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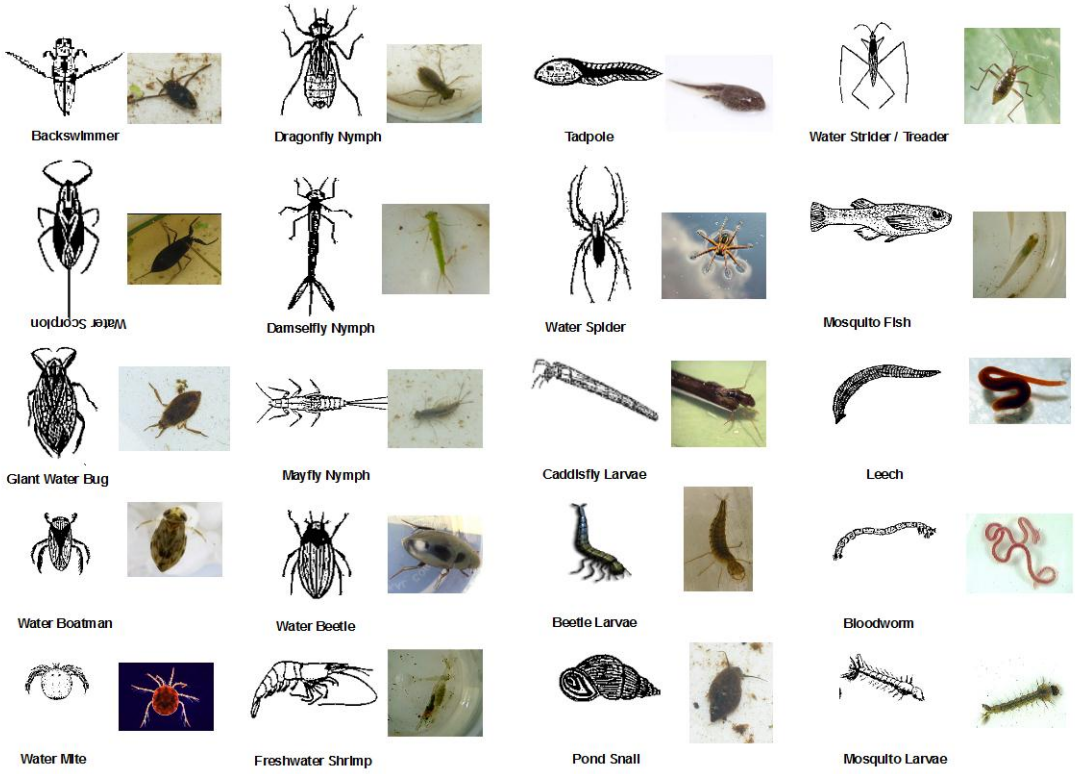

River macroinvertebrate sampling manual for volunteers

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1. Summary

This document describes how volunteers may collect samples of river macroinvertebrates to help determine the biological health of a river. We are currently testing the methodology to see if it is robust and provides sufficient guidance.

- A river site is a section of river from which macroinvertebrates will be collected. For rivers that have an average width of 10 metres or less, a site is a 100 metres length of the river.

- Samples must be collected in spring (September-December) and autumn (March-June).

- Ideally, four pairs of volunteers would sample each site. In this case the length of river should be divided into four sections and each of these sections will be sampled by a different pair of volunteers.

- At each site, macroinvertebrate samples will be collected from the edge habitat. This habitat are areas along the creek bank with little or no flow. In some sites an additional sample can be collected from a riffle habitat if it is present. The riffle habitat includes areas of broken water with rapid current.

- Macroinvertebrate samples must be collected with a kick net of 0.25 millimetres mesh size. How the net is used to collect samples differs between riffles and edges.

- Macroinvertebrates are sorted in the field. The method involves picking invertebrates from plastic trays in the field using forceps and pipettes.

- The cumulative picking time is 120 minutes per river site per habitat. Hence, if there are four pairs of volunteers, each pair should spend 15 minutes on sorting the sample they collect.

- The aim of sorting macroinvertebrates is to get as many different types of invertebrates and place these into a jar filled with ethanol.

- These jars will be sent to a laboratory where the invertebrate samples will be identified.

- Each jar should contain a paper label that has the details of the site and habitat type (written in pencil).

2. Introduction

Macroinvertebrates are animals without backbones that are large enough to be easily seen by the naked eye. Macroinvertebrates that live in rivers include worms, snails, beetles, dragonflies, mayflies, stoneflies and yabbies. Pollution and other changes caused by human activities in and around a river will determine what types of macroinvertebrates live there. For this reason river macroinvertebrates are widely used to indicate the biological health of a river. Healthy rivers are typically unpolluted and have many different macroinverterbate habitats, so in a healthy river one would expect to find many different types of macroinverterbates including species that are sensitive to water pollution. Unhealthy rivers may be highly polluted or may have lost most types of macroinvertebrate habitats. Such rivers may have only few types of hardy, pollution tolerant macroinvertebrate species.

