

THE GOOD, THE BAD AND THE FUNGI



PROPS AND IMAGES

Compiled by Liz Holden (Grampian Fungus Group) in association with Aberdeen Environmental Education Centre, Aberdeenshire Council Health and Safety Unit, Aberdeenshire Council Ranger Service, British Mycological Society and Buchan Countryside Group. With support from Scottish Natural Heritage.

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THE GOOD, THE BAD AND THE FUNGI

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Fungi in the Field

Dentist mirrors.

Using dentist mirrors enables the children to look closely at the toadstools without always having to pick them. They will be able to find much of the information that they need to use the key in this way.

It is sometimes possible to find these mirrors in hardware stores or 'minimart' type shops. This is usually the cheapest option.

Otherwise they can be obtained from:

Chemical Supplies,
Carlton House,
Livingstone Road,
Bilston,
West Midlands WV14 0QZ

Tel: 01902 402402



Track Down Your Toadstool!



Track down your toadstool!

A toadstool is usually thought of as a fleshy fruitbody with a cap and stem. Mushroom is another word meaning the same thing. Many common members of this group of organisms (the fungi) have, however, very different shapes. We have included 35 ‘easy-to-recognise’ fungi in this key and some of them might surprise you by their appearance! There are hundreds of larger fungi in the woodlands and grasslands of the British Isles, so it is quite possible you will find something that is not in this key.

We have classified the fungi together according to their shapes, and this sometimes puts closely related fungi into different keys. For instance, you might like to try and work out why stinkhorns, earth stars and bird’s nest fungi are actually relatives of the puffballs—there is a clue in the Latin word which describes them as the ‘gasteroid’ fungi.

(The answer’s at the back of the book!)

Remember:

Always wash your hands after working with fungi. This key is not designed to help you identify edible fungi.


Never eat a wild mushroom unless you are absolutely certain that you have identified it correctly or have asked an expert first.





When you see this symbol, it means that your fungus is probably not in the key—try looking in a book on fungi! We have suggested some useful books to look in at the end of the key.


Track down your toadstool!


Read the first question. If your answer is 'YES', see which key you need to look at next.
If the answer is 'NO' then go to the next question.


1. Does your fungus have a cap and stem?
The cap can have gills, pores or spines underneath it. YES LOOK AT **KEY A**
NO GO TO QUESTION 2 

2. Does your fungus look like a shelf or fan?
It will probably be growing on a tree trunk or stump if the answer is yes. YES LOOK AT **KEY B**
NO GO TO QUESTION 3 

3. Is your fungus 'club' shaped with a stem but no cap?
Sometimes the top can be split into 'branches' YES LOOK AT **KEY C**
NO GO TO QUESTION 4 

4. Is your fungus round, like a ball and usually growing in grassy places?
It can sometimes have a short, thick stem part. YES LOOK AT **KEY D**
NO GO TO QUESTION 5 

5. Is your fungus a blob on a leaf or piece of wood? YES LOOK AT **KEY E**
NO GO TO QUESTION 6 

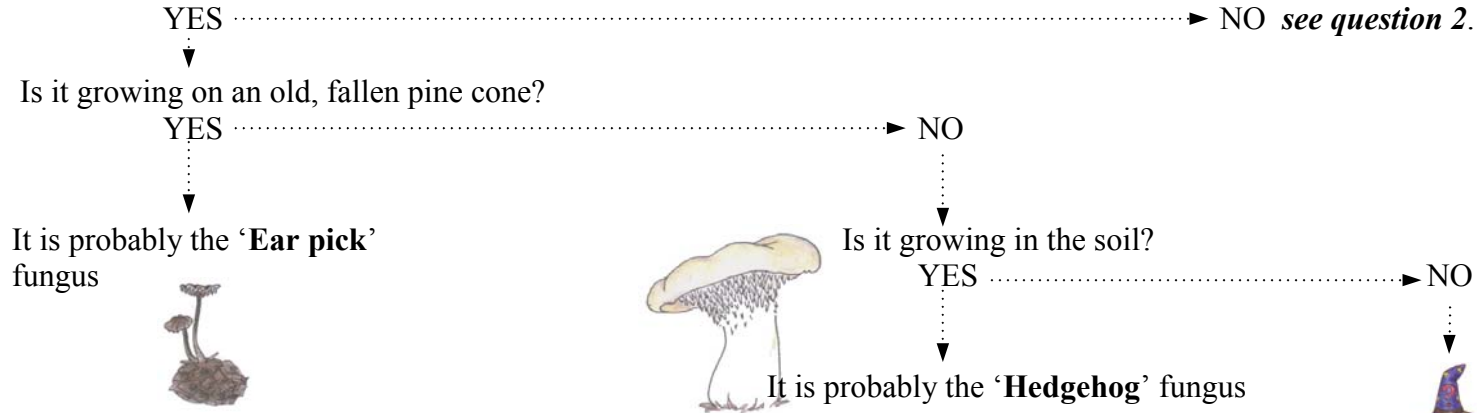
6. Is your fungus like a cup or bowl, sitting on the ground with no stem?
OR is there a small ball-shaped centre raised up on several legs? YES LOOK AT **KEY F**
NO 



