Collecting micro land snails in terrestrial and freshwater habitats

Version 1.0

This specification was prepared by Karin Mahlfeld, Dave Roscoe and Alison Evans in 2016.

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Inventory and monitoring toolbox: invertebrates

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Collecting micro land and freshwater snails

Collecting handfuls of friable plant decomposition material from the main habitat types listed below is a good way to start a presence/absence survey for terrestrial snails. Berlese funnel extraction is not recommended for land snails because it will produce poorer results. Equally, pitfall trapping is going to produce incomplete, biased samples.

The uppermost sticks, dry large leaves and stones can be discarded on site. A simple way of getting rid of this dry uppermost leaf litter layer is to use a very coarse sieve (a mesh paper basket or deep-fryer sieve; see Fig. 1). Usually there are not many snails in this top layer unless the habitat of the collecting site is quite wet. The large leaves, sticks and rocks can also be gently brushed to the side to expose the mid to lower layers of leaf litter (see Fig. 2). Most of the micro and small snails will be in this slightly moister and more friable decomposition layer down to the soil level. Productive micro-habitats are described below.

Figure 1. Searching for snails in the top layer.

Figure 2. Searching carefully for snails in leaf litter.

Land snail habitats

- Snails generally inhabit **accumulations of drier decomposing leaf litter** and areas adjacent to moisture (e.g. under tangles of fallen tree fern fronds, *Blechnum* spp. (crown ferns), grass clumps and fallen nīkau fronds, under clumps of plants such as *Celmisia* spp. in high country, or under flax and leaf litter around/near big trees). Collecting handfuls from different litter types found at a site, like broadleaf, podocarp or beech, is important to achieve a representative sample.

- **Under twigs and logs**. On a moist twig surface most specimens will be alive, and empty shells often can be found on the soil surface underneath.
- A few species are found **on or under bark on standing trees**. Those specialised for living under bark may have flattened shells in side profile if 3–5 mm, otherwise spherical if around 1 mm. Those specialised for living on bark surfaces may be camouflaged by having a rugged, rounded upper surface, a dark-coloured pattern and a smooth base. Similar form is shown by dorsoventrally flattened or tiny spherical snail species between accumulations of fallen beech leaves (e.g. Desert Road, Waihohonu area). Species specialised for living under fallen twigs may have cylindrical or conical shapes that protrude into the spaces beneath them.
- Some species with tiny (mostly external) pāua-shaped shells have been observed feeding **on slime-mould or fungus** on exposed twig surfaces after rain. In damp conditions, species may occasionally be observed on leaves of standing trees.
- The **decomposition layer under stones and between rocks**, especially in high country **screes** and **limestone crevices** (e.g. Salisbury Open near Mt. Arthur) and where there is little plant cover, may support snails, particularly the smaller species. Crevices between larger rocks may hold undamaged specimens if the surrounding vegetation has been destroyed by fire.
- **Limestone ledges and debris at limestone cave entrances** may have accumulations of empty shells. The roof of caves near the entrance may be moist and live snails may be found crawling there. Some species preferentially live on the underside of limestone slabs (e.g. *Phrixgnathus n.sp.* at the quarry in Ward).
- The junction between **leaf bases and their supporting stem** in plants such as kiekie (*Freycinetia banksii*) and nīkau (*Rhopalostylis sapida*) will often have resting slugs. A few species (e.g. the *Phrixgnathus moellendorffi* group) are usually restricted to this habitat.
- **Steep or undercut bank edges** often have accumulations of twigs and plant material acting as a natural sieve, so small shells may often be found on the bank surface.

A sample should at least fill half a plastic shopping bag. It is important to label samples. Labels should include locality, grid reference (GPS reading or read of topographic map), altitude (if available), collector, date, and habitat description. In order to prevent labels from getting damaged they can be placed in a zip-lock bag or vial with each sample.

Freshwater snail habitats

Freshwater or apparently amphibious snails have been recovered from various habitats including:

- On plant matter, algae, mud or stones at stream margins
- Under decomposing leaves floating on water or resting on seepages
- Under stones in fast-flowing water, and near stream margins
- At seepages—specimens were found in moss, on freshwater liverwort or on exposed slimy rock surfaces, and in all these cases were often located by touch
- Caught on the pad surfaces of artesian water filters

- Inside limestone caves on exposed stone surfaces underwater, and on sandy streambeds, apparently grazing on biotic films
- From the submerged inner wall of cold springs

Processing leaf litter samples

Dry sieving method

Spread out litter samples to dry in big trays (plastic trays or apple cartons) lined with newspaper or paper towels. If samples are very wet, the paper can be changed several times to help soak up the moisture. Every sample should be labelled to avoid confusion. It is good practice to keep the label with collecting information (locality, grid reference, altitude, collector, date, habitat description) in a small zip-lock bag with the sample all the time. Once the sample is dried, it needs to be sieved through a coarse mesh sieve (6–8 mm mesh size). This will get rid of sticks, stones and large leaves. The coarsest fraction can be examined for larger shells by eye under bright light. However, the bulk of the shells will be in the medium coarse and fine fractions. The medium coarse fraction can be sieved again through a mesh of 3–4 mm mesh size. This will retain all the larger shells, which can be extracted by eye under bright light. A fine paintbrush or fine metal tweezers can be used to pick out shells. For the fine fraction a sieve with a mesh size of 0.8–1 mm is used. This will retain the bulk of the micro-snails. A very fine sieve can be used to get rid of dust particles. This will make it easier to sort the fine fraction under a binocular dissecting microscope.

Figure 3. Use three sieve mesh sizes to sort coarse to fine material.

Wet sorting method

For this flotation method, a bucket is filled up with water and handfuls of the litter samples stirred into the water. Empty shells filled with air will float to the surface and can be scooped out with a little fine sieve (tea sieve) into a plastic tray to dry. The muddy debris remaining at the bottom of the bucket can be rinsed out over a very fine sieve to catch any shells or slugs that did not float to the surface or sank again. Repeat this procedure as often as needed under bright light to float off shells from the entire sample. When the floated remains are dry enough, individual shells can be picked out and sorted into species under the microscope. Depending on the habitat, samples can contain between 10 and 40 species and between a few and hundreds of micro-snail shells.

Recommended reading

Barker, G.M. 2005: The character of the New Zealand land snail fauna and communities: some evolutionary and ecological perspectives. Pp. 53–102 in Cameron, R.A.D.; Nekola, J.C.; Poryszko, B.M.; Wells, F.E. (Eds): Patterns and process in land mollusc diversity. Records of the Western Australian Museum, Supplement 68, Perth, Australia.

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Bogich, T.L.; Barker, G.M. 2012: Fragmentation, grazing and the species-area relationship. *Ecography 35(3)*: 224–231.

Denmead, L.H.; Barker, G.M.; Standish, R.J.; Didham, R.K. 2015: Experimental evidence that even minor livestock trampling has severe effects on land snail communities in forest remnants. *Journal of Applied Ecology 52(1)*: 161–170.