## *Worksheet answers*

# Part 1

1. Place each organism in the correct column, in the following table.

| DECOMPOSER / PRIMARY CONSUMER | DETRITIVORE / MICROBIVORE | HERBIVORE | CARNIVORE |
|---|---|---|---|
| *bacteria* | *millipede* | *nematode (root)* | *mite (predatory)* |
| *fungi* | *springtail* | | *centipede* |
| | *mite (detritivore)* | | *nematode (predatory)* |
| | *protozoa* | | *pseudoscorpion* |
| | *potworm* | | *rove beetle* |
| | | | |

2. Use your completed table from question 1, and information provided in *Soil life explorer,* to complete the following food chains.

   organic matter ⟶ bacteria ⟶ *springtail ⟶ mite (predatory) ⟶ pseudoscorpion*

   organic matter ⟶ fungi ⟶ *mite (detritivore) ⟶ pseudoscorpion ⟶ centipede*

3. Build your own 5-level food chain that includes a tardigrade (you may need to refer to *Soil life explorer*).

   *organic matter ⟶ bacteria ⟶ rotifer ⟶ tardigrade ⟶ nematode (predatory)*

4. Describe how a terrestrial food chain differs from a soil decomposer food chain.

   *A soil decomposer food chain contains no sun or direct primary producer (green, living plant). A terrestrial food chain begins with a green plant; a soil decomposer food chain begins with decaying organic matter (which may be plant, animal, microorganism or fungus).*

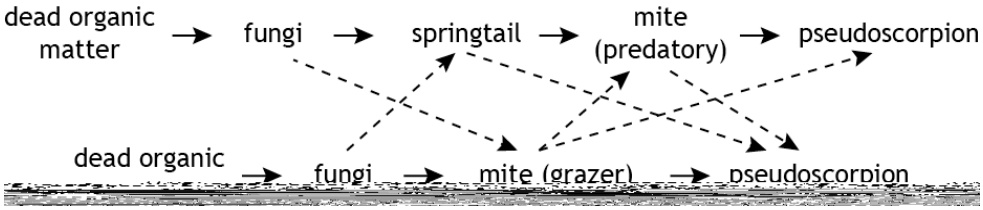
5. Soil food chains generally begin with dead or decaying plant or animal matter. Why is the sun still important in soil food chains?

   *The sun is important in soil food chains as dead organic matter may have come from a terrestrial food chain, where sun is the primary energy source. Without the sun, there might be no dead organic matter in the soil.*

6. Given your answer to question 5, why do soil scientists omit the sun from food chains?

   *The sun adds an extra level of complexity to the food chain that is difficult to represent in a diagram. If the sun were to be included, then the terrestrial food chain that is associated with it would have to be included, as well as decomposition that occurs after death. It is simpler to begin with dead organic matter below ground.*

7. Look at the food chains below. Using arrows, make as many connections as you can between organisms in the two chains to make a simple food web. Remember, arrows show the direction of energy flow.




As you can see, food webs represent feeding relationships between organisms in an ecosystem by linking the food chains. So far, we have only looked at a food web where fungi is the decomposer.

8. In the space provided below, create a more complicated soil food web by adding the food web you constructed above to the following food chain.

9. What other organism could you add to make a link between fungi and predatory nematode?

   *fungal-feeding nematode*

10. What happens to soil organisms when they die?

    *They become dead organic matter. Dead organic matter is colonised by fungi and bacteria, and grazed by detritivores such as springtails. Dead soil organisms become part of the soil food web.*

# Part 3

11. How will this affect the pseudoscorpion population, in the food web above?

    *The population is likely to decrease as less food is available, due to removal of both grazing and predatory mites.*

12. Describe what may happen other organisms in the food web.

    *This is hard to predict as there are many interactions. One possible scenario is that the number of springtails may decrease, as they are the only remaining food source for the pseudoscorpions. A decrease in the number of springtails may see an increase in the amount of bacteria and fungi in the soil. These are a food source for protozoa and nematodes, so numbers of protozoa and nematodes may increase. An increase in predatory nematodes may also occur.*

