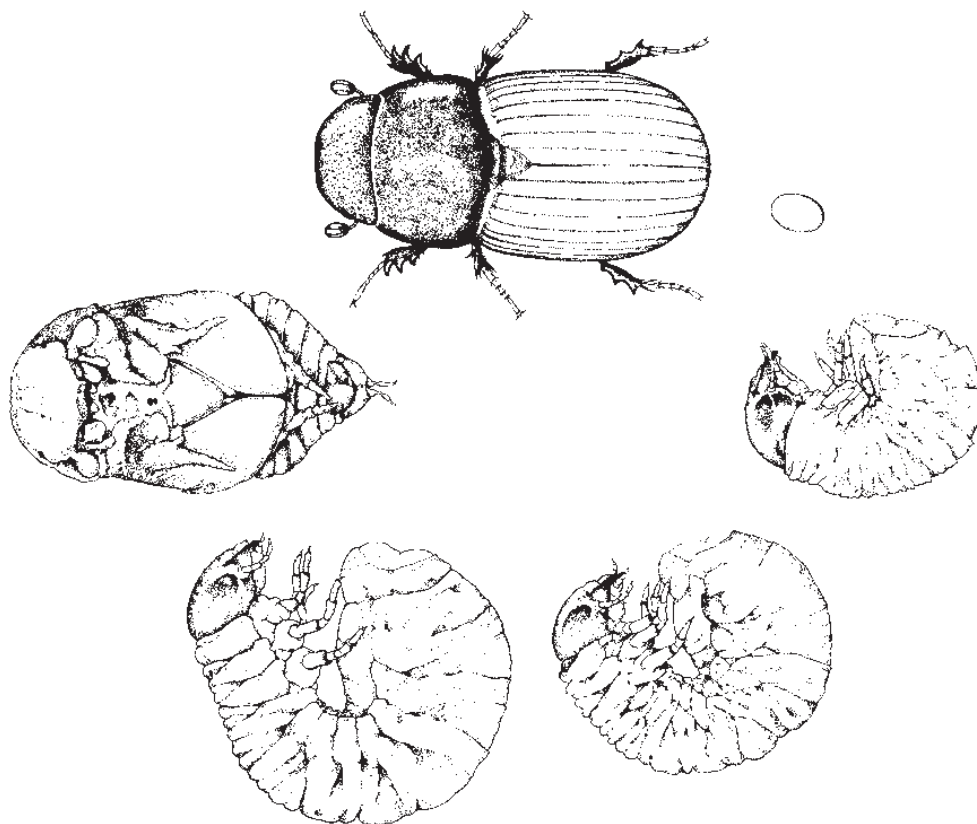


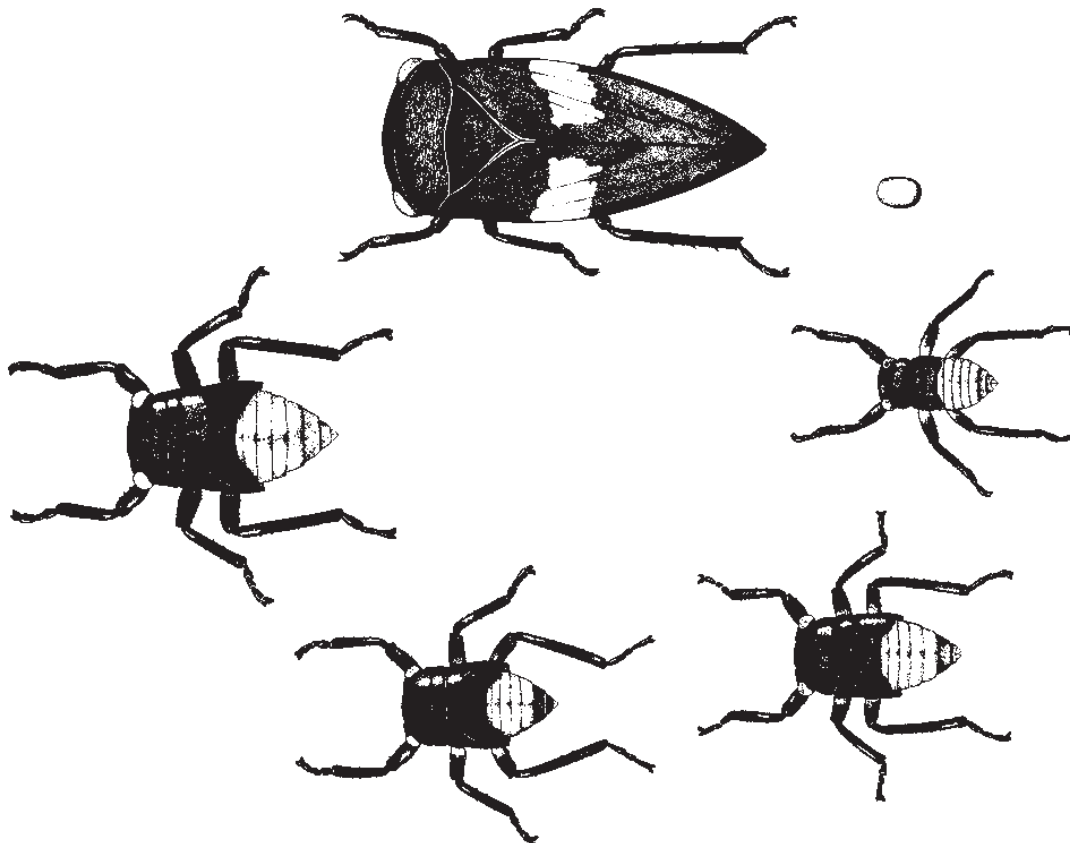
Bugs



Complete metamorphosis — Dung Beetle lifecycle

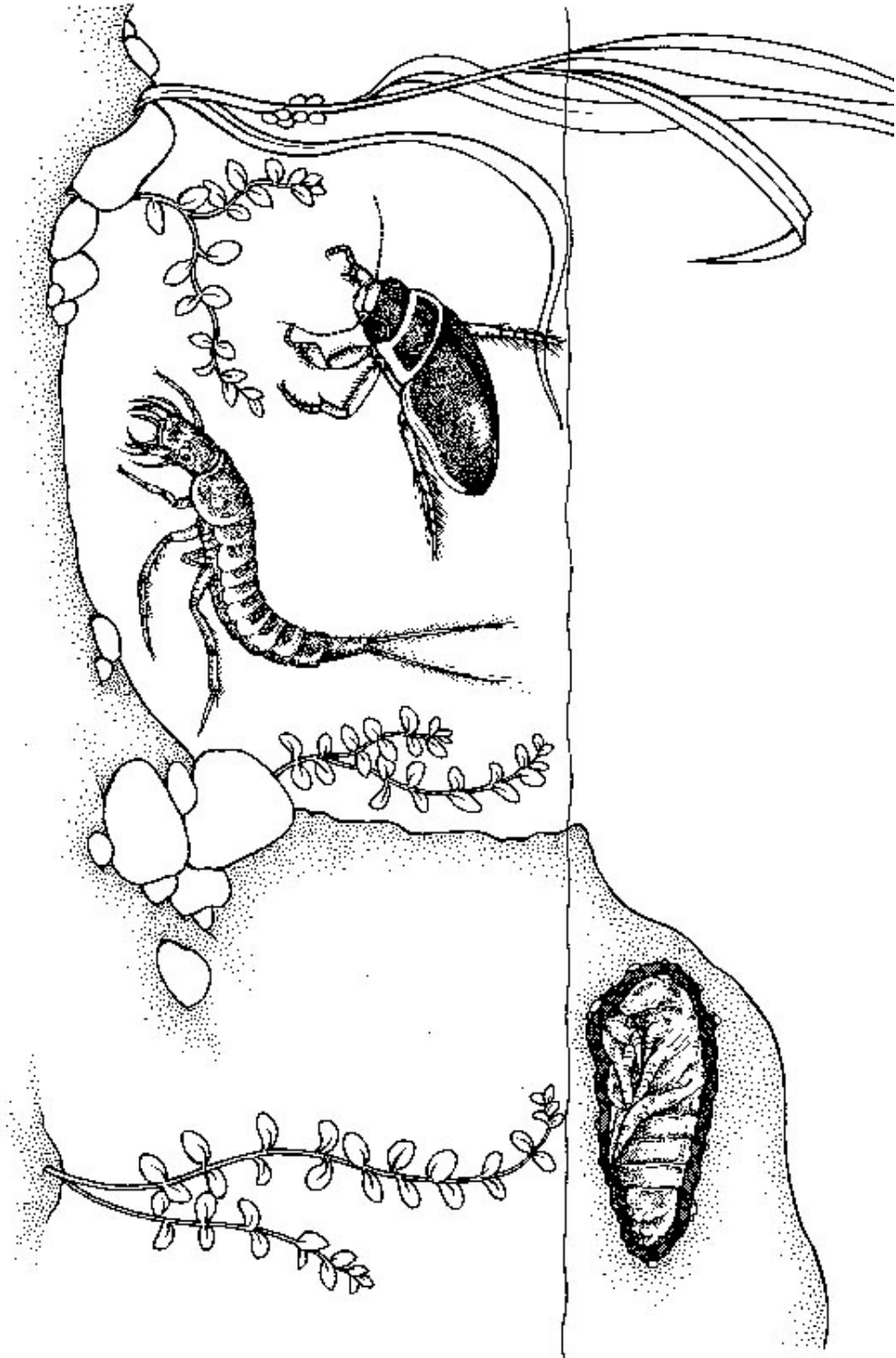


Incomplete metamorphosis — Leafhopper lifecycle





A Diving Beetle's story





A Dragonfly's world



Bugs



Animals in the classroom

Keeping live animals in the classroom encourages children to observe, discuss and record changes that occur as animals grow.

What to do

Select a 'bug' project on which to keep an animal growth diary.

Record children's observations of the changes in size, shape, colour and movement.



Hatching moths and butterflies

A small number of caterpillars can be collected from the school ground and raised if you have access to a continuous supply of their host plant. Caterpillars require specific food sources, so note which plant species they are feeding on when found. They also have huge appetites.

