



**Biodiversity is life
Biodiversity is our life.**

Biodiversity Complexity and Change

By Jeanie Clark

This is the third in a series of Biodiversity articles. See February and May issues for the first two articles.

Winter

The International Year of Biodiversity is half way through. Our days are shorter, colder, windier and, thank God, sprinkled with rain. Have you noticed any changes to the biodiversity in your garden, or other places you visited and explored earlier in the year?



Here, mosses are now a soft lush green. Forgotten bulbs are exploding: Nerines in flower; Soursobs carpet the unweeded garden; Jonquils' strong leaves shoot straight upwards through the mulch, some of which is fallen plant litter. In the vegie patch, tomatoes, cucumbers and basil have gone. A new vegie patch has cabbages bulging and peas climbing upwards. Occasionally, on days after rain, a frog sings for a mate.

The International Year of Biodiversity

National Science Week, August 14 -22, will focus on Australian Biodiversity. (Visit www.scienceweek.gov.au for more information about activities.) You could review your knowledge of biodiversity to see if the places you have explored show evidence of change and increasing complexity. How many species have you found so far? Have you checked a Tree of Life resource¹ to see if some groups are missing? Here's a selection:

- **Fungi** eg. yeast, mould, truffles, lichens, mushrooms etc
- **Animals** eg. corals, jellyfish, shellfish, seastars, seacucumbers, fish, frogs, amphibians, crustaceans – shrimps, crayfish, crabs..., reptiles – snakes, lizards, ghekkos..., mammals – hopping animals, monkeys, cats, dogs, dolphins, whales, monotremes, bears, marsupials, rodents, primates... , birds – flightless, ducks, gulls, waders, parrots, birds of prey, owls, fishers... , spiders, worms, insects, molluscs, hoppers, termites, flies, bugs, beetles, scorpions, mosquitoes, moths, butterflies, etc.
- **Plants** eg. algae, moss, worts, ferns, palms, conifers, flowering plants – lilies, bulbs, mints, grasses, grains, buttercups, cactii, thistles, vegetables, roses, fruit trees, nut trees, eucalypts, bottlebrush, grevilleas, banksia etc.

Repeated observations

Do our observations of bulbs, frogs and new vegetables suggest that our biodiversity record in summer was wrong? No, merely that it was not complete. Observations taken only once, only record what is apparent under that set of environmental conditions eg. summer. Really knowing the biodiversity of a place requires repeated observations. And that makes for good science!

Are there some things that you have not recorded, but think you should have? Perhaps it is time to return to observe changing conditions... maybe in National Science Week? If you have done observations anywhere already this year, try to get back there. Take your original recording, and compare it to discover any additions or deletions from what was there under the first set of conditions. Do this as many times as you can to increase the depth of understanding of the biodiversity of a place, or ecosystem.

As additions and deletions are recorded, the greater range of species using a place is revealed. We begin to see more complexity in biodiversity. Why do these changes take place, especially the regular seasonal ones? Being there helps the identification of environmental conditions that are likely to be linked to the growth and decay, or arrival and departure, of living things. These can be recorded as well and then investigated by book or the web (some examples follow) in the detail that is suitable for the child.

- Deciduous leaves turn – autumn, but how early? (www.scienceadesimple.com/leaves.html for clear explanations, vocabulary words, and science projects based on autumn leaves)
- Bulbs emerge – winter, a little damper this year than recent ones, has them out at least a month earlier. (www.vtaide.com/prg/plants-bulbs.htm for a simple life cycle diagram, or www.ehow.com/how-does_5005576_growing-cycle-tulip-bulbs.html or www.pacificbulbsociety.org/pbswiki/index.php/HowToGrowBulbs for more detailed information)



