

# Life underground

The hidden habitats beneath our feet

# Subterranean fauna occur in:

## Terrestrials:

- Caves/karst systems
- Basalt lava caves/cracks
- Interstitial terrestrial faunas?

## Aquatics

- Cave streams
- Seepages
- Groundwater, especially interstitial groundwater beneath river plains

## Cave fauna subdivisions

- Accidentals – animals which fall or are washed into caves & may become food for the other inhabitants
- Troglonexenes – “cave visitors” which may use caves for part of their lives. Example: cave weta
- Troglophiles – “cave lovers” which are capable of completing their entire life cycle in caves, but also occur in suitable external habitats. Examples: glowworms, “Nelson” cave spider *Spelungula cavernicola*
- Troglobites – “cave life” which are species considered to be fully adapted to life underground. The group that will be focused on here.



Because there are often faunal overlaps between cave streams and other subterranean aquatic habitats, subterranean aquatics are often given their own group of subdivisions:

- Stygoxenes
- Stygophiles
- Stygobites



In New Zealand, species known or thought to be troglobites come from the following groups:

- Slaters (terrestrial isopods) – unknown number of species; no taxonomy of cave forms
- Harvestmen – 10 species of short-legged harvestmen in *Nuncia* and *Hendea* have been described but more work, including DNA is required
- Spiders – different species are known to occur in a number of caves but just a single species described to date: *Maloides cavernicola*
- Pseudoscorpions – 1, possibly 2 species known from Waikato & northern Taranaki but none described. A group that is highly prevalent in overseas caves.



## Troglobites (continued)

- Millipedes – approx. a dozen species recognized in NW South Island; none described
- Centipedes – possibly two species recognized; no taxonomy
- Symphyla – primitively eyeless & lacking pigment, often deep soil dwellers; often found in caves
- Diplura – a single species known from a single Golden Bay cave; description submitted for publication



## Troglobites (continued)

- Collembola (springtails) – 3 species described, each from a different cave in Waikato; likely to be many more species
- Cixiid bug – single species, *Confuga persephone*, described from a Golden Bay cave.





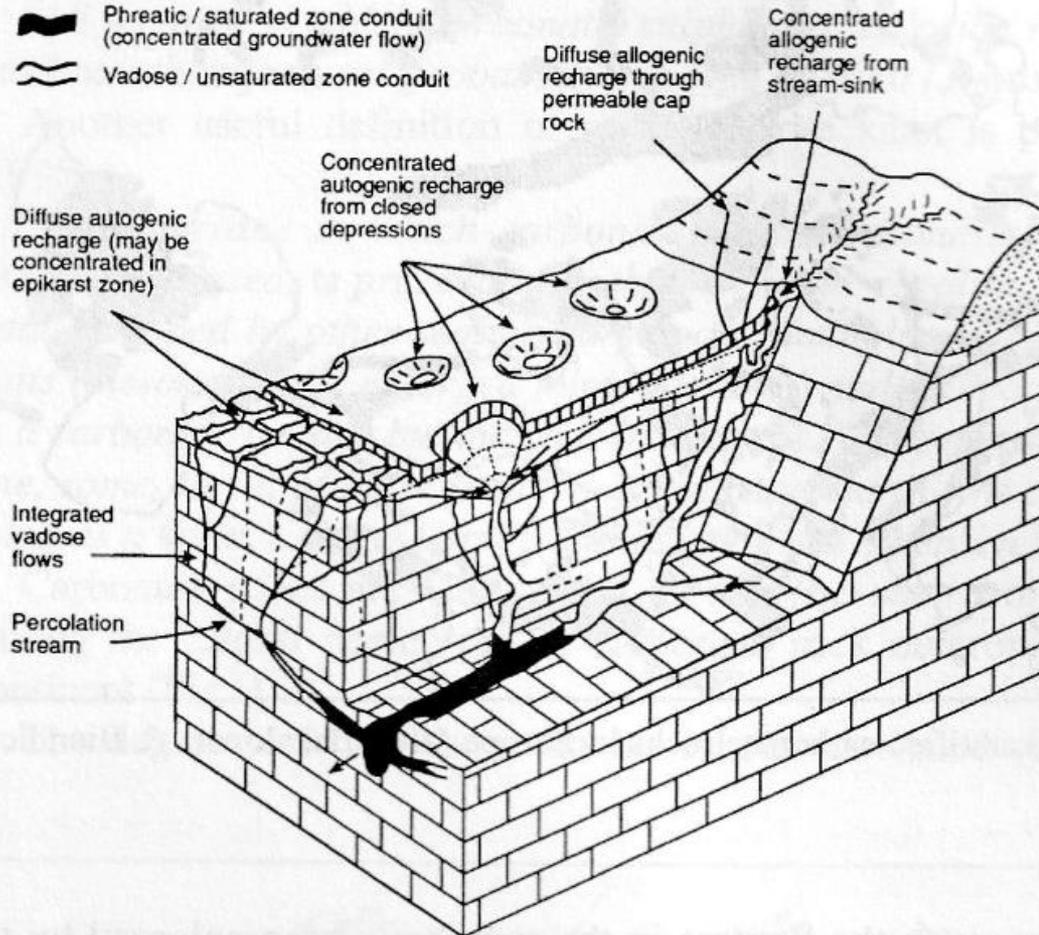
# Troglobites (continued)