Butterfly eggs, and information about their care, can be purchased from the Zoo Education Service (ph. 9285 9355). Butterfly eggs and kits must be ordered prior to the start of terms 1 and 4. A source of citrus leaves is needed to raise the Orchard Swallowtail caterpillars that are supplied.

If you have access to a supply of Mulberry leaves, the silkworm is a wonderful species to maintain and observe in the classroom. Eggs hatch to coincide with new season's growth of Mulberry leaves. Eggs can be obtained from Monnie Fenner billmonniefenner@bigpond.com, subject to availability.

Plant a butterfly garden. Butterflies take nectar from a variety of flowers but lay their eggs on specific host plants that provide food for their caterpillars. Planting the host species of plant will encourage butterflies to lay eggs in your area.

Information about host plants can be found at www.museum.vic.gov.au/bioinformatics/butter/

Keeping Phasmids (stick and leaf insects)

These creatures are fascinating animals to study – a supply of fresh gum leaves and suitable housing is all that is required. Detailed information about obtaining and caring for phasmids and other insects is available from The Australian Insect Farm. Full details at www.insectfarm.com.au

Lifecycle in a jar

A simple lifecycle to observe is the r
Collect some mosquito larvae (wrigg
These will quickly become tumblers
before turning into adult mosquitoes
Refer to activities, *A Bugs Story* (pre
and *The Cycle of Life* (years 3 – 8) f
an outline of the mosquito lifecycle.

