	Comprehensive sorting for taxonomic 'bins' (RTUs* and families). Aim is comparative diversity information.	Rapid sorting into RTUs* with emphasis on a suite of indicator taxa.	Rapid sorting of target taxa, but curation very time consuming. Pinning, pickling in alcohol and labelling is an important second stage of sorting.	Rapid sorting of invertebrates into size classes. Taxonomic sorting less important.	Comprehensive sorting. All classes of invertebrate are important, especially if a management activity has targeted a predator (thus relative abundance information).	Rapid sorting depending on characteristics of target taxon.	Comprehensive sorting. Information on diversity is required and therefore sorting to genus and species necessary.

* RTUs = Recognisable Taxonomic Units



Step 2: Sorting

On return from collecting specimens, place any tubes and specimen-containing pottles in a fridge (they'll be okay at room temperature for the short term).

Next, set up a 'production line', preferably including an overhead magnifying glass, a microscope, preserving alcohol (70%), specimen pottles, tubes etc. on one side (left or right depending on your preference). Next is a sorting tray for bulk handling; next to the bulk tray you might have several taxonomic trays (depending on space and specimen quantities), then the microscope for the actual identifications.

A side table will probably be necessary here too for all the reference keys, books, pictures and paper, pencils and scissors you will require. Adjacent to the microscope are the tubes and jars into which go the identified specimens – there may be many of these. Be organised and break down the groups taxonomically. Labelling is the big job here – either write labels out in pencil on pre-cut slips of paper (preferably goatskin, non-acid paper).

Species information can be loaded directly into a laptop as you work or onto a data sheet and then transferred to a spreadsheet.

Tip bulk specimens (including larvae) into the sorting tray half filled with either 20% ethanol/80% water or 100% water and a small amount of detergent as a wetting agent. With a metal spatula and forceps, cluster the similar specimens into separate areas of the tray. Using the magnifying glass may help.

Next, begin with groups of easy to identify invertebrates, passing each one through under the microscope. Key them out using the morphological characters, and transfer them to jars with a label. Some species can be bulk handled and included in the same container with one label (see example layout in Figure 1).





Figure 1. Example layout for sorting, curation and preliminary identification of invertebrate specimens.

Step 3: Labelling

For 'wet-specimens' (those stored in alcohol), record the following on small pre-cut labels using either a sharp pencil or drafting ink pen (e.g. Rotring or similar):

- Date
- Location (Lat/Long) / Easting Northing
- Habitat (on plant, under rocks/bark etc.)
- Collector's name
- Identification to either genus or species (see 'Invertebrates: invertebrate identification aids'—doccm-3000682)¹

¹ <http://www.doc.govt.nz/Documents/science-and-technical/inventory-monitoring/im-toolbox-invertebrates-invertebrate-identification-aids.pdf>



The labels are then slipped down the inside of the container taking care to not crush the specimens. Later, more permanent laser-printed labels on specialist paper can be produced. A good reference book for specimen curation is:

Walker, A.; Crosby, T.K. 1988: The preparation and curation of insects. DSIR Information Series. Science Information Publishing Centre, DSIR, Wellington.

https://www.landcareresearch.co.nz/_data/assets/pdf_file/0012/22242/Walker_Crosby_1988.pdf

For dry pinned specimens, a sheet of polystyrene (or 'plastizote' foam) is necessary for grouping and holding specimens. Polystyrene boxes also make convenient temporary storage containers, but always include labels on the same pin as the specimen. Specimens can be transferred to proper long-term systems following identification and labelling.

Step 4: Recording, reporting and lodging voucher specimens

Specimen identifications can go directly into a spreadsheet. In general, Excel or a similar spreadsheet is used. Depending on the type of information required, the layout should be something like Table 2 below.