- Ground beetles (fam. Carabidae) – 21 species described; 3 from Waikato caves, the remainder from Nelson and West Coast caves.

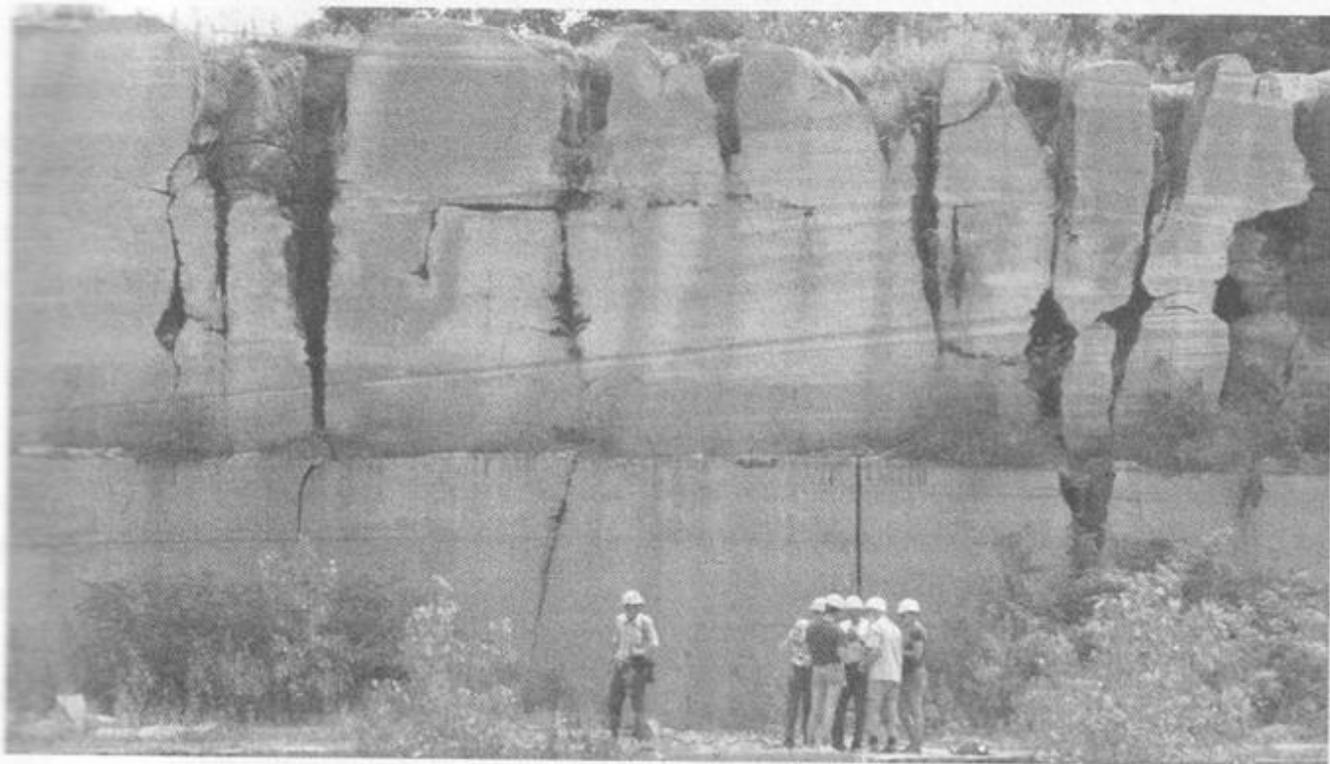
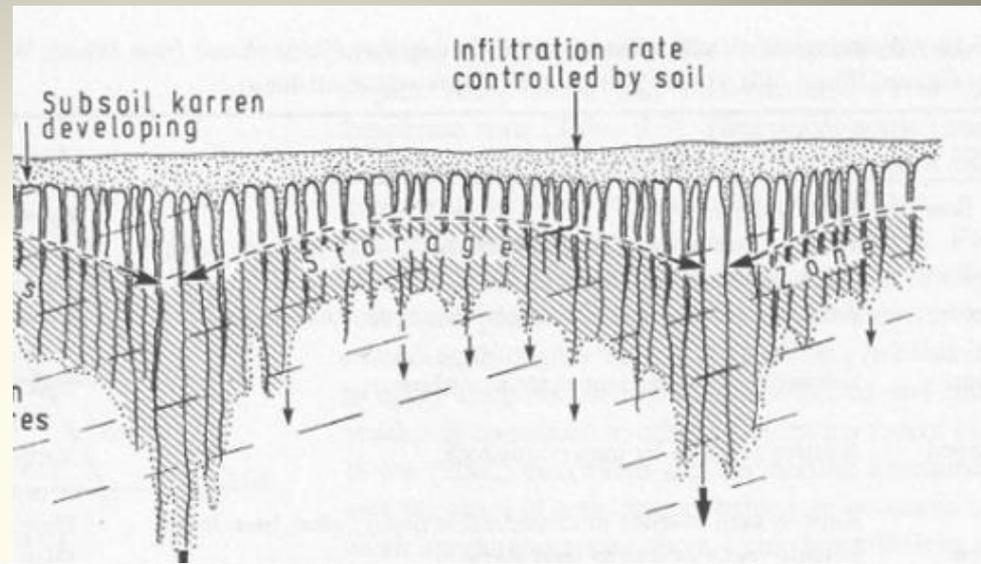


# KEY

- Soil / superficial deposits
- Epikarst
- Limestone
- Overlying rock
- Closed depression
- Limestone pavement
- Phreatic / saturated zone conduit (concentrated groundwater flow)
- Vadose / unsaturated zone conduit