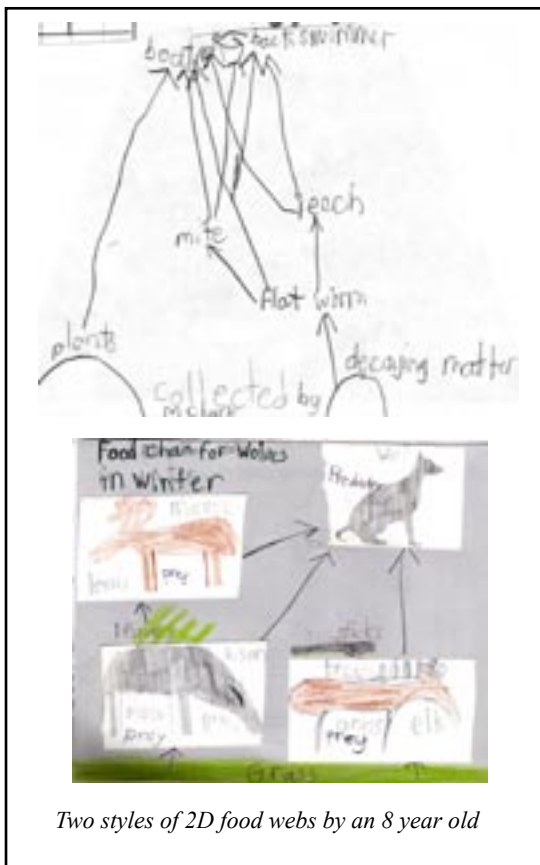
- Flies disappear – usually in July – it is especially noticeable around the sheep shed when there are none! We're waiting for that to happen this year! (www.vtaide.com/prg/flies.htm for a life cycle)
- Frogs are heard – songs after at least 12 mm rain event (www.uq.edu.au/eco-lab/aestivating-frogs or <http://freshscience.org.au/?p=44> for explanation)

If you want to get into even greater complexity, conduct more surveys under different conditions: night/day, wet/dry: drought/flood. All of these environmental changes will bring some new level of complexity.

Food Chains and Webs

The range of species is one aspect of the complexity and change of biodiversity; another is the linkage between the species based on food! First you need information on what a species eats. Such information is common in books about animals and is easily found by using the web. Plants and fungi are a little trickier – they need nutrients from decaying dead living things or from the soil. These should not be left out of food chains and webs.

Linking species by who eats what can be great fun. These food webs can be based on just one species or all the species of a place. Start with one species first and something the child is familiar with – perhaps a pet. Draw a diagram with the arrow head going to the (mouth) species that does the eating of the other. You can have multiple arrow heads into one species if it eats more than one thing, or multiple arrows from a species that is eaten by many other species. Try to go the whole way from animals (consumers) to plants (producers) and to the fungi and animals that eat dead things (decomposers).



Two styles of 2D food webs by an 8 year old

If you focus on one species (a food chain) and follow species down, then a triangular diagram is likely. If the death and subsequent decay is taken into account, then adding in what eats the decaying matter can produce a circle. If you do all the species of a place, it will make a web – quite often a messy one. Science text books will have examples of these, or search the web.

Food webs can be in words, pictures, ICT, or models. Try telling a food chain/web story using cards with species on them. As you put cards on top of what it eats or under what is eating it, you can create a story. A pile should result at the end of all the species linked by eating. If there are some choices, retell it with different sequences and survivals to the top!

River Red Gums are an important Australian tree, inland especially. They mark where the water courses run, not necessarily all the time. They also have much life linked with them, but this is not so well known. The key changes in conditions that should be observed are the difference between night and day, dry and wet.

Studies of the biodiversity of the River Red Gums in the Riverina² reveal some key differences in food chains with these changing environmental conditions. In the day, bird species dominate; in the night, it's the marsupials. In a flood, aquatic species and water birds are added in. See www.reec.nsw.edu.au/geo/scirrg/scrrg15.htm for some clear food web diagrams of this complexity.

More complex issues of change

How should River Red Gum Woodlands be managed?

