



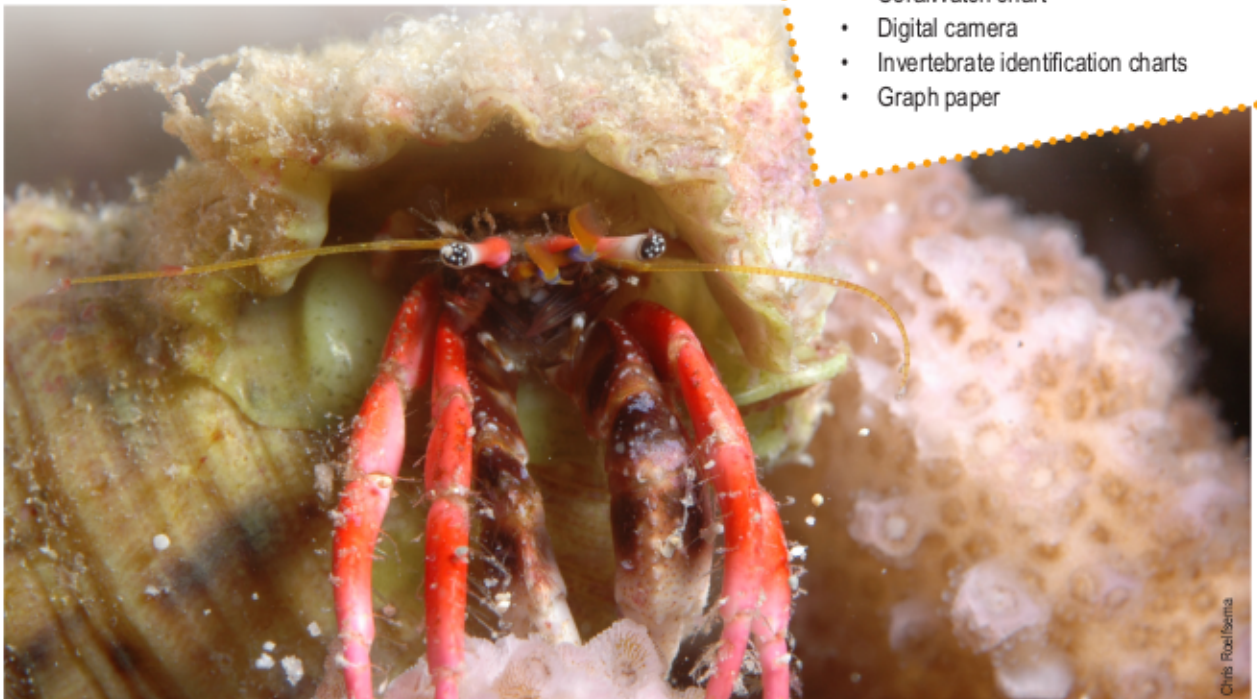
The aim of this activity is to identify invertebrate organisms and to investigate whether a correlation exists between invertebrate colour and the colour of the coral reef substrate. You will experiment in the field observing invertebrate types and their associated habitats, identify characteristic features of different invertebrate groups and create a dichotomous key for classification purposes.

## Time

Three hours in the field, two hours in the classroom

## Tools

- Reef shoes and snorkeling gear
- Dive slate and pencil
- Tape measure
- CoralWatch chart
- Digital camera
- Invertebrate identification charts
- Graph paper



*Hermit crab.*

## Background

Every time you look at the colourful reefs you are seeing invertebrates. Aside from corals, reef invertebrates include sea squirts, copepods, toxic nudibranchs, crown-of-thorns sea stars, cleaner shrimp, grazing crabs, parasitic worms and goose barnacles, to name just a few. They make up the web of life that sustains coral reefs. These invertebrates are eating each other, cleaning sand, digging burrows, eroding coral, grazing algae, providing protein, removing parasites, building shells, mating, competing for space and resources and filling every niche with incredible life forms uniquely evolved and adapted to the reef environment. Their amazing range of colours are a way that reef creatures communicate, sometimes using bright or contrasting colours to announce they are aggressive or toxic, while others have colours that keep them hidden in their environment.