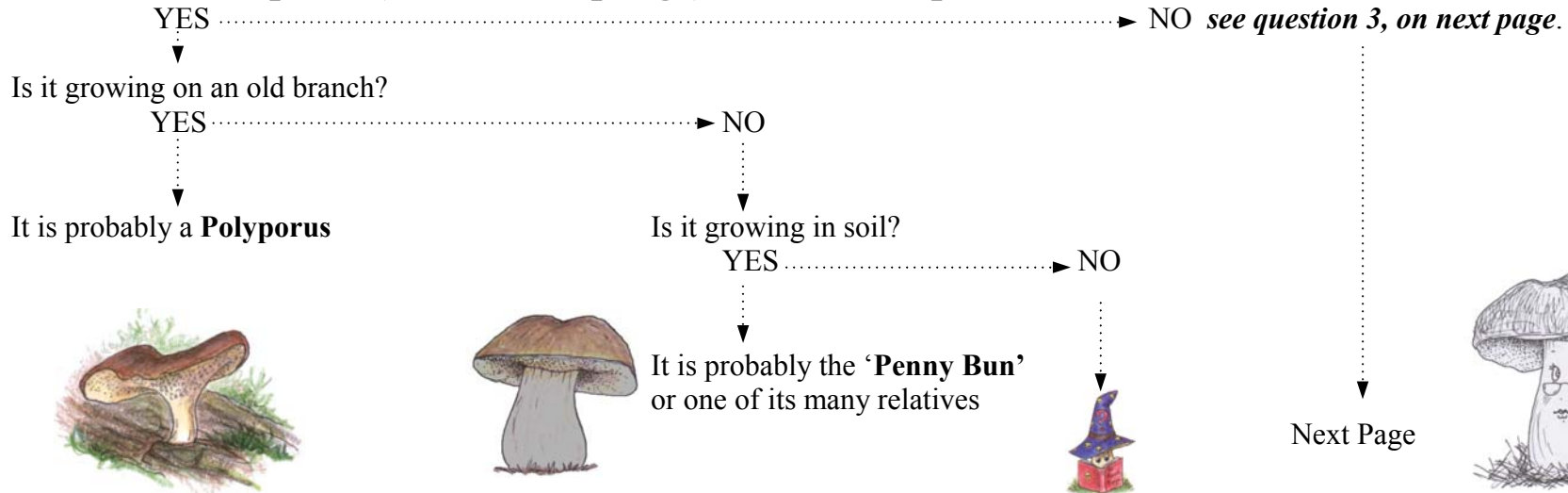
KEY A Fungi with a cap and a stem

Start at question 1 and answer 'yes' or 'no' to the questions below; follow the arrows and see if your fungus is here.

