Samford State School

Biodiversity Project 2011

Scientist in Residence:
Dr John Stanisic

The Snail Whisperer


Clams
Euglenophytes
Jellyfish
Urchins
Protists
Conifers
Insects
Toadstools
Gree
Rusts
Mushrooms
Reptiles
Slugs
Paramecium
Sea
Spiders
Quillworts
Echinoderms
Coral
Pteridophytes
Arachnids
Arthrpopods
Animals
OPysters
annelids
Bryophytes
Tardigrades
Morerans
Basidiomycota
Protozoa
Platyhelminthes
Sponges
Molluscs
Fungi
Flowering
Birds
Vertebrates
invertebrates
Rotifers
Amoeba
Mosses
Nematodes
Starfish
Snails
Lycopodiophytes
Blue
Magnnoliophytes
Mammals
Plants
Cyanobacteria
Trees
Crustaceans
Amphibians
Ferns
Cnidarian
Euglena
Mussels
Pine
Fish
Flatworms
plants
Worms
algae
Chhordates
Hydra
Squid
Club
Roundworms
Octopus
Bacteria
Viruses

Samford State School Biodiversity Project

AIM

To identify and assess the key elements of the invertebrate fauna of the Samford State schoolyard.

OUTCOME

Appreciation of the role of invertebrates in the ecosystem;
Comparison of Riparian [creek], Araucaria forest [school] and Rainforest [Mt Glorious] habitats and their biodiversity
Recommendations for school yard improvements

STUDY SITE

Samford State School, School Road, Samford.

FIELD METHODOLOGY

- Deploy pitfall traps (two lines) for 4 weeks.
- Deploy Malaise traps for two 1-week periods

ON SITE ACTIVITIES

- Sampling flying and ground-dwelling invertebrates in selected areas of the school grounds using standard pitfall and malaise traps.
- Sorting and identification of samples to major invertebrate orders.
- Identifying the functional role of selected invertebrates in the ecosystem.
- Presentation of results. Why are invertebrates important?

OFF SITE ACTIVITY

- Field trip to Mt Glorious with Dr John Stanisic, BAAM Biodiversity Scientist

RESOURCES

- Pitfall traps (10) with pegs and covers
- Malaise traps (2) and pegs
- Pitfall traps (10) with pegs and covers
- Malaise traps (2) and pegs
- Preservatives (95% EtOH, Propylene Glycol)
- Small shovels, strainers, hammers

11 Year 6 and 7 G&T students, Lorelle Holcroft [Deputy Principal], Justin Marchesi [GEM], Dr John Stanisic [BAAM]

Biodiversity Assessment AND MANAGEMENT PTY LTD

PROJECT TIMELINE

Term 4, 2011

Week	Activity	Teacher Leaders	Resources
1	Introduction to Biodiversity and the 5 Kingdoms A closer look at the Animal Kingdom Defining *Biodiversity*	Ms Holcroft Mr Marchesi	Smart Board Concept Map Activity Digital and Monocular Microscopes Leaf Litter
2	Vertebrates and Invertebrates Defining *Invertebrates* Learn use of binocular and digital microscopes ❖ Dr Stanisic: Set Pitfall 2 and Malaise 2 on the weekend.	Ms Holcroft Mr Marchesi	Smart Board Digital and Binocular Microscopes Leaf Litter Attenborough DVD *Life in the Undergrowth*
3	Set Pitfall 1 and Malaise Traps 1	Dr Stanisic, Ms Holcroft, Mr Marchesi	Pitfall traps (10) with pegs and covers Malaise traps (2) and pegs Preservatives (95% EtOH, Propylene Glycol) Small shovels, strainers, hammers
4	Studying invertebrates Defining Ecosystem Process Groups and linking to species groupings	Dr Stanisic/Ms Holcroft	Smart Board Sorting specimens from Malaise 2
5	Monitor and repair traps; identification of species; collecting and photographing species	Dr Stanisic, Ms Holcroft	Preservatives (95% EtOH, Propylene Glycol) Small shovels, strainers, hammers Digital microscope Microscopes
6	Monitor traps; liaison with Queensland Museum	Dr Stanisic, Ms Holcroft	Preservatives (95% EtOH, Propylene Glycol) Small shovels, strainers, hammers
7	Field trip to Mt Glorious Identification of species; collecting, labelling and photographing species	Dr Stanisic, Ms Holcroft	Gloves Camera Maps
8	Monitor traps; report writing	Ms Holcroft,	Digital microscope Microscopes
9	Publication of report [upload to SEMP]	Dr Stanisic, Ms Holcroft	