They have been a great resource for our society for construction uses, like railway sleepers, and as a fuel, wood or charcoal, for over a century. But after a 'too long dry', many are now in trouble or already dead. Does this matter? Is it only a tree that dies? What are the economics when a tree dies or goes out of consumption?

Someone who can appreciate the biodiversity of any tree, or place, will also recognise that it is not just the trees that are under threat or lost. While some species can nest in the hollows of dead trees and creatures and fungi live in eerie white skeletons, other species will have been lost from the live trees. Studying biodiversity for changes, linkages and complexity, can help develop understanding of, and opinions on, issues such as retaining dead trees or the recent creation of parks to protect River Red Gum Trees along the Murray River.

Should the living things of a place have greater economic value than the potential human uses of it? This is an important question that could be discussed with older children as a part of their study of biodiversity. The Riverina Education website² has a detailed study of the River Red Gum woodlands, ending with a timber logging plan (www.reec.nsw.edu.au/geo/scirrg/scrrg20.htm). Not logging was not a given choice, but this is what my teenage son chose for his plan and gave good reasons for it, despite the devastating economic consequences for the 'company' and its employees he was running in his plan.

Growth changes

'Biodiversity is life' is part of the IYB logo. But what does life need to live, ie. grow? Understanding change from the growth perspective can add two more aspects of complexity: the structure of living things as systems; the needs of life forms for home (shelter, place to reproduce) and food (nutrients, minerals, energy sources) and transportation (food via air/water to cells). Try some simple experiments to explore changes and complexities:

- Rings of growth – you need a bulb. Cut it in half, find the linkages from roots to bulb to leaves and flower. It's home is the soil where it reproduces. Its roots search out food in the soil. Water, from soil and air, transport the food around the cells. Sunlight is converted to plant energy combined with food for growing new cells.
- Transportation – you need a stalk of celery and a jar of food dyed water. Leave the celery in the jar and watch a line of dyed water crawl up it.
- Live & plastic flowers – You need eight jars, four with water, and four covers. Make matching pairs of freshly cut and plastic flowers: two jars with water – one open to sunlight, and two jars with no water – one covered. Leave them and check them daily to record what happens. Make conclusions about the needs of living plants for light and water compared with plastic ones.



Photo: Lyn Saint

Changing your backyard biodiversity.

Time to add to the biodiversity of your backyard! Choose some vegetables. Discuss why you choose them. Plant them. Help them (and observe them) grow...until they are ready to eat! Did you notice other changes to biodiversity linked to them? Now, enjoy devouring them!

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Photos: Jeanie Clark, Drawings, Michael Clark

¹ An example of a 'Tree of Life' resource with clear diagrams is the *Variety of Life* by C. Tudge, OUP 2000.

² The Riverina Environmental Education Centre's website "*River Red Gum*" (www.reec.nsw.edu.au/geo/scirrg) is worth visiting for its detailed 20 lessons on the tree and its ecosystem.

Grampians Camp 2010

Sunday 17 October to Friday 22 October (5 nights)

Grampians Gardens Tourist Park, 2223 Grampians Road, Halls Gap

www.grampiansgardens.com.au

or email info@grampiansgardens.com.au

Activities :

The following activities are scheduled as long as there are sufficient numbers. There are limited places available for canoeing, abseiling/rockclimbing and high ropes.

- Canoeing.
- Bambuk Aboriginal Cultural Centre with options of a film presentation or aboriginal dreamtime stories, didgeridoo workshop, boomerang throwing, bush tucker discovery walk with tastings
- Abseiling & Rock Climbing
- High Ropes
- Mini golf
- Possible bushwalks
- Zoo including education session, handling snakes and lizards, and a guided tour

One night's accommodation payable to confirm booking, remainder on arrival.

Powered and unpowered campsites are available. There may be a limited number of cabins remaining.

Kitchen and undercover dining area available.

Please book accommodation by phoning the caravan park on 03 5356 4244.

On booking your accommodation, please email Julie at juliemc9@gmail.com for an activities booking form.