Classification of so many species can be difficult. Colours can sometimes help, but can also confuse classification as they can differ between adult and young, male or female or from one moment to the next, in a single species. Invertebrates are separated into major groups, or phyla, based on characteristic features that all members of the group possess, such as jointed appendages of arthropods and possession of a shell in molluscs. However, some molluscs evolved to have small internal shells, or no shells at all, to adapt to their environment. For this reason, a combination of features is used, helped by genetic analysis, to classify each organism correctly. A dichotomous key is a simple tool that can be used to identify unknown organisms based on mostly observable characteristic features. Dichotomous means 'divided in two parts' and the key is made up of a series of choices that leads a person to the correct identity of an unknown thing or organism.





## Field activity

This activity should be conducted on the reef flat at low tide.

1. Conduct a line transect from the shore line to the reef crest.
2. At each point of the transect record the following data using the 'invertebrates results table':
  - a. substrate and its colour
  - b. reef zone
  - c. coral type, using the CoralWatch chart
  - d. coral colour
  - e. invertebrates present
  - f. invertebrate colour
  - g. patterns on the invertebrate (stripes, spots, alternating colour schemes)
3. Take a digital photograph for referencing the invertebrate's identification back on shore.



### Teacher Hint

Laminate 'Common groups of inverts' to take in the field.







## Common groups of invertebrates

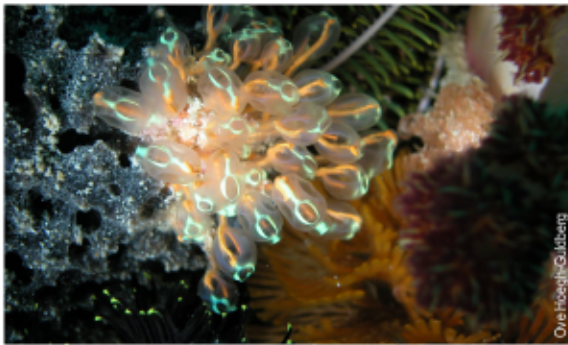
### Porifera and ascideans Sponges, Seasquirts, Salps



*Polycarpa aurata* (Sea squirt)



*Nephtheis fascicularis* (Blue lollipop tunicate)

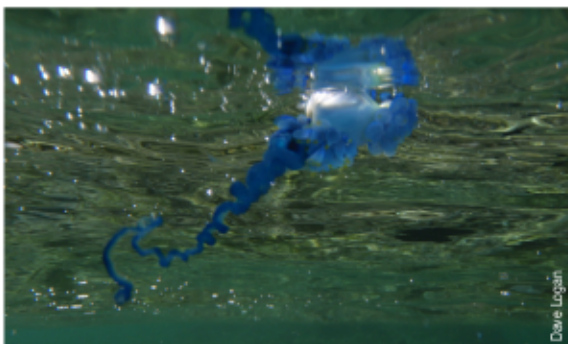


*Clavelina huntsmani* (Lightbulb tunicate)



*Didemnum vexillum* (Ascidian)

### Cnidarians Jellies, Hydroids, Corals, Anemones



*Physalia utriculus* (Blue bottle)



*Stomolophus meleagris* (Cannonball jellyfish)



*Heteractis magnifica* (Magnificent anemone)



Corals

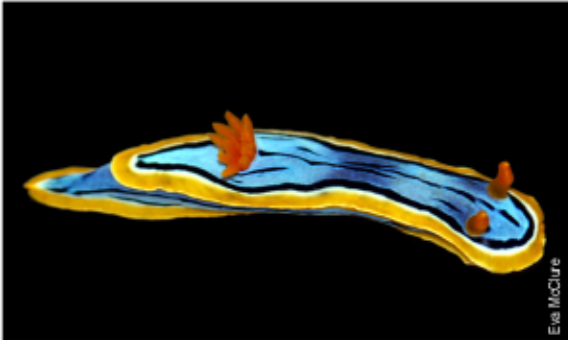






## Common groups of invertebrates

### Molluscs Chitons, Clams, Mussels, Oysters, Snails, Slugs, Nudibranch, Octopus, Squid, Cuttlefish



*Chromodoris elisabethina* (Nudibranch)



*Tridacna gigas* (Giant clam)



*Acanthopleura granulata* (Fuzzy chiton)



