



# Running with bugs

**Wendy Pyper** braves the icy waters of southern Tasmania to find tiny indicators of healthy water.

**S**tumbling along the stream bank in a pair of oversized waders did little for my confidence. With swiftly flowing water and a treacherously rocky surface to navigate, an unplanned dip in the icy Mountain River appeared likely.

According to my companion, freshwater ecologist John Gooderham, several bizarre river creatures would witness my humiliation. Among them, certain caddisfly larvae with their two front legs modified into scissor-like structures.

'Hydrobiosid caddisflies wander around the stream bed really fast, bumping into other invertebrates, chopping them into little pieces, and eating them,' Gooderham says.

Mayflies – which live under water as nymphs for up to two years before completing their life

Left: John Gooderham performs 'kick samples' in Mountain River, Tasmania.

Below: Hydrobiosid caddis fly larvae have scissor-like front legs that chop their prey into small bite-sized pieces.

Bottom: Mayflies, like this leptophlebiid nymph, are usually indicators of good water quality. Their flat, hydro-dynamic shape makes them well suited to living in fast flowing water.



cycle as winged adults in a two-day swarm of sexual urgency – would also bear witness, provided the dragonflies, trout or fishing spiders didn't catch them first.

But this was good news. The presence of such creatures in and around Mountain River north-east of Huonville – one of Tasmania's healthier waterways – was a sign that the river was, well, healthy. Closer to town, however, it would be a different story.

Wading into the icy water, I watched as Gooderham performed a series of 'kick samples', overturning rocks and boulders with his feet, and catching the sediment, detritus and waterborne inhabitants in a net. After five years of sampling rivers and streams throughout Tasmania, Victoria and New South Wales, Gooderham is a dab 'foot' at these.



The end result of all this sampling is *The waterbug book – a guide to the freshwater macroinvertebrates of temperate Australia*.

Gooderham and co-author Edward Tsyrlin of the Water Studies Centre at Monash University hope the book will provide children, fishers, volunteer groups and others with a resource to monitor the health of their local rivers and streams.

‘The idea was to take published information about the ecology of streams and the way we use that ecology to monitor the health of the stream, and condense it into a book that could be read and used by the public,’ Gooderham says.

‘To illustrate the sorts of critters that indicate whether a stream is healthy or not, we’ve photographed all the freshwater invertebrate families.

‘So as well as providing information on stream ecology, the book will act as an identification guide – a bit like a bird book, except that you’ll need a magnifying glass rather than binoculars.’

‘Many legs good, few legs bad,’ is the catchphrase Gooderham uses to generalise the concepts covered in the book.

As he empties his net into a tray of water, I see what he means. Scores of many-legged nymphs – caddisflies, mayflies and stoneflies – wiggle and dog-paddle their way around the tray. One large worm, much like an earthworm, is the only legless representative.

With a small pipette, Gooderham plucks out individual waterbugs and groups each type in an ice-cube tray. After half an hour, we have a large collection of nymphs, numerous black fly larvae, one worm and one amphipod (a tiny crustacean).

As the ‘waterbug book’ recommends to prospective water monitors, half an hour of studying kick samples provides enough time to ‘get your eye in’, and to pull out a representative sample of critters.

Top left: Large eusthenid stonefly nymphs take their toll on the smaller stream invertebrates found in the Mountain River. They prefer to live in cool, clean, fast flowing streams.

Above left: Worms can thrive in soft organic matter, burying their heads in the sludge, and waving their behinds at the sky. They can also tolerate poor water quality very well.

Left: Many snails, such as this pond snail, are more at home in slow flowing, or low oxygen environments.

Gooderham and Tsyrlin also recommend that about 10 metres of stream be assessed in order to get a good cross-section of the waterbug community.

'Some streams can be very patchy and will support different animals depending on the speed of the water and potential habitat surfaces, such as cobbles, gravel or smooth rock,' Gooderham says.

Once the different waterbugs have been separated, the book can be used to identify them to family level. After five years of photographing them, Gooderham and Tsyrlin can identify each invertebrate from 10 paces. For the rest of us, more than 200 colour photos can assist with a 'snap' identification, although an identification key is included for more accurate results.

The health of the water can then be assessed using the SIGNAL-score system, developed by New South Wales water scientist Bruce Chessman in 1995.

'Every waterbug is given a grade, from 1-10, according to how sensitive or tolerant they are to pollution,' Tsyrlin says.

'For example, some stoneflies are given a grade of 10, as they are very sensitive to pollution. Some caddisflies can tolerate a little pollution and have a grade of about eight. Snails and worms, being the most tolerant of pollution, have even lower grades.

'You can then calculate the mean SIGNAL score by adding up the grades of each waterbug type you've identified, and dividing by the total number of waterbug types.'

A mean SIGNAL score above six indicates that the stream is healthy. A score of between four and five indicates moderate pollution and less than four suggests high levels of pollution.

After half an hour, some of the waterbugs in Gooderham's tray begin to beat their gills rapidly, a sign of distress due to oxygen depletion.

'This is what makes waterbugs such good indicators of water quality,' Gooderham says.

'Oxygen is depleted when water becomes nutrient enriched, and algae and bacteria build up and utilise the oxygen to assimilate nutrients.'

This process is exemplified at a rivulet closer to town, into which a storm-water drain empties. Large slicks of bright green algae fan out like long green hair as the



Wendy Pyper

## Welcome rest for weary shutterbugs

TRAVERSING the rivers and streams of temperate Australia, photographing nature, may sound like fun. But for John Gooderham and Edward Tsyrlin, it wasn't all glorious sunsets and picturesque mountain views. Much of the work was done at the end of a hard day working for someone else, with eyes firmly focussed on a tray of river samples. Specimens were sometimes photographed in the field, in a miniature aquarium, while others were taken back to the laboratory for full studio treatment. But how do you take a picture

of something so small? While a macro lens is essential, technique is everything, and for Gooderham and Tsyrlin, it took six months to get it right.

'We had six months worth of black photos, or really poor photos, and we didn't know what was going wrong,' Tsyrlin says. 'Then I met a macro-invertebrate photographer from America who showed me his technique. After that, we were successful.'

Five years and thousands of photos later, Tsyrlin says he really enjoys 'not photographing bugs anymore'.

murky water trickles over clumps of weed, silt and rocks. Few creatures would tolerate such living conditions and, as expected, Gooderham's sample is dominated by snails and worms.

While the rivulet scores a disappointing three on the SIGNAL score scale, Gooderham says that improvements in water quality and the habitat around the rivulet will invite a return of the more sensitive invertebrates.

If you'd like to stumble about in your own pair of oversized plastic waders assessing the health of your local streams and rivers, you can pick up a copy of the waterbug book.

*The Waterbug Book is available for \$39.95 from CSIRO Publishing, freecall 1800 645 051, email: [publishing.sales@csiro.au](mailto:publishing.sales@csiro.au).*