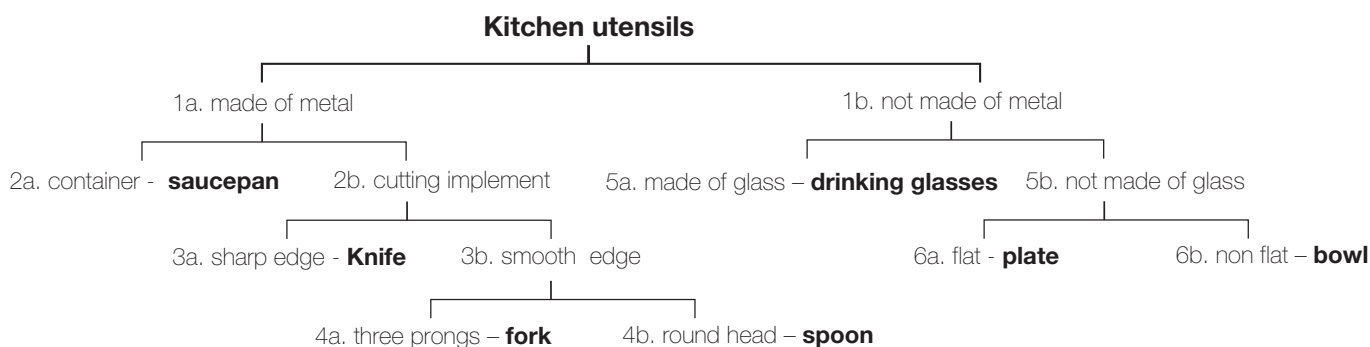


Bugs



Using a Dichotomous Key

Dichotomous keys are useful tools that help us organise a number of different things into identifiable groups. They classify things according to whether a particular characteristic is present or absent. An example of a diagrammatic dichotomous key is shown below for utensils found in most kitchens.



This same information can also be presented as a written dichotomous key:

- 1a. Made of metal.....go to 2
- 1b. Not made of metal.....go to 5
- 2a. Container.....saucepan
- 2b. Cutting implement.....go to 3
- 3a. Sharp edge.....knife
- 3b. Smooth edge.....go to 4
- 4a. Three prong head.....fork
- 4b. Round head.....spoon
- 5a. Made of glass.....drinking glass
- 5b. Not made of glass.....go to 6
- 6a. Flat.....plate
- 6b. Not flat.....bowl

Student Discussion

Use the dichotomous key to answer the following questions.

What utensils are made of metal?

Describe the characteristics that are unique to plates and bowls.

Describe the characteristics that are unique to a spoon.

Would you be able to identify a glass bottle using the dichotomous key above?

How would you change the dichotomous key so that it was able to identify the glass bottle?

What are the limitations of dichotomous keys?

Develop your own diagrammatic dichotomous key for the same kitchen objects - saucepan, knife, fork, spoon, drinking glasses, plate, and bowl.

Translate your diagrammatic dichotomous key into written format.

Bugs



Key to the world of Bugs

Students develop their own dichotomous key to classify a range of bugs into individual groups.

What you need

A class set of *Key to the World of Bugs – Student worksheet*.

Bug Profile – student worksheet

An A3 piece of paper, pens, scissors.

Access to the internet Bugs Alive website: What is a Bug?

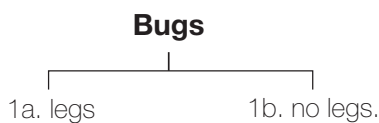
<http://www.museum.vic.gov.au/bugs/aboutbugs/>

or other books and resources.

What to do

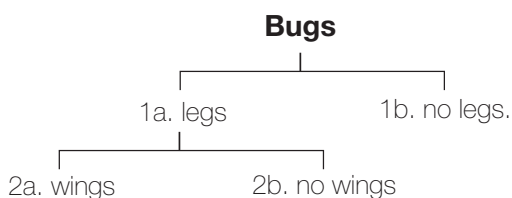
Provide each student with a sheet of A3 paper and a copy of the *Key to the world of Bugs – Bug Images* student worksheet. At the top of the A3 page, have the students write the heading 'Bugs'. They will then cut out the bug photographs and place them on the A3 sheet of paper near the "Bugs" heading.

Each student will develop a dichotomous key to classify each of the bugs by looking closely at their characteristics. They will use these to divide each group into two smaller groups based on the appearance or absence of a particular characteristic. For example the first division might be...



Each student chooses their first classification, and writes down the two new headings before they sort the bug photographs into the two groups, under each new heading.

The students then look at the characteristics of the bugs in the group labeled 1a. and choose another characteristic to divide this group into two smaller groups – 2a. characteristic is present, and 2b. characteristic is absent. The students write down these new headings underneath the heading 1a, and connect the new headings with a branching line. For example:



The students repeat this exercise for the group 1b, remembering to give each new division a number and letter. They should continue this branching process until there is only a single bug in each group. When they get to this stage, they should write the bug's name underneath the heading.

When the students have developed the diagrammatic dichotomous key, they can translate the information from the diagram into a written format. Refer to the previous activity called *Using a Dichotomous Key* to see how this is done.