Table 2. Suggested layout for samples to record in an Excel spreadsheet

Class: Insecta; Order: Orthoptera					
Family	Genus	Species & authority	Location coordinates	Threat status	Common name
Anostomatidae	<i>Hemideina</i>	<i>maori</i> (Pictet & Saussure 1891)	E xxxxxxx N xxxxxxx	Not threatened	Mountain stone wētā
Rhaphidophoridae	<i>Pharmacus</i>	<i>montanus</i> (Pictet & Saussure 1891)	E xxxxxxx N xxxxxxx	Not threatened	Mt Cook flea/ cave wētā
Class: Diplopoda; Order: Polydesmida					
Dalodesmidae	<i>Icosidesmus</i>	<i>tumidus</i> (Johns 1964)	E xxxxxxx N xxxxxxx	Not threatened	Millipede
Class: Arachnida; Order: Araneae					
Gnaphosidae	<i>Taieria</i>	<i>erebus</i> (Koch 1873)	E xxxxxxx N xxxxxxx	Gradual decline	Stealthy spider
Lycosidae	<i>Anoteropsis</i>	<i>montana</i> (Vink 2002)	E xxxxxxx N xxxxxxx	Naturally uncommon	Alpine wolf spider
Class: Arachnida; Order: Opiliones					
Trianenonychidae	<i>Nuncia</i>	<i>arcuata</i> (Forster 1954)	E xxxxxxx N xxxxxxx	Not threatened	Forest harvestman
etc.					



Once the specimens are pinned, preserved and labelled they can be submitted to a collection for long-term national storage.

At time of writing, the following locations are best suited for DOC-collected invertebrate specimens:

New Zealand Arthropod Collection (NZAC), Landcare, Auckland

Postal address: Landcare Research
Private Bag 92170
Auckland 1142
New Zealand

Email: nzac@LandcareResearch.co.nz

Phone: (09) 574 4100

Physical address: 231 Morrin Rd
St Johns
Auckland 1072
New Zealand

Website: <http://www.landcareresearch.co.nz/resources/collections/nzac>

Te Papa National Museum

Postal address: Dr Phil Sirvid
55 Cable Street
PO Box 467
Wellington, 6011
New Zealand

Phone: (04) 381 7000

Lincoln University entomology collection

Postal address: Mr John Marris
Entomology collection
Bio-Protection Research Centre
PO Box 85084
Lincoln University 7647
Canterbury
New Zealand

Phone: (03) 423 0748

Physical address: Bio-Protection Research Centre
Burns building, room 510a
Lincoln University
Ellesmere Junction Road/Springs Road
Lincoln
Canterbury

Website: <https://bioprotection.org.nz/facilities/lincoln-university-entomology-research-collection>



Table 3. Entomological material suppliers (as of March 2017)

Item	Source	Notes
Glass tube / jars	Stowers Containment Solutions: http://www.plastic.co.nz/plastic-products/0602.html Australian Entomological Supplies: http://www.entosupplies.com.au/	The 35 mL screw-top pots make excellent field collecting specimen containers. They are alcohol tight, strong and reusable.
Preserving ethanol	For laboratory grade ethanol (pure, expensive), Thermo Fisher Scientific: http://www.labserv.co.nz/search.aspx?search=ethanol For recycled ethanol (cheaper), Solvent Rescue in Christchurch: http://www.solventrescue.co.nz/	Analar (analytical reagents) grade chemicals are highly purified (over 99.9% pure). For DNA work on invertebrates, lab-grade ethanol is recommended.
Forceps / tools	Bioquip Products (USA): http://bioquip.com/ Australian Entomological Supplies: http://www.entosupplies.com.au/	Bioquip is efficient with a wide range. Similarly Australian Entomological Supplies – also closer and cheaper.
Label paper	As above or through New Zealand paper suppliers. For goatskin parchment paper (low acid): https://www.officemax.co.nz/Paper/Specialty-Paper/Goatskin-A4-120gsm-Blue-White-Parchment-Paper-Pack-of-250-2222698	Also check with Landcare Research Auckland: http://www.landcareresearch.co.nz/resources/collections/nzac
Pins	Bioquip Products (USA): http://bioquip.com/ Australian Entomological Supplies: http://www.entosupplies.com.au/	A wide range of pins, points and pinning blocks.
Optical equipment	Education range of stereo microscopes from Optika (Italy): http://www.optikamicroscopes.com/index.php?option=com_virtuemart&view=category&virtuemart_category_id=13&lang=en Available in New Zealand via Alphatech (Auckland): http://www.alphatech.co.nz/ Also Blaxall & Steven (Christchurch): https://blaxall.co.nz/collections/microscopes	Microscopes are expensive. Second-hand is a wise option as many microscopes are well cared for. Old university or school instruments occasionally turn up on TradeMe under the photography/optic category. Cold light sources also available from these suppliers