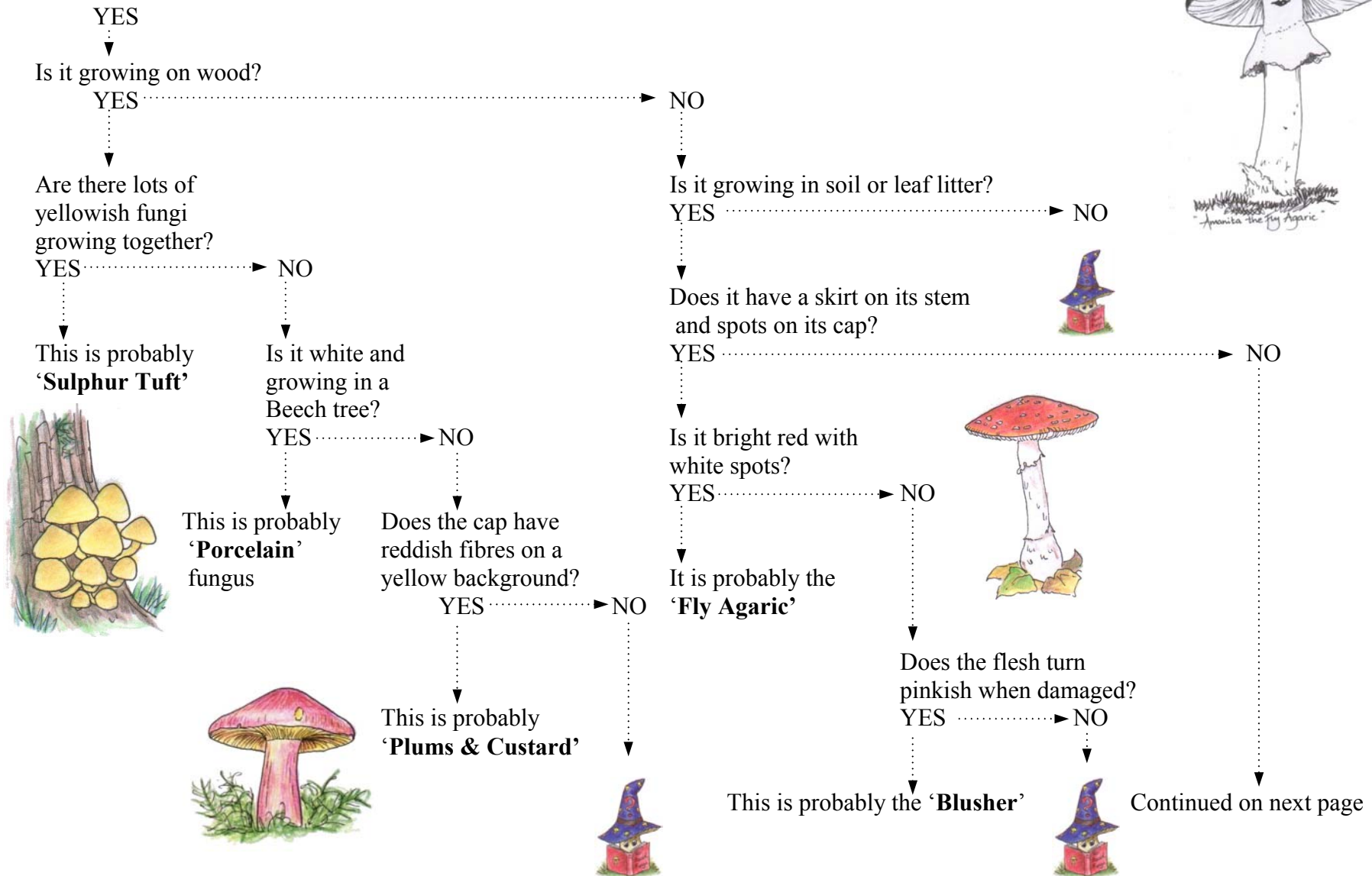
1. Does it have lots of little 'tooth-like' spines under the cap?



2. Does it have pores (a bit like a sponge) under the cap?



3. Key A continued. Does it have gills under the cap?

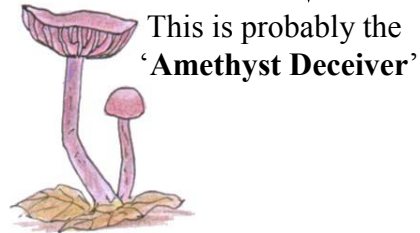


Key A continued from previous page

Does it produce a milky substance when broken?

YES NO

This is probably one of the 'Milk Cap' species



Is it purple all over?
YES NO



Is it bright red all over?
YES NO

This is probably the 'Scarlet Hood'

Does it have a shaggy white cap that rots to a black, inky mess?

YES NO

This is probably 'Shaggy Ink Cap' or 'Lawyers Wig'