2.1 Equipment needed

- Handheld kick nets 250 mm mesh
- Waders
- White sorting trays
- Sample jars filled with ethanol
- Watering can or plastic bucket
- Labels
- Forceps
- Plastic pipettes
- Pencil to write the label

Figure 1. Handheld kick net

Figure 2. Waders

3. Macroinvertabrate sampling

3.1 Can macroinvertebrate samples be collected any time of the year?

The types of macroinvertebrates found in the rivers of NSW change with the seasons. Over the past two decades much of the macroinvertebrate sampling in New South Wales has been done in either autumn or spring. Hence, it is preferable that sampling is done in spring or autumn, or both. As a rough guide the autumn sampling season runs from 15 March to 15 June and the spring sampling season from 15 September to 15 December.

3.2 What is a river site?

A river site is a short section of the river (called a reach) from which macroinvertebrate samples will be collected. A river reach is roughly 100 metres for all rivers that are on average 10 metres wide or less.

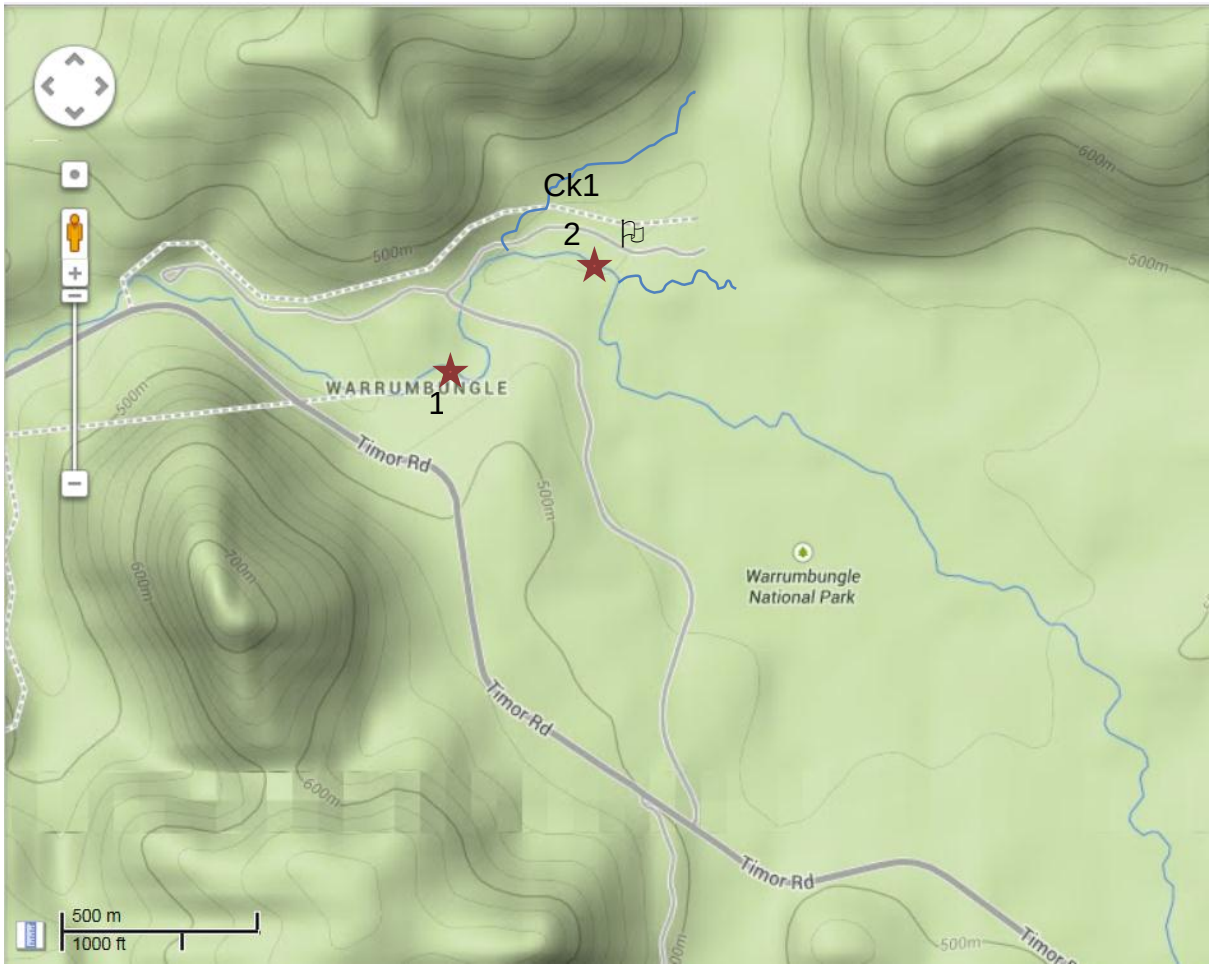

Figure 3. Map of the area of Warrumbungle National park near the visitor and education centres. Student monitoring sites are shown as red stars.