PARTICIPANTS:

STUDENTS

6B	Ella
6B	Xaviere
6B	Killian
6C	Ben
6C	Kyle
6D	Kate
6D	Jayden
7B	Toby
7B	Tristan
7B	Indiana

STAFF

Ms Lorelle Holcroft
Dr John Stanisic [*Biodiversity Assessment and Management Pty Ltd* (BAAM) and Queensland Museum]
Mr Justin Marchesi

HABITAT/METHOD PROFILE

Site 1: Samford SS site

27º 22’ 38.9”S, 152º 52’ 54.7”E; Elevation 72m

Forest Canopy Trees: *Araucaria cunninghamii* [Hoop Pine]

Shrub Layer: Absent

Grass Layer: *Megathyrsus maximus* [Guinea grass] with poor litter

Malaise Trap 1. Deployed: 20 October, 2011

Collected: 27 October, 2011

Pitfall Trap 1. Deployed: 20 October, 2011

Repaired: 2 November, 2011

Collected: 23 November 2011

Site 2: Samford SS – Creek bank adjacent to back fence of school

27º 22’ 40.3”S,152º 52’ 52.4”E; Elevation 60m

Forest Canopy Trees: Multi-species tree canopy *(inc. Lophostemon confertus* [Brush Box], *Eucalyptus spp.* and the introduced *Pinus radiata* [Pine Tree] and *Cinnamomum camphor* [Camphor Laurel])

Shrub Layer: Shrub layer flowering and complex including a number of introduced species e.g. *Lantana camara* [Lantana]*, Cassia, Psidium guajava* [Guava]

Grass Layer: *Megathyrsus maximus* [Guinea grass] with poor litter

Malaise Trap 2. Deployed: 12 October, 2011

Collected: 22 October, 2011

Pitfall Trap 2. Deployed: 12 October, 2011

Repaired: 22 October, 2011

Collected: 9 November, 2011

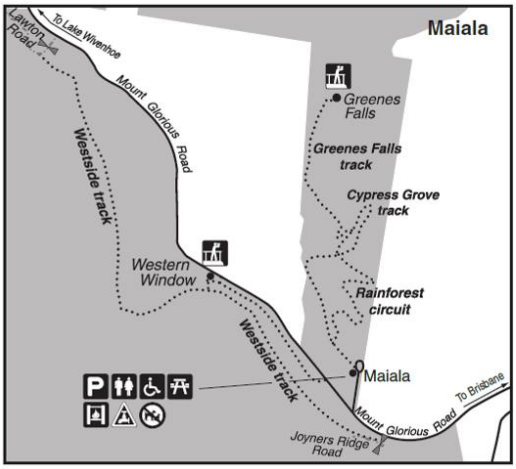
Site 3 Offsite: Mt Glorious – Rainforest Circuit Walking Track Maiala, D'Aguilar National Park

27º 19' 59.4"S, 152º 45' 48.1"E; Elevation 680m

Forest Canopy Trees: Rainforest species consisting of multi-species tree canopy

Shrub Layer: Present

Grass Layer: Absent. Leaf litter prominent



This special area was the first national park declared on the D'Aguilar Range. Originally cleared for a timber mill, Maiala is now a spacious and peaceful place to visit. Some machinery and remnant hoop pine plantation remain as evidence of Maiala's loud and laborious past.

http://www.derm.qld.gov.au/parks/daguilar/about.html

Once eucalypt forest, it is now subtropical rainforest. Sydney Blue Gums are the remaining evidence of this earlier forest type.

Activity: Walking and hand-collecting for 1.5 hours.

HYPOTHESES

All science is progressed through a process of hypothesis testing.