*Cypraea tigris* (Tiger cowrie)

### Crustaceans Copepods, Crabs, Shrimp, Lobster, Mantis shrimp, Amphipods, Isopods, Mysids, Barnacles



*Odontodactylus scyllarus* (Peacock mantis shrimp)



*Lysmata amboinensis* (Cleaner shrimp)



*Panulirus interruptus* (Spiny lobster)



*Carcinus maenas* (Green crab)





## Common groups of invertebrates

### Echinoderms Sea stars, Cucumbers, Urchins



*Stichopus chloronotus* (Black sea cucumber)



*Acanthaster planci* (Crown-of-thorns sea star)



*Nardoa novaealedoniae* (Common sea star)



*Lamprometra palmata* (Feather star)

### Worms Bristleworms, Nematodes, Flatworms, Lace animals



*Spirobranchus spinosus* (Christmas tree worm)



*Phidolopora labiata* (Lacy bryozoan)



*Eupolymnia crassicornis* (Spaghetti worms)

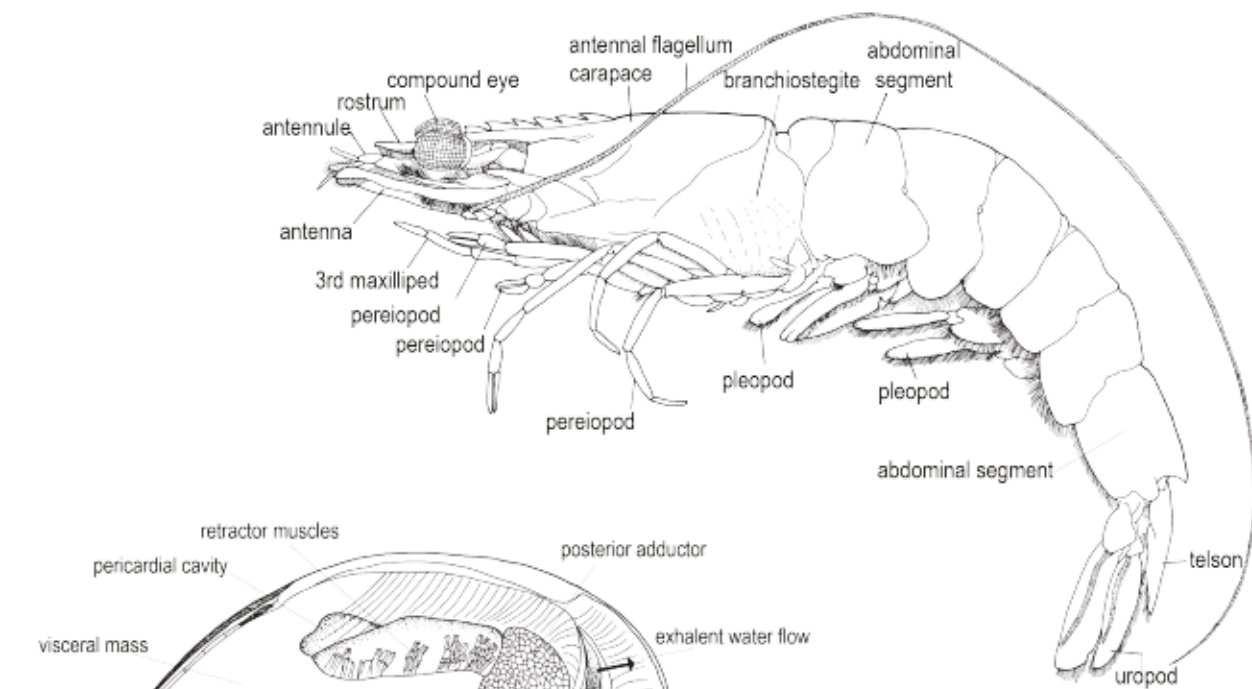


*Thysanozoon nigropapillosum* (Yellowspot flatworm)

