LESSON 4

PLANT AND ANIMAL CLASSIFICATION AND IDENTIFICATION

Aim
Become familiar with the basic ways in which plants and animals can be classified and identified

CLASSIFICATION OF ORGANISMS

Living organisms that are relevant to the ecotourism tour guide are generally divided into two main groups of things:

ANIMALS.....and.....PLANTS

The boundaries between these two groups are not always clear, and there is an increasing tendency to recognise as many as five or six kingdoms. However, for our purposes we will stick with the two kingdoms.

Each of these main groups is divided up into a number of smaller groups called 'PHYLA' (or Phylum). Each phylum has certain broad characteristics which distinguish it from other groups of plants or animals.

For example, all flowering plants are in the phyla 'Anthophyta' (if a plant has a flower it is a member of the phyla 'Anthophyta'). All animals which have a backbone are members of the phyla 'Vertebrate' (i.e. Vertebrates).

Getting to know these major groups of plants and animals is the first step in learning the characteristics of, and learning to identify living things. You should try to gain an understanding of the order of the phyla - from the simplest to the most complex - in both the animal and plant kingdoms. Gaining this type of perspective will provide you with a framework which you can slot plants or animals into when trying to identify them in nature.

Understanding the phyla is only the first step, however. Phyla are further divided into groups called 'classes'. Classes are divided and divided again and so on. After making several divisions we get down to the level of FAMILIES. FAMILIES are further divided into GENERA (singular: genus). GENERA are further divided into SPECIES.

Kingdoms are divided into Phyla
Phyla are divided into Classes
Classes are divided into Orders
Orders are divided into Families
Families are divided into Genera (plural for genus)
Genera are divided into Species

When identifying a particular plant or animal the names usually used are the Genus and Species.

Examples:

Eucalyptus ficifolia is the Red Flowering Gum
Eucalyptus is the genus name *ficifolia* is the species name

Homo sapiens is the scientific name for humans
Homo is the genus name *sapiens* is the species name.

Tananus indefinitus is the March Fly
Tananus is the genus name *indefinitus* is the species name.

CLASSIFICATION OF ANIMALS

The Animal Kingdom is laid out from the simplest to the most complex phyla as follows:

Phylum	**Sub Phylum or Class**
Protozoa	Mastigophora - flagellate
	Sarcodina - amoeboid
	Sporozoa - spore forming
	Cilopora - ciliate
Porifera	Calcarea - chalk sponge
	Hexactinellida - glass sponges
	Demospongiae - horny sponges
Coelenterata	Hydrozoa - hydrozoans
(Cnidaria)	Scyphozoa - jellyfish
	Anthozoa - coral, sea anemone
Platyhelminthes	Turbullaria - free living
(Flatworms)	Trematoda - flukes
	Cestoda - tapeworms
Nemertes	Ribbonworms
Aschelminthes	Nematoda - roundworms
	Rotifera - rotifers etc
Acanthocephla	
Priapulida	these phyla unimportant
Annelida Segmented worms)	Polychaeta - marine (many bristles)
	Oligochaeta - land and freshwater (few bristles)
	Hirudinea - leeches
	Archiannelids....minor
Arthropods	Pcynogonia - spider like on sea shore
	Symphyla)
	Chilopoda) Myriopods 9000 species
	Diplopoda)
	Crustaceae - 28,000 species
	Arachnids - 57,000 species plus
	Insecta - 700,000 species plus
Onychophora	eg. Peripatus
(hook bearer)	

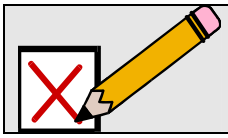
Mollusca	Amphineura - chiton, neoplina
	Scaphopoda - tusk shells
	Gastropods Sub Class
	Prosobranchia - Cowries, welks etc.
	Oposthobranchia - Sea hares etc.
	Pulmonata - slugs and snails
	Pelecypoda - bivalves - muscles, oysters etc.
	Cephalopoda - cuttlefish, squid, octopus etc.
Echinodermata	Sea lilies, starfish, sea urchins, sea cucumbers etc. 5 radially symmetrical.
Hemichordata	Enteropneusta - Acorn worms
Chordata	(Urochordata)
	Cephelochordata) Vertebrata
	Acrania
	Agnatha - Jawless fishes
	Chondrichtyes - cartiliginous fish
	Osteichthyes – bony fish
	Amphibia - amphibians
	Reptillia - reptiles
	Aves - birds
	Mammalia - mammals