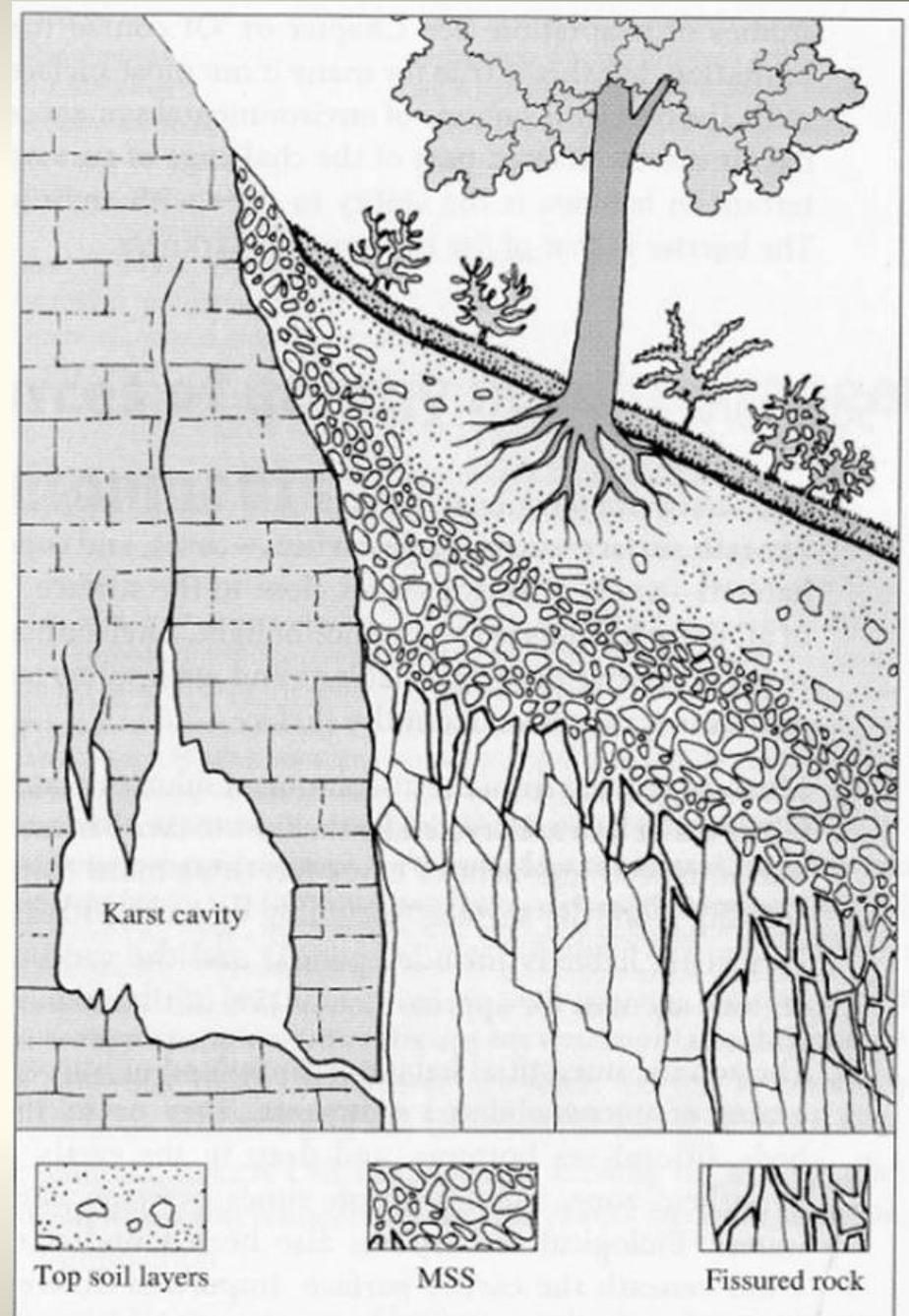