In this case we are examining the invertebrate biodiversity of two sites which are distinguished (among other things) by quite different vegetation structure (trees and shrubs). The common view would be that there should be a difference in the invertebrate biodiversity of the two sites, with probably greater diversity at the creek site because of the more diverse vegetation. We could then hypothesise that there is a difference in the invertebrate biodiversity of the two sites based on our knowledge of invertebrate habitat preferences. And we would normally expect this to be true. But in science there is a need to test this hyptothesis with data rather than just making an educated guess.

So our hypothesis [H_1] is: **There is a difference in the invertebrate biodiversity of the two sites.**

This is called the alternative hypothesis. However, to prove that this is really true and not due to chance alone we try to disprove what is called the 'null hypothesis'. This is the hypothesis which is the opposite of the alternative hypothesis.

So our null hypothesis [H_0] is: **There is no difference in the invertebrate biodiversity of the two sites.**

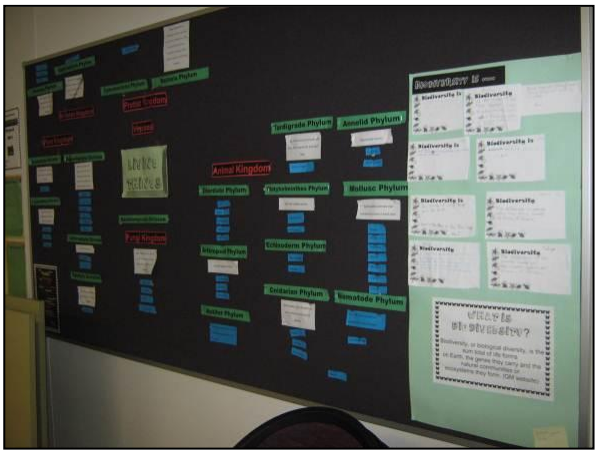
H_0

There is no difference in the invertebrate biodiversity of the two sites.

We try to disprove this hypothesis with data collected in a scientific experment which is our field survey. The data collected is usually analysed and tested by specially designed statistical significance tests and probability tables. To simplify matters, in our case the analysis is going to be just a comparing the numbers of the key invertebrate groups which we managed to collect at the two sites. Higher numbers will indicate a greater diversity. A show of hands from all the 10 participants will be used instead of probability tables. If at least 9 out of 10 hands are raised when I ask whether there is a significant difference in the numbers of invertebrate groups between site 1 and site 2, then the null hypothesis is considered disproved.

As a result the alternative hypothesis which is 'that there is a difference in the invertebrate biodiversity of the two sites'…is accepted as a true and factual statement.

SURVEY PROCESS:



Initial lessons were conducted to look at:

- Kingdoms
- Animal Kingdom
- Vertebrates and Invertebrates
- Meaning of biodiversity

The surveys were conducted in Samford SS at two locations: the creek bank adjacent to the back fence of school, in a riparian forest [river bank – mixed regrowth forest. Regrowth since 1995] and a Hoop Pine forest, to the side of school grounds [Araucaria cunninghamii].

Both pitfall and malaise traps were used in the surveys.

Pitfall Trap Collection Process

Pitfall traps were used to catch ground-active invertebrates. Traps were set about three to five metres apart and left for several days before collection.

Equipment

- 2 litre ice cream container, solid lid and lid with large central hole cut
- Trowel
- Perspex/plastic roofing to cover the traps plus metal pegs to keep in place
- Solution to enable insects to sink
- Specimen jars
- Sieve

Method

1. Use a trowel to dig a hole large enough for the container. Place the container with solid lid in the ‘trap’ position, with the lip flush with the ground. Backfill around the container to create a flat plane with the ground.
2. Once ground around container is tamped, remove solid lid and replace with the holed lid.
3. Place roof over the container and peg in place
4. Add alcohol solution to containers
5. Leave traps for several days
6. Collect invertebrates from solution
7. Sort using tweezers and collection jars
8. Observe features and record
9. Identify invertebrates
10. Record scientific and common names, plus count individual numbers for the survey

Malaise Trap Collection Process

Malaise traps collect invertebrates in the vertical space perpendicular to the forest floor. It involves a series of nets strung in an area slightly away from the pitfall traps, with the base on the forest floor and the top of the trap about one to two metres from the ground. The malaise traps collect flying invertebrates over several days.