VERTEBRATES - Further Classification	
CLASS Amphibia	
Sub Class	Stegocephalia - extinct
	Apoda - cecilians; wormlike, no limbs
	Caudata - newts and salmanders
	Anura (Salientia) - Frogs and toads
CLASS Reptilia	
Order	Chelonia - Turtles and tortoises
	Squamata - lizards and snakes
	Rhynchocephalia - tuataras (lizard like)
	crocodilia - crocodiles and alligators
	NB: Other orders are extinct
CLASS Aves	(extinct orders excluded)
Superorder	Palaeognathae (walking birds)
Orders	Casuariiformes (emus, cassowaries); Apetygiformes (kiwis)
	Struthioniformes (ostriches);
	Rheiformes (rheas)
	;Tinamiformes (tinamous).
Superorder	Neognathae (flying birds)
Orders	Sphenisciformes (penguins); Procellariformes (petrels); Gaviiformes (loons);
	Podicipitiformes (grebes); Pelecaniformes (gannets, cormorants, pelicans etc);
	Ciconiiformes (herons, storks, ibis, flamingos etc); Anseriformes (swans, geese, ducks etc)
	Falconiformes (eagles, buzzards, hawks, condors etc);
	Galliformes (chickens, turkeys, quail peacocks etc);
	Gruiformes (cranes, coots, mudhens etc);
	Charadriiformes (gulls, terns, snadpipers, plovers etc);
	Columbiformes (pigeons, doves etc);
	Cuculiformes (cuckoos etc);
	Psitaciformes (parrots, macaws, parakeets and lovebirds);
	Strigiformes (owls);
	Caprimulgiformes (nighthawks, whipoorwills);
	Apodiformes (hummingbirds, swifts);
	Passeriformes - perching birds (crows, magpies, wrens robins, thrushes, starlings, shrikes, finches, warblers, sparrows etc

PLANT CLASSIFICATION

The Plant Kingdom is divided up into a number of phyla including the following:

PHYLUM	COMMON NAME
Cyanophyta	Blue Green Algae
Pyrrophyta	Unicellular and lack wall
Chrysophyta	Golden Algae
Phaeophyta	Brown Algae
Rhodophyta	Red Algae
Xanthophyta	Golden Green Algae
Euglenophyta	Euglena
Chlorophyta	Green Algae
Schizomycophyta	Bacteria
Myxomycota	Slime moulds
Eumycota	Fungi
Bryophyta	Mosses and liverworts
Psilophyta	Psilotum
Lycophyta	Club mosses
Sphenophyta	Horsetails
Pterophyta	Ferns
Ginkgophyta	Ginkgo
Cycadophyta	Cycads
Coniferophyta	Conifers
Anthophyta	Flowering plants (Angiosperms)



SELF ASSESSMENT
Perform the self assessment test titled ‘test 4.1’
If you answer incorrectly, review the notes and try the test again.

VIRUSES – THE ODD ONE OUT?

Viruses grow and multiply like living things, and yet they do not have all of the characteristics of all other living things. Some will argue that viruses are living; others will argue that they are not. They remain part of the environment, but they only survive as parasites - inside of other living things. When it comes into contact with a host cell, a virus can insert its genetic material into its host, literally taking over the host's functions. An infected cell produces more viral protein and genetic material instead of its usual products. Some viruses may remain dormant inside host cells for long periods, causing no obvious change in their host cells. But when a dormant virus is stimulated new viruses are formed, self-assemble, and burst out of the host cell, killing the cell and going on to infect other cells.

USING KEYS TO IDENTIFY ORGANISMS

The scientific community as well as the hobby botanist or zoologist finds the use of biological 'keys' extremely valuable tools in identifying living things. A key is simply a systematic guide which you work through to find out the name of an organism. Read the 'Key to Plant Phyla', found in Part 16 of the Accompanying Notes to see an example of a key to plants.