Bugs



Key to the World of Bugs

There are millions of living things, which have a great variety of shapes, sizes and body structures. Many living things share a number of characteristics even though they may be quite different in other ways. The characteristics of living things are used by taxonomists to order or classify them into groups.

The number and diversity of living things in a single group may be very large. So, scientists adopt a system whereby large groups are classified into progressively smaller groups or subdivisions. The names of the subdivisions (from most general to least general) that scientists use to classify living things are: Kingdom, Phylum, Class, Order, Family, Genus, and Species.

The number of living things in each subdivision decreases from the kingdom to the species level, whilst the number of shared characteristics increases. In other words, organisms grouped together at the Family level will have more characteristics in common than organisms grouped together at the Phylum level. At the species level, organisms are very similar in appearance and can interbreed to produce fertile offspring. Using this system of classification, species that are closely related belong to the same Genus. Similarly, Genera that are closely related belong to the same Family. Families that are closely related belong to the same Order and so on.



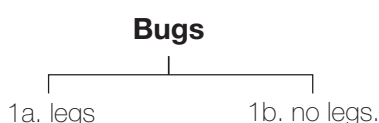
For example, the three species shown above have their own unique characteristics, together with other characteristics in common. They are animals so they belong to the Animal Kingdom. They do not have a backbone and they have a hard external skeleton and jointed limbs so they are classified, along with two thirds of the world's animal species, into the Arthropod Phylum. Some of these have three major body parts – head, thorax and abdomen – and six legs. These common characteristics allow us to classify the Green Carabid Beetle (*Calosoma schayeri*), Harlequin Bug (*Tectocoris diophthalmus*) and Ground Beetle (Carabidae) into the Insect Class.

What to do

Your teacher will provide you with a sheet of A3 paper and a sheet of paper with photographs of different bugs on it. At the top of the A3 page, write the heading – Bugs.

Cut out each of the bug photographs and place them on the A3 sheet of paper near the bug heading. It may help to line them up into rows so that you can see them all at the same time.

Now you are going to develop a dichotomous key to classify each of the bugs. You will need to look closely at the characteristics of each of the bugs. You will use these characteristics to divide each group into two smaller groups based on the appearance or absence of a particular characteristic. For example the first division might be...



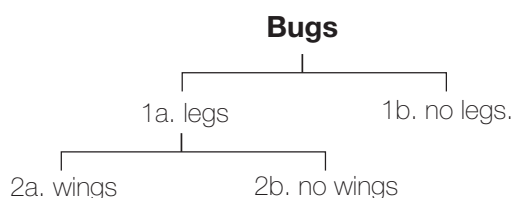
Whatever your first classification is, write it down and sort the bug photographs into the two groups, under the new headings.

Bugs



Key to the World of Bugs

Now look at characteristics of the bugs in the group labeled 1a. Choose another characteristic and divide this group into two smaller groups – 2a. characteristic is present, and 2b. characteristic is absent. Write down these new headings underneath the heading 1a, and connect the new headings with a branching line. For example:



Now look at the bugs in the group 1b and repeat this exercise, remembering to give each new division a number and letter. Continue this branching process until there is only a single bug in each group. When you get to this stage, write the bug's name underneath the heading.

See if you can translate the information from a diagram into a written format. If you are not sure how to do this, refer to the previous activity called *Using a Dichotomous Key*.

Student discussion:

If you found a particular bug outside and you wanted to use your dichotomous key to identify it, what characteristics would it have if it was identified as a snail?

Look at someone else's dichotomous key. Are the characteristics of a snail the same according to their key?

What does this tell you about dichotomous keys?

Use your dichotomous key to identify the following bugs. Were you able to correctly identify each of the bugs? Why or Why not?



In groups of 3 or 4 students, refer to the *Bugs Alive* website: What is a Bug?

<http://www.museum.vic.gov.au/bugs/aboutbugs/> to research the different Bug Classes and Orders, that are represented by each of your photographs.

On the back of each Bug picture, write down the physical characteristics that are specific to that bug and any other interesting information that you can find.

Can you find some other bugs or insects that are not represented by your pictures?

Rearrange your dichotomous key to include them in it as well.