Equipment

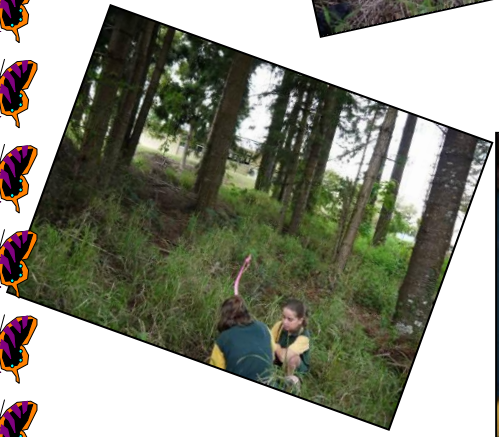
- Malaise trap [central and vertical panel]
- Collection bottle/container
- Solution to enable insects to sink
- Specimen jars
- Sieve

Method

1. Using existing trees, identify site near pitfall traps to tie vertical and central panels
2. Place collection bottle at the top of the vertical panel.
3. Fill bottle half to three quarters with collection solution
4. Leave traps for several days
5. Collect invertebrates from solution
6. Sort using tweezers and collection jars
7. Observe features and record
8. Identify invertebrates
9. Record scientific and common names, plus count individual numbers for the survey

Lab Work

Field Work





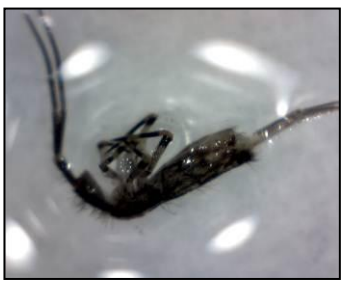


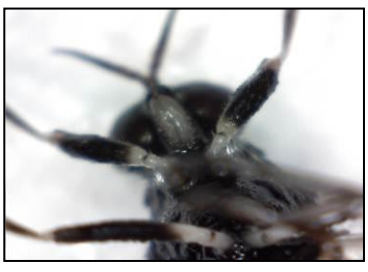



DATA COLLECTIONS

Malaise Trapping Data

Insect	Role	School: Site 1	Creek: Site 2
Diptera [flies]	Predation Pollination	11	40
Lepidoptera [moths]	Pollination	8	32
Hymenoptera [ants, bees and wasps]	Seed dispersal Pollination Improve soil structure Interaction with other species	4	9
Coleoptera [beetles]	Herbivory Predation Parasitism	5	16
Neuroptera [lace wings]	Pollination	0	4
Hemiptera [bugs]	Food sourcing Decomposition	4	10



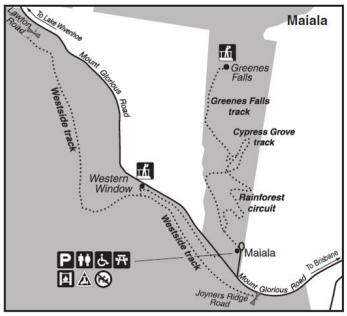


Pitfall Trap Data

Insect	Role	School: Site 1	Creek: Site 2
Arachnida [spiders and mites]	Predation Pollination Parasitism	3	56
Oligochaeta (earthworms)	Soil Building	16	123
Hymenoptera [ants]	Seed dispersal Pollination Improve soil structure Interaction with other species	21	12
Amphipoda (forest hoppers)	Herbivory Decomposition	9	12
Hemiptera [bugs]	Food sourcing Decomposition	1	10

OFF SITE ACTIVITY REPORT

Students were briefed on the rainforst area and collected snails as the invertebrate indicators of a rainforest environment. Species common in this area are illustrated below:



Giant Panda Snail
Hedleyella falconeri

Fraser's Banded Snail
Sphaerospira fraseri

Glossy Turban Carnivorous Snail
Terrycarlessia turbinata

Challenger's Bristle Snail
Ramogenia challengeri

Red-flamed Pinwheel Snail
Nautiliropa omicron

Black-spotted Semi-slug
Macularion aquila

Spiral-lined Carnivorous Snail
Echotrida strangeoides

Southern Flat-coiled Snail
Pedinogyra rotabilis

Pink Glass-snail
Nitor pudibunda

Hairy Pinwheel Snail
Setomedea seticostata

Richmond River Keeled Snail
Thersites richmondiana

Drayton's Droplet Snail
Pleuropoma draytonensis

SPECIES COLLECTED

Hedleyella falconeri
Giant Panda Snail
Location: Maiala, Mt Glorious SEQ in rotten tree stump
Collector: Toby
Date: 16 November, 2011