Most keys are dichotomous – i.e. they list two choices at each step. There are some exceptions, but the basic way to use the key remains the same:

- Start at the beginning of the key. This will usually be numbered 1 or A. Read the description of the plant. If your plant fits this description, then continue on to the next description directly below the first – do not worry if the next number of letter is not consecutive. If your plant does NOT fit the first description, you need to go to the alternative description which will usually be marked 1* or A*.

- Read the description you have now arrived at. If your plant fits the description, then continue on to the next description located directly below. If your plant does not fit the description, then proceed to the alternative (usually marked with an * or something similar).
- At some point in the key, you will arrive at a group name for the plant – this will be listed after a description. It may be a family, genus, species, or even a group that the writer of the key has determined. This is the group that your plant belongs to.

An easy key to plant groups

This key is used as an illustration of a key that you might find in a biology book. It is not important that you understand all of the scientific jargon in the key – rather, try to grasp the overall concept of how to use the key, which is explained below.

1. No vascular tissue present
    2. Plant body not specialised into stems and leaves, and the reproductive cells not surrounded by a protective layer.
        3. Chlorophyll is present
            4. Plant usually lives in water……..Algae
            4*Plant usually lives on rocks or in trees……..….Lichens (also some algae)
        3* Chlorophyll is not usually present……Fungi
    2* Plant body is often specialised into stems and leaves, and the reproductive cells are surrounded by a protective layer.
    5 Plant body dorsiventral, thalloid or leafy……...……Liverworts
    5* Plant body radial, leafy……Mosses

1*Vascular tissue present
    6. Sexual reproduction by spores……Ferns
    6* Sexual reproduction by seed
        7. Seeds not enclosed in an ovary, but often on scales in a cone……Gymnosperms
        7* Seeds enclosed in an ovary, flowers present……Angiosperms
            8. Parallel venation in leaves, flower parts in multiples of 3, has a fibrous root system……Monocotyledons
            8* Reticulate venation in leaves, flower parts in multiples of 4 or 5, has a taproot……Dicotyledons

Using the Easy Key to Plant Groups, we could key out a Hibiscus plant as follows:

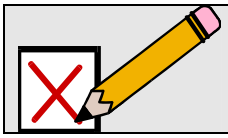
1. No vascular tissue present – this does NOT correctly describe a hibiscus plant. Therefore, we proceed to the alternative description:
1*Vascular tissue present – which is correct. Therefore we proceed on to the description located directly below:
6. Sexual reproduction by spores – this is incorrect, so we proceed on to the alternative description:
6* Sexual reproduction by seed – this is correct, so we proceed on to the description located directly below:
7. Seeds not enclosed in an ovary, but often on scales in a cone – this is incorrect, so we proceed on to the alternative description:
7* Seeds enclosed in an ovary, flowers present – this is correct, so we proceed on to the description located directly below:
8. Parallel venation in leaves, flower parts in multiples of 3, has a fibrous root system – this is incorrect, so we proceed on to the alternative description:
8* Reticulate venation in leaves, flower parts in multiples of 4 or 5, has a taproot……Dicotyledons
This tells us that our Hibiscus plant is dicotyledon, which indeed it is.

OTHER WAYS OF IDENTIFYING

Short cuts can be taken to identifying organisms by simply making comparisons to photographs or drawings. This method can be quite successful and accurate, particularly if you can gain a guide to the particular area which you are looking around in. A guide to plants of California, for example will be a valuable short cut when you are in California. It will save you considering a wide variety of possibilities which are not really possibilities in that locality. This type of guide needs to sometimes be approached with caution though.

Check out who the author, writer or artist was. Some such guides are not accurate in terms of colours used or biological detail etc (eg. a plant might have too many leaves or not enough petals). Many such guides are accurate though and very useful, especially for the hobby naturalist.

A second short cut (similar to what has already been written) is to acquire a list of organisms which are most likely to be found in an area. Naturalist groups, and similar bodies, often publish bird or plant lists for specific areas.



SELF ASSESSMENT
Perform the self assessment test titled 'test 4.2'
If you answer incorrectly, review the notes and try the test again.

SET READING

The following is a case study of Australian animals. There are many interesting websites that relate to animals all over the world. The following are some recommended sites in the United States and Britain.
http://www.naturereserve.org/explorer/summary.htm
http://www.abdn.ac/uk/mammal
http://www.ourworld.compuserve.com/homepage

Australian animals: A case study

It is up to the individual guide when deciding how much information to give to someone when describing an animal. This would be something that would need to be judged depending on time and interest displayed.