3.3 Habitats sampled

A habitat is a type of environment within a river site that supports a distinct type of biological community. In NSW, macroinvertebrate sampling is widely done in two types of river habitats: riffles and edges. These are defined below.

3.4 The Riffle Habitat

The riffle habitat is an area of broken water with rapid current that has some cobble or boulder in it (Figure 4). If the broken water habitats in a river do not have cobbles and boulders it may not be appropriate to collect a macroinvertebrate sample. Your teacher will advise you on the best places to sample.

Figure 4. Good riffle habitat with both cobble and boulder substratum. Cockerawombeeba Creek on the mid-north coast of NSW.

3.5 The Edge Habitat

The edge habitat is an area along the creek bank with little or no flow (Figure 5).

Figure 5. A rich edge habitat with a variety of sub-habitats such as logs and overhanging vegetation. Headwaters of the Ellenborough River in the Hastings River catchment, mid north coast of NSW.

Suitable sampling areas on the river edge include an alcove or backwater with abundant leaf-litter, fine organic/silt deposits, macrophyte beds, overhanging banks and areas with trailing bank vegetation. These areas are often indicated by the presence of surface-dwelling insects. Your teacher will advise you on the best places to sample.

4. Collecting macroinvertebrate samples

Each pair of volunteers will pick a quarter of the river reach (e.g. 25 metres for narrow rivers). While one person is using the net the other person can identify suitable spots for collecting and keep an eye on the person who is doing the sampling. If there are not enough nets for four pairs and the samples cannot be collected simultaneously, sampling should start at the quarter reach that is furthest downstream and move upstream.

All macroinvertebrate sampling must be done with a kick net of 0.25 millimetres mesh size. Nets should be rinsed well prior to each sampling occasion to ensure no animals collected from another habitat or site remain stuck to the net.

4.1 Sampling riffles

- Locate the downstream end of the riffle zone within the site and begin sampling there.
- Disturb the substratum with your feet while holding the net downstream with its mouth facing upstream (Figure 6).
- Vigorously move the substratum about by digging your feet well into the cobbles and boulders. If necessary, turn and rub the boulders and cobbles by hand to dislodge organisms.
- Continue this process until you have sampled a total of about five metres of riffle habitat. Depending on the extent and structure of the riffle habitats being sampled this may be a continuous five metres or consist of a number of discrete segments totalling five metres.

It may be necessary to stop and rinse the net a couple of times during sampling to remove fine particles. It is also a good idea to thoroughly rinse the sample again once sampling is completed. This will assist in the sorting process by removing fine particles that can cloud water in the tray, obscuring the invertebrates.

Figure 6. Sampling the riffle habitat.

4.2 Sampling edges

As for riffles, each pair of volunteers should sample a total length of five metres of edge habitat. These five metres need not be continuous and can be composed of a number of discrete segments, one to two metres in length, that ensure the inclusion of all edge sub-habitat types available in the reach.

Samples in edge habitats are collected by using two types of sweeping motions with the net.

- The first type consists of sequential, short sweeping movements at right angles to the bank (Figure 7), dislodging benthic animals and suspending them in the water column.
- The second type of sweeping movement is to sweep the net through the cloud of suspended material, collecting macroinvertebrates in the net.

This procedure, combining both types of net sweeping, should be repeated in each of the discrete segments sampled in the edge habitat.

Figure 7. Sampling the edge habitat.

Note: Attempts should also be made to collect surface dwelling insects such as water striders and whirligig beetles.

4.4 Sorting the macroinvertebrate sample

Once the macroinvertebrate sample is collected it is transferred to a plastic sorting stray where animals are picked with forceps and placed into a jar of ethanol.

Samples should be sorted as soon as possible after collection. Edge and riffle samples must be processed separately. The aim of the live-sorting procedure is to pick as many types of macroinvertebrates from the sample as possible.

If fine clay particles are clouding the sample in the tray return it to the net and rinse thoroughly in the river to remove these before sorting. Each pair of volunteers will sort their own sample and will spend 15 minutes on each sample.

For the first five minutes, collect the active and common species while trying to avoid being biased towards the larger, more colourful ones. For the next 10 minutes, concentrate on getting new animals. The following rules will help improving the sample:

- If you think that you have already picked more than 10 of any animal, avoid picking more of that type
- Actively search for cryptic or small animals
- Check the bottom of the sorting tray when discarding any sample residue to ensure that previously undetected taxa are not attached to the tray. Invertebrates commonly found stuck to the tray include flat worms, water pennies, leeches, freshwater limpets and other gastropods. Any new taxa found at this stage should still be added to the live-pick sample.

4.5 Macroinvertebrate identification

The macroinvertebrate samples will be sent to a laboratory where they will be identified by experts.

5. References

Turak, E. and Waddell, N. (2002). New South Wales Sampling and Processing Manual. NSW Environmental Protection Authority. Monitoring River Health Initiate Technical Report Number 13. Environment Australia, ISSN 1447-1280. ISBN 0 642 54880 3.