Sphaerospira fraseri
Fraser's Banded Snail
Location: Maiala, Mt Glorious SEQ on ground
Collector: Toby
Date: 16 November, 2011

Hedleyella falconeri
Giant Panda Snail
Location: Maiala, Mt Glorious SEQ on ground
Collector: Ben
Date: 16 November, 2011

Sphaerospira fraseri
Fraser's Banded Snail
Location: Maiala, Mt Glorious SEQ on ground
Collector: Ben
Date: 16 November, 2011

Nitor pudibunda
Pink glass-snail
Location: Maiala NP
Collector: Tristan
Date: 16 November, 2011

Hedleyella falconeri
Giant Panda Snail
Location: Maiala NP
Collector: Tristan
Date: 16 November, 2011

Macularion aquila
Black Spotted Semi Slug
Location: Maiala reserve Mt Glorious
Collectors: Kyle, Indiana
Date: 16 November, 2011

Ramogenia challengeri
Challengers Bristle Snail
Location: Maiala reserve Mt Glorious
Collector: Kyle
Date: 16 November, 2011

Macularion aquila
Black Spotted Semi Slug
Location: Maiala reserve Mt Glorious
Collector: Kate
Date: 16 November, 2011

Nitor pudibunda
Pink Glass Snail
Location: Maiala reserve Mt Glorious
Collector: Kate
Date: 16 November, 2011

Ramogenia challengeri
Challenger's Bristle Snail
Location: Mt Glorious
Collector: Ella
Date: 16 November, 2011

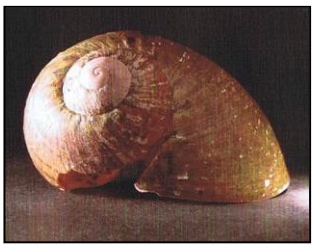
Terrycarlessia turbinata
Glossy Turban Carnivorous Snail
Location: Mt Glorious
Collector: Ella
Date: 16 November, 2011

Sphaerospira fraseri
Fraser's Banded Snail
Location: Mt Glorious In forest down the road from Maiala NP. In leaf litter
Collector: Xaviere
Date: 16 November, 2011

Pedinogyra rotabilis
Southern Flat Coiled Snail
Location: Mt Glorious In forest leaf litter
Collector: Jayden
Date: 16 November, 2011

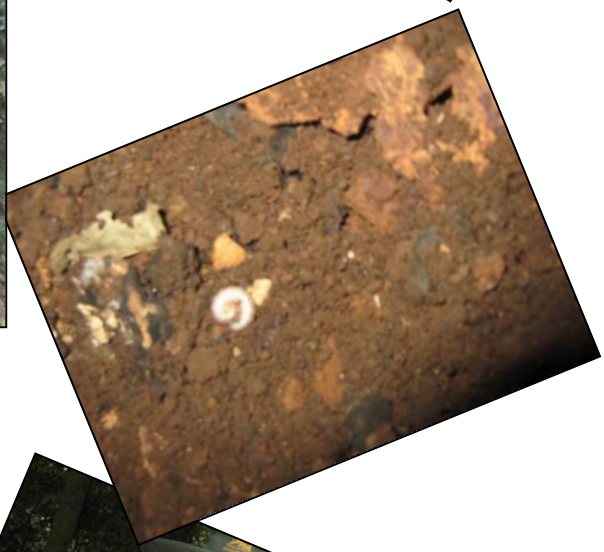
Sphaerospira fraseri
Fraser's Banded Snail
Location: Mt Glorious In forest leaf litter
Collector: Jayden
Date: 16 November, 2011

Hedleyella falconeri
Giant Panda Snail
Length: 58mm
Location: Mt Glorious, Qld, Australia
Collector: Killian
Date: 16 November, 2011



Nitor pudibunda
Pink Glass Snail
Length: 17mm
Location: Mt Glorious, Qld, Australia
Collectors: Killian, Indiana
Date: 16 November, 2011

Field Work at Mt Glorious



CONCLUSIONS

H_0: **There is no difference in the invertebrate biodiversity of the two sites.**

Malaise Trap data: Unanimously agreed that the Creek Area had the most biodiversity

Pitfall trap data: Unanimously agreed that the Creek Area had the most biodiversity

The null hypothesis is disproven.