As a couple of examples there is some information set out below which could be used to give people a better idea of what a Koala really is. While a guide might not need to go through all of this he might like to talk about some of it, and perhaps hand out written material in addition for visitors to read at their leisure. The main thing is that a guide needs to be well informed about the organisms in the area.

Koala (*Phascolarctos cinereus*)
Koalas were first recorded by Europeans in 1798. In 1816, the koala was given its scientific name - the generic name means pouched bear and the species name means ash coloured. Although the koala has been placed in its own separate family, it is more closely related to the wombat than any other marsupial.

Free Range Husbandry
Feed and Feeding
1. Quantity: varies with the seasons. Koalas tend to eat less in winter then in summer and fortunately the majority of their food trees are summer growers. However it is necessary to bring in additional or supplementary food when the area is over stocked.

2. Quality:
- A/ Balance of tips and more mature leaves (roughage)
- B/ If quality goes up so does consumption. The reverse also occurs resulting in weight loss; lowered milk production resulting in loss of pouch young; or lower growth rate of back young.
- C/ During collection leaves must be prevented from drying out and be fed out as soon as possible. Furthermore they must be kept clean ie. free of dust and other contaminants.

3. Variety: at least two, preferably three, different species of leaves should be fed each day. It is generally accepted that there are approximately 550-600 distinct species of Eucalyptus, of which koalas will eat only about 50.

The preferred species in Queensland include:

E. citriodora	Lemon-scented Gum
E. maculata	Spotted Gum
E. microcorys	Tallow Wood
E. moluccana	Gum-topped Box/Grey Box
E. populnea	Poplar Box
E. punctata	Grey Gum
E. resinifera	Red Stringybark/Red Mahogany
E. robusta	Swamp Mahogany
E. saligna	Sydney Blue Gum
E. teriticornis	Blue Gum/Forest Red Gum

4. Accessibility: additional fed must be located in such a way that a large percentage of it is in easy reach and is not compacted in a tight bunch. These should be rearranged each morning to keep them accessible.

Daily Checks
1. Base of trees for sick/dead animals. Koalas tend to sit bent over forward if sick followed by lying prone on their side as death approaches.
2. Faeces on ground under the canopy, for consistency, ie. normal pellets, or diarrhoea; for internal parasites eg. tapeworm segments.
3. In the case of supplementary food, check leaves eaten or remaining and their species. Determine the reason why leaves have been rejected.
4. If koalas are quiet and accessible, check body condition by feeling the prominence of the spine and scapula (shoulder blade). Very pronounced in animals means it has a low condition or health. Also check for presence of pouch young if relevant, and if alive. In the case of large pouch young, 3 months or older, this can be done visually or by feeling with the palm of the hand.
5. Check eyes for conjunctivitis.
6. Nostrils for upper respiratory tract infection.
7. Backsides for wet bottom or dirty tail.
8. If appropriate, check for signs of oestrus (heat).

Breeding
Males are particularly territorial during the mating season which extends from September through to February/March. They mark trees with scent from the glands on the chest and this combined with the mating call (loud pig-like grunts), attracts the females to the male.
Generally, koalas produce only one offspring per breeding season. After a gestation (or pregnancy period) of 35 days the young is born. At birth it is approx. 19 mm in length and weighs about 0.5 grams. It immediately crawls unaided from the cloaca to the mother's pouch using only its forelimbs. Once inside it attaches itself to one of two teats, where it remains and continues to develop. At 5 1/2 to 6 months the young koala begins to vacate the pouch for short periods. By 7 months it is too large for the pouch and rides around on the mother's back. Weaning occurs at 11-12 months.

Predators
Apart from man, koalas have few predators. Adults and young fall prey to dingoes as they search for food trees. Young koalas are occasionally taken by powerful owls and wedge-tailed eagles. Domestic and feral dogs have been known to main and kill koalas.
Problems
Apart from the daily supply, the main problems associated with the keeping of koalas include:

- Keratocon junctivitis
- Upper Respiratory-tract infections
- Cystitis
- Kidney failure
- Female infertility
- Internal parasites

Macropods : Kangaroos, Wallaroos, Wallabies, etc.
There are 58 species of macropods (large foot) and they vary in size from the Red Kangaroo to the small Rat-Kangaroo. The largest are the Red, and the two species of Grey Kangaroos - Eastern and Western. Almost as large as these are the Wallaroos and the Antilopine Kangaroo.