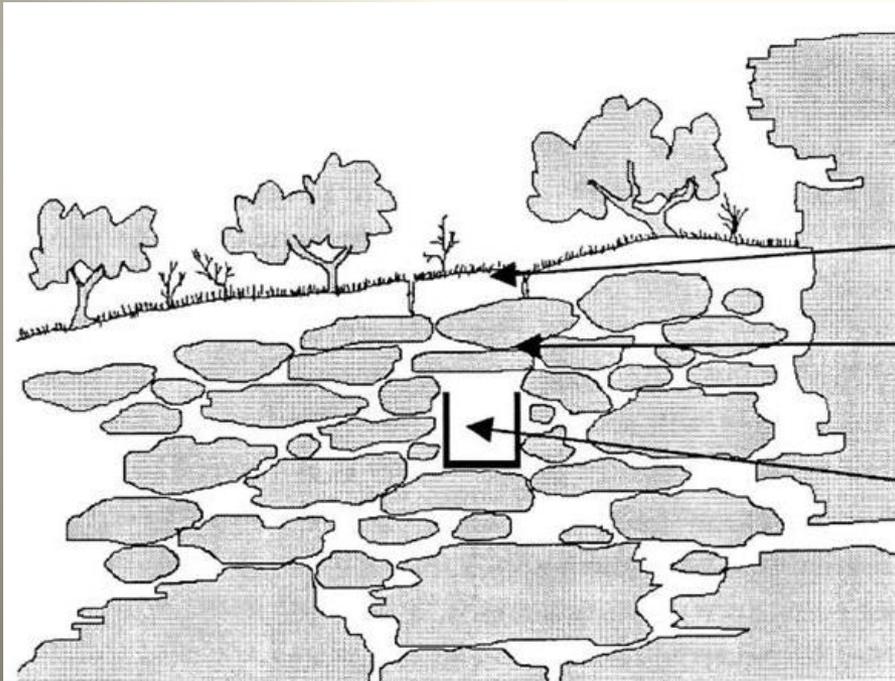