Therefore, H_1 is true: **There is a difference in the invertebrate biodiversity of the two sites.**

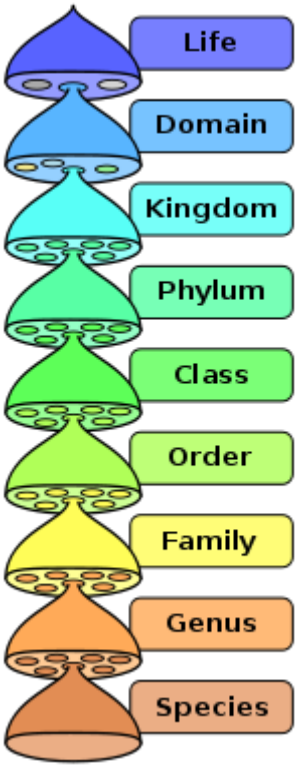
RECOMMENDATIONS

The students made a number of recommendations to improve the biodiversity of the Pine Forest area:

1. Plant a thicker shrub layer in the Hoop Pine Forest consisting of native plants.
2. Remove the introduced species of plants.
3. Mulch the area.
4. Increase the number of native plants.
5. Put rotting wood around the area to allow invertebrate diversity and number to increase.
6. Clear some of the grass to plant the native trees that will grow in the shade.
7. Investigate what invertebrates each plant species attracts/hosts.
8. Liaise with Environemntal Cub in Brisbane eg the Butterfly Club

Considerations for a 2012 Project:

- Investigate which plants attract which species of invertebrate.
- Plant the araucaria forest with appropriate native shrubs.
- Increase the amount of rotting timber in the forest.



APPENDIX 1: Living Things:

All organisms are split into five Kingdoms:

Animal Kingdom: organisms that usually move around and find their own food.

Plant Kingdom: organisms that make their own food and do not actively move around.

Fungi Kingdom: organisms that absorb food from living and non-living things.

Protist Kingdom: organisms that have single, complex cells.

Moneran Kingdom: organisms that have single, simple cells.

Animal Kingdom

The Animal Kingdom is split into several Phyla. Each Phylum group contains organisms that have things in common. Below is a list of some animal Phyla:

- **Chordate Phylum:** All the animals which have a backbone. Includes: Fish, Reptiles, Birds, Amphibians, and Mammals.
- **Arthropod Phylum:** All the "jointed legged" animals. All of these animals have an exoskeleton, meaning the skeleton is on the outside of the body. Include: Insects, Arachnids, and Crustaceans.
- **Mollusc Phylum:** Soft-bodied animals that sometimes have a hard shell. Includes: Snails, Slugs, Octopus, Squid, Clams, Oysters, and Mussels.
- **Annelid Phylum:** Segmented worms. Includes: Earthworms and Leeches.
- **Rotifer Phylum:** Tiny, microscopic animals with a wheel-shaped mouth and tiny hairs.
- **Nematode Phylum:** Very tiny worms with no segments in their bodies. Also called Roundworms.
- **Tardigrade Phylum:** Tiny, slow-moving animals with four body segments and eight legs. Includes Water Bears.
- **Cnidarian Phylum:** Soft-bodied, jelly-like animals with tentacles and venom glands. Includes: Hydra, Jellyfish, Anemones, and Coral.
- **Echinoderm Phylum:** Often spiny animals, with several "arms" reaching out from the centre of its body. Includes: Starfish and Sea Urchins.
- **Platyhelminthes Phylum:** Soft, flat-bodied worms. Includes: Planarians and Tapeworms.