The most common of the medium sized macropods are the Swamp, Pretty Face or Whip-tailed, Red Necked, Agile or Sandy, and Black Striped Wallabies. Smaller species include the Rock Wallabies, Pademelons, Tree Kangaroos and the Hare Wallabies. These animals range from 4-8 kgs. The smallest are the Rat-Kangaroos, Potoroos and the Bettongs.

Feed and Feeding
In the wild, macropods are cropuscular ie. they start feeding late in the afternoon and into the early hours of the night, rest until early morning and feed again until a few hours after first light. They then seek shelter and rest until late afternoon. Being herbivorous, macropods as a group will virtually eat any form of plant life ranging from crops of lucerne and oats to the bark of trees.
In captivity they should be fed protein pellets containing a coccidostat to prevent coccidiosis. If supplementary feeding is necessary it must be good quality (soft) chaff or hay to prevent Lumpy Jaw.

Problems
Due to their large size, adult male kangaroos and wallaroos are not exhibited in free range situations in many nature parks. They tend to become aggressive particularly if there are does in oestrus and also when hungry and competing amongst themselves for hand held food from the public. A "rest or security" area must be provided that is not accessible to the public.
Other problems include:

- Internal and external parasites
- Coccidiosis
- Lumpy Jaw
- Predators - dogs, foxes, cats
- Public
- Botulism - due to unhygienic feeding conditions.

Wombats
There are three species of wombat common to Australia:
* Common Wombat *Vombatus ursinis*
* Southern Hairy-nosed Wombat *Lasiorhinus latifrons*
* Northern Hairy-nosed Wombat *Lasiorhinus krefftii*

The Common wombat of southern Australia and the Southern hairy-nosed wombat of South Australia are still abundant. The Northern hairy-nosed wombat is restricted to Epping Forest
National Park, near Clermont in central Queensland, and is not found exhibited in zoos or sanctuaries. They are large herbivorous burrowing marsupials, more closely related to the koala than to any other living marsupial.

Wombats are best displayed or exhibited in enclosures. As they are a burrowing creature resembling a miniature bulldozer they soon destroy a free range area as well as the surrounding fences. Furthermore, being nocturnal during summer they cannot be seen in the burrows. Common wombats have a reputation of being aggressive in captivity- they will chase humans and lunge and bite. Enclosures with concrete floors to prevent burrowing and burrows constructed with underground obstruction pits for the viewing public, work well. Burrows must be constructed as to prevent them from filling up with water. It is virtually impossible to keep vegetation other than large trees in such enclosures due to the appetite and the burrowing nature of wombats.

Feed and Feeding
Being herbivorous, wombats will eat a wide range of foods. These include large amounts of grass and hay together with amounts of grain and poultry pellets, apples, carrots, pumpkin and sweet potatoes. They are best fed in the morning as this makes them active and makes them a better exhibit.

Emu *- Dromaius novaehollandiae*
It is Australia's largest bird and the second largest bird on earth. The adult can run up to 50 kms per hour with a bouncy swaying motion. Up a dozen very large dark green eggs are laid and are incubated by the male. Emus are a good addition to nature parks and sanctuaries, although many people are intimidated by their size and appearance. A watchful eye must be kept for the first sign of an emu becoming troublesome and retreat is encouraged in these circumstances.

Feed and Feeding
The emu is virtually a big "chook" and is fed accordingly. They feed on insects, seed/grain, fruit, grass and other herbage.

SET TASK

Visit a natural area (e.g. bush reserve, marine reserve, national park), and attempt to identify at least 20 different organisms (including both plants and animals) that occur in that area. Collect any relevant brochures or leaflets that are provided as part of interpretive services for that natural area (in some case there may be none available, but where they are available they can help you with identification). Many of the better known National Parks or reserves have had plans prepared for their management. These are an invaluable source of information, and are often readily purchased from local management authorities, or can be viewed at their offices, or in local libraries. This may help you to identify organisms in that area.

ASSIGNMENT
Download and do the assignment called ‘Lesson 4 assignment’.