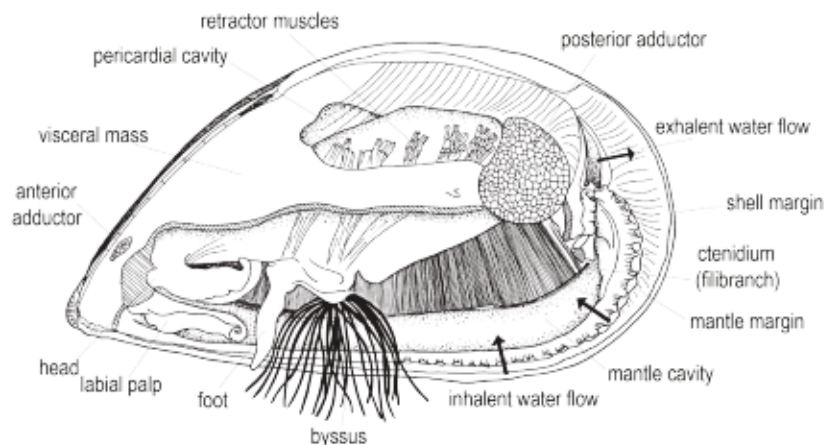




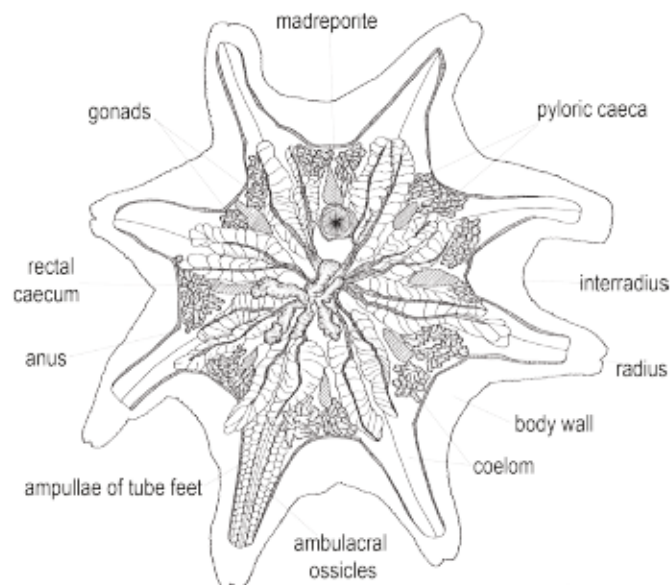
## Anatomical drawings



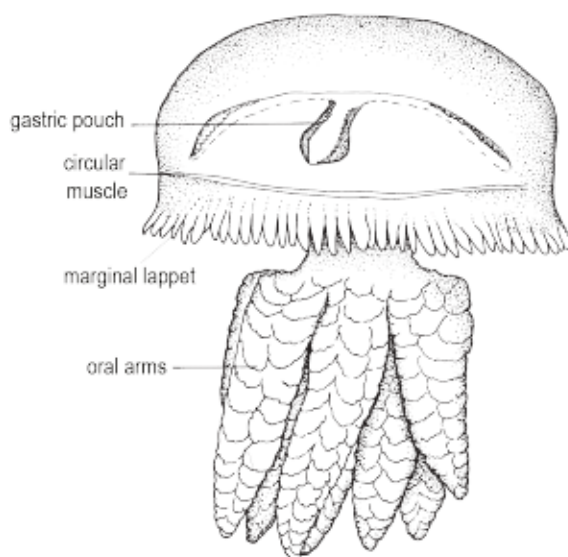
*Prawn anatomy, external structure.*



*Mussel anatomy, external structure.*



*Sea star anatomy, external structure.*



*Jellyfish anatomy, external structure.*

Source: Anderson DT (1996) *Atlas of invertebrate anatomy*. New South Wales University Press Ltd



## Invertebrates results table

Observer(s): \_\_\_\_\_

Location: \_\_\_\_\_ Date: \_\_\_\_\_

Date: \_\_\_\_\_

Weather conditions: windy / calm / cloudy / sunny









[illegible]





## Classroom activity

- During this activity you will identify invertebrates you have observed and create graphs to show relationships between invertebrates, their location on the reef and coral colours nearby. Using your digital photos and invertebrate identification charts or books, identify the invertebrates you found on the reef including their phylum, class, scientific and common name where available.
- Discuss in a group how you plan to quantify invertebrate colours (i.e. solid and patterned; red, green and blue; pale or dark). Use graph paper or a spreadsheet to plot:
  - invertebrate abundance versus reef zones
  - invertebrate richness versus reef zones
  - coral colour scores versus invertebrate colour
- Compare the graphs and look for trends or patterns in the data.
- Write down the features that are characteristic for each major invertebrate phylum.
- Use these features to make a dichotomous key. The first branch has already been provided as an example. Create your key by asking questions relating to these features.