# Epikarst



# MSS

- Mesovoid shallow substratum





# Stygobites from NZ caves & groundwater

- 1880s-90s: Chilton's discoveries from Canterbury wells with descriptions of 3 amphipod & 3 isopod species
- 1970s: Entomology Division, DSIR collections from pumped wells in Waimea Plains & surrounds initiated by Willie Kuschel
- 1970s-90s: Sporadic visits by overseas specialists
- 1990s-2000s+: NIWA undertakes major programme of assimilating data and collections of NZ stygofauna and undertakes widespread collecting, including Martin Haase's taxonomic study of our surface & groundwater snails from family Tateidae (formerly Hydrobiidae)

# Stygofauna groups recognized from NZ

- Several primitive invertebrate groups, including oligochaete & polychaete worms, flatworms, nematodes, rotifers: only a handful of species described
- Tateid snails: Haase's 2002 study brought described NZ species to 64. 28 from cave streams (some of these also from seepages); 24 from springs, seepages & interstitial groundwater habitats (a few of these also from caves)

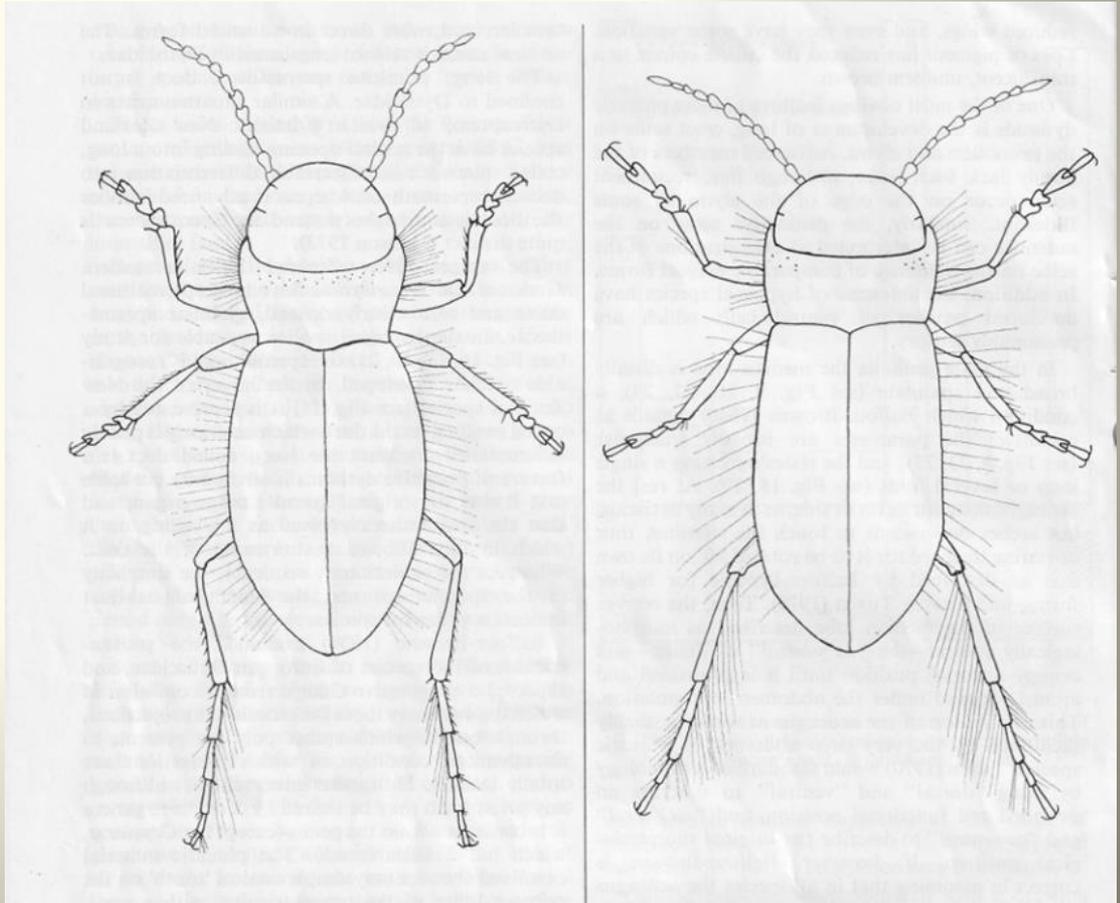


# NZ stygofauna (continued)

- Aquatic mites: 71 species described from springs, groundwater & a few caves; most from the DSIR collections, with additions from subsequent visitors.
- Crustacea:
- Syncarids: 8 described spp.; probably many more
- Copepods: many collected; little or no taxonomy
- Amphipods: >40 species recognised; 4 described