13. Describe the effect Portuguese millipedes may have on the other organisms in the food web.

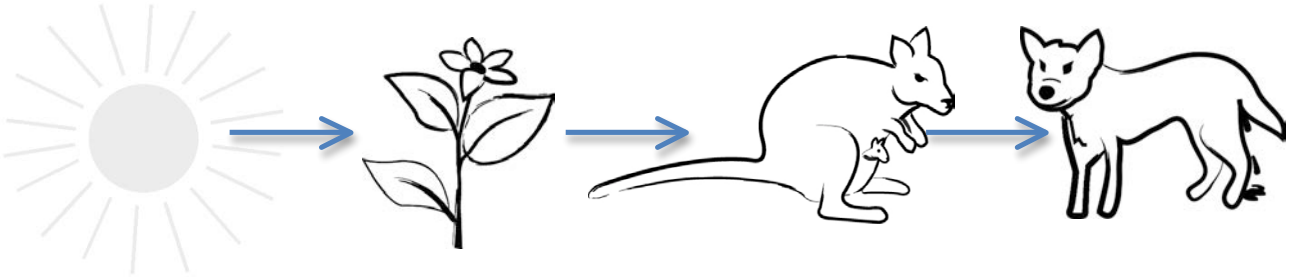
*The Portuguese millipedes may cause a decline in numbers of other detritivores such as springtails and grazing mites, due to competition for food. Pseudoscorpions and predatory mites may then decrease due to lower numbers of springtails and grazing mites. Bacteria and fungi could increase if springtails and grazing mites decrease. This may increase numbers of protozoa and fungal feeding nematodes, thereby increasing numbers of predatory nematodes.*

14. Compared with native Australian millipedes, Portuguese millipedes can occur in huge numbers and are often considered a pest. Suggest why native Australian millipedes are not found in such large quantities.

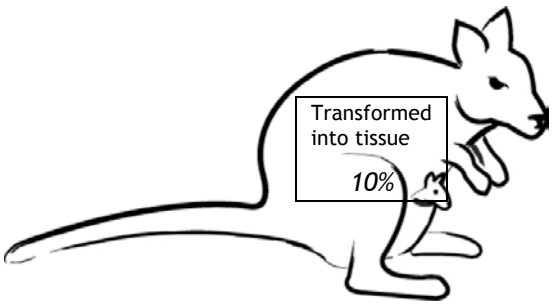
*The Australian millipede is a native species that will have natural predators that keep the population in check. The Portuguese millipede, which has few known natural predators, can reach large numbers.*

# Part 4

15. Using arrows show the direction of energy flow on the diagram



16. In the video, energy transfer is mentioned a number of times. Write percentages in the boxes around the wallaby to show, on average, how much energy passes out undigested, goes towards its daily activities or becomes part of the wallaby and is then available to the next organism. What are some activities that the wallaby might require energy for? Write these in the text box next to the wallaby.




Daily activities
*40%*

undigested
50%

Energy requiring activities:
*growth*
*movement*
*reproduction*
*repair*

17. Wallabies and dingoes are endotherms, warm-blooded animals. Much of the food energy they consume goes towards maintaining a constant body temperature. What advantage do you think an ectotherm (cold-blooded) organism like a snake or crocodile might have, considering they use the outside environment to regulate their body temperature?

    *Cold-blooded animals convert less chemical (food energy) to heat energy, so they need to eat less, or eat less often.*

18. On average, 50% of the energy acquired through eating passes on undigested. Where does this energy go and what organisms may use this energy?

    *This energy may enter the decomposer food chain.*

19. How does the availability of energy to be transferred affect the potential length of a food chain?

    *Usually energy is the greatest limiting factor for food chains. As energy available for transfer decreases so the potential to add further consumers to the food chains decreases.*

20. Which do you think will be more abundant, pseudoscorpions or springtails? Explain your answer.

    *There should be fewer pseudoscorpions than springtails as the amount of energy available for transfer decreases as it passes upwards through tropic levels. Thus, there can be fewer organisms at higher levels.*

21. Which of the two food chains is the most efficient, in terms of energy transfer, at delivering energy to humans?

    *The first food chain is the most efficient as more energy is available to humans, from the original source.*

22. What might be some consequences to humans in choosing a diet that contains relatively large amounts of meat? What does the rest of your class think?

    *The energy efficiency of a meat-laden diet is less than that of a vegetarian diet.*

    *Explanations of energy flow may have students questioning the impact on the environment of a vegetarian diet versus an omnivorous diet, and ideas around animal rearing practices, inequalities in resource distribution, land productivity and agricultural techniques.*

    *If only food chains are considered, then it is obvious that the more levels there are, the less energy is available to be transferred at each. However, modern agricultural practices (including the use of water, fertilisers and pesticides) and associated energy consumption must be taken into consideration before a balanced judgement can be made in each case. Both diets generally involve some kind of intensive agriculture, but the energy input into animal rearing is generally considered to be greater than that of plant production. Other environmental implications, such as greenhouse gas emissions, water use and chemical use, must also be considered when comparing diets.*