Plant Kingdom

Instead of Phyla, the Plant Kingdom is split into Divisions. Each Division group contains organisms that have things in common. Below is a list of some plant Divisions:

- **Magnoliophyta Division:** All "flowering" plants. These plants have leaves, stems, and roots. After flowering, they form fruits with seeds. Includes most crops, trees, shrubs, grasses, garden plants, and weeds.
- **Coniferophyta Division:** Plants that bear cones. Includes: Pine Trees and Cedars.
- **Pteridophyta Division:** Plants that have roots and stems, but do not have flowers or seeds. Instead, they spread with spores. Includes Ferns.

- **Bryophyta Division:** Plants with very small leaves and stems, with no roots and no flowers. Usually grow very low to the ground. Includes: Mosses.
- **Lycopodiophyta Division:** Small plants with green, branched stems, scale-like leaves, and no flowers. Usually grow very low to the ground. Includes: Club Mosses, Quillworts, and Spikemosses.

Fungi Kingdom

Just like Plants, the Fungi Kingdom is split into Divisions instead of Phyla. Each Division group contains organisms that have things in common. Below is a list of some fungi Divisions:

- **Basidiomycota Division:** Many different forms, most of which help decompose and break down wood, litter, and animal poop. Includes: Mushrooms, Puffballs, Rusts, and Jelly Fungus.

Protist Kingdom

The Protist Kingdom is split into several Phyla. Each Phylum group contains organisms that have things in common. Below is a list of some protist Phyla:

- **Protozoa Phylum:** Tiny, microscopic organisms which reproduce by splitting in half to become two new organisms. Includes: Amoeba, Paramecium, and Sporozoa.
- **Euglenophyta Phylum:** Tiny, microscopic organisms which have a flagella (tiny hair-like thing that helps them move through water). Some eat algae and keep it inside their bodies, using it to make food. Includes Euglena.

Moneran Kingdom

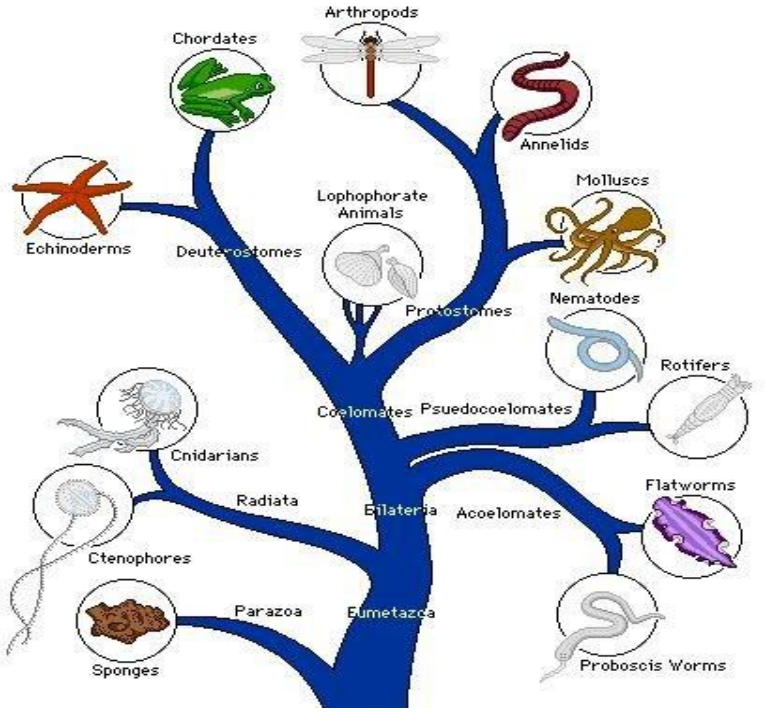
The Moneran Kingdom is split into several Phyla. Each Phylum group contains organisms that have things in common. Below is a list of some Moneran Phyla:

- **Bacteria Phylum:** These organisms are extremely important and can also be very dangerous. They live anywhere there is moisture, including inside animal's bodies. Some carry disease.
- **Cyanobacteria Phylum:** These organisms are also known as Blue-green Algae. These algae are different from the Green Algae found in the Plant Kingdom.

Viruses

Scientists have not yet figured out where to put viruses. We have a lot we need to learn about them. They do not currently belong in one of the five Kingdoms.

http://www.fcps.edu/islandcreekes/ecology/classification_group_expla.htm



APPENDIX 2: Ecosystem Process Groups