- Isopods: 7 species described; 4 from groundwater and 3 (including a stygophile) from NW South Island caves, with a further cave species description in progress.

## NZ Stygofauna (continued)

- Water beetles (Dytiscidae): 3 eyeless aquatic beetle species described; 2 from the Nelson area and 1 from Canterbury.



# **A guide to the groundwater invertebrates of New Zealand**

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And just when you thought it was simpler to stay out of the water...

- During the DSIR samplings of pumped groundwater, in the late summer of 1972 groundwater levels fell, in one case to near the bottom of the pipe which only penetrated 4.5m below the surface. (Only the bottom 30cm was slotted.) When pumping was attempted the unexpected haul was “a number of terrestrial interstitial arthropods”.
- These included a single eyeless female spider, *Anopsolobus subterraneus* (family Orsolobidae) and a small (2.2mm long) eyeless beetle, *Hygranillus kuscheli* (family Carabidae).

So, who knows what lies beneath your patch....

## Photo Credits

- Grant Stirling, Nelson (Stirling Images): cave weta
- Nelson Boustead, Christchurch (via NIWA): aquatic cave amphipod
- Andy MacDonald, Nelson: 1<sup>st</sup> cave opilione; *Confuga* (cave cixiid) x 2; *Kettlotrechus* (1<sup>st</sup> cave beetle)
- Andy Murray, UK: cave dipluran; collembolan; *Kupetrechus* (2<sup>nd</sup> cave beetle)
- David Roscoe, Wellington: Tateid snails – *Platypyrgus*, *Leptopyrgus*