Invertebrate phylum features			
 <p>Phylum <b>Cnidaria</b></p> <p><b>Features</b></p> <p>-</p> <p>-</p>	 <p>Phylum <b>Porifera</b></p> <p><b>Features</b></p> <p>-</p> <p>-</p>	 <p>Phylum <b>Annelida</b></p> <p><b>Features</b></p> <p>-</p> <p>-</p>	 <p>Phylum <b>Chordata</b></p> <p><b>Features</b></p> <p>-</p> <p>-</p>
 <p>Phylum <b>Echinodermata</b></p> <p><b>Features</b></p> <p>-</p> <p>-</p>	 <p>Phylum <b>Arthropoda</b></p> <p><b>Features</b></p> <p>-</p> <p>-</p>	 <p>Phylum <b>Mollusca</b></p> <p><b>Features</b></p> <p>-</p> <p>-</p>	 <p>Phylum <b>Bryozoa</b></p> <p><b>Features</b></p> <p>-</p> <p>-</p>





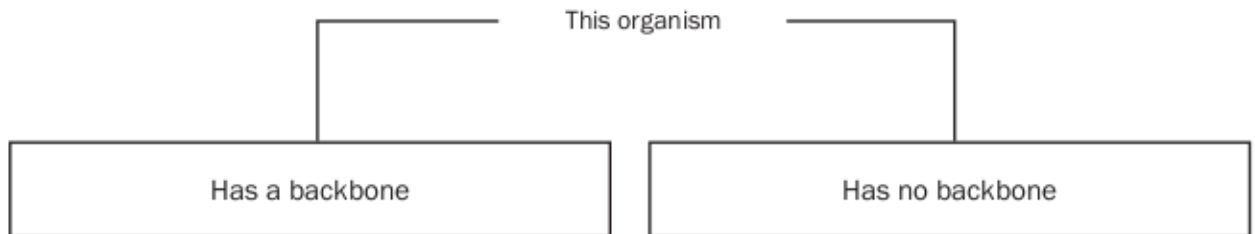
## Dichotomous key

Does this organism

2a Have an external skeleton it sheds and replaces as it grows? (go to ...)

2b Have a shell, internal skeleton or no skeleton? (go to ...)

or draw your dichotomous key as a tree



### Teacher Hint

You can provide specific species, one in each phyla or several in one phylum, with images to get things started.





## Questions

1. What trends or patterns in invertebrate distribution in reefs zones did you find?
2. Suggest the factors that might determine the patterns of distribution.
3. What is the function of invertebrates on the reef?
4. Looking at the graphs you have constructed for this section, is there any correlation between invertebrate colour and coral colour?
5. What sorts of colour patterns were apparent on some of the animals?
6. Does any relationship exist between these colour patterns and the substrate?
7. How would the invertebrates use colour to their advantage?
8. Why are colours not the best features to use to identify species?
9. What are some of the difficulties in constructing a dichotomous key?

## Research projects

1. If you were conducting a survey of the entire reef area, what species would you select as indicators to determine the population numbers of invertebrates on the reef? Justify your reasoning.

## References

- Reid et al. (2009) Coral Reefs and Climate Change: The guide for education and awareness. CoralWatch, The University of Queensland, Brisbane. (See A Crowd of Invertebrates pages 106-113)
- Allen GR and Steene R (1994) Indo-Pacific Coral Reef Field Guide. Tropical Reef Research, Singapore
- Gosliner TM, Behrens DW and Williams GC (1996) Coral Reef Animals of the Indo-Pacific Monterey, California: Sea Challengers
- Census of Coral Reef Ecosystems (CReefs); [www.creefs.org](http://www.creefs.org)
- Australian Museum; [www.austmus.gov.au](http://www.austmus.gov.au)
- Reef Education GBRMPA; [www.reefed.edu.au](http://www.reefed.edu.au)