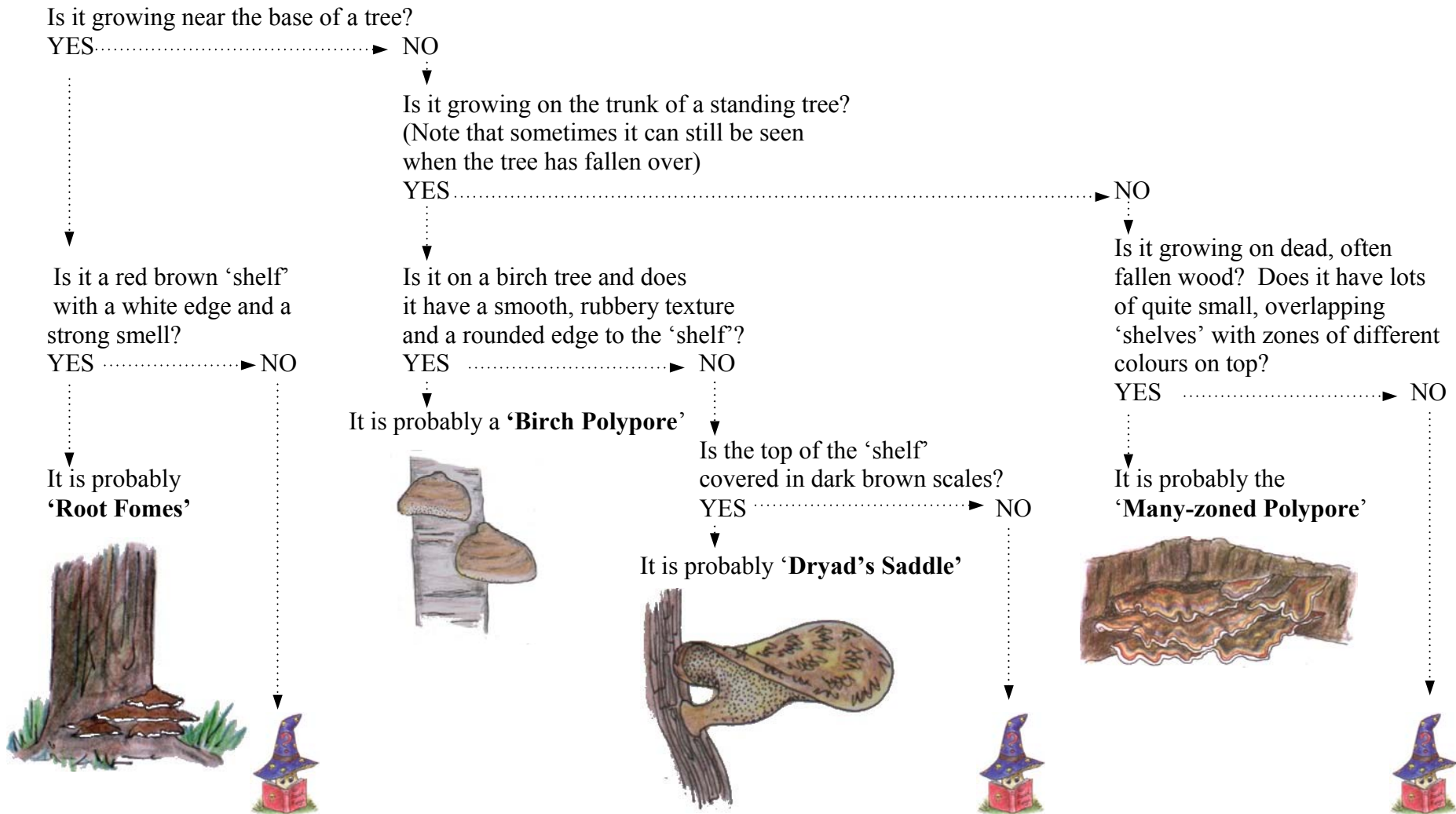
Is it yellow all over with a cap shaped like the end of a trumpet and gills that run down the stem?
YES NO

This is probably 'Chanterelle'



KEY B Fungi that Look Like a Shelf or a Fan

Answer 'yes' or 'no' to the questions below; follow the arrows and see if your fungus is here.



KEY C Fungi that are 'club' shaped with a stem and head area but no cap. Sometimes the top is branched.

Answer 'yes' or 'no' to the questions below; follow the arrows and see if your fungus is here.

Is the top of the fungus covered in a very smelly 'goo' which attracts flies?

YES> NO

It is probably a 'Stinkhorn'



Is it black?

YES> NO

Is it growing on wood?

YES> NO

Do the clubs look like black fingers?

YES> NO

It is probably 'Dead Man's Fingers'



Do the clubs have branched, grey ends?

YES

It is probably 'Candle-Snuff' fungus



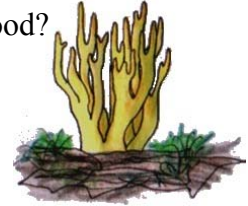
Are the clubs growing in grassland?

YES
They are probably 'Earth Tongues'



Is it yellow, branched and growing on wood?

YES
It is probably 'Stag's Horn' fungus



Don't worry if your fungus is not here! Try looking for it in a book on fungi.



KEY D Fungi that are round like a ball

Answer 'yes' or 'no' to the questions below; follow the arrows and see if your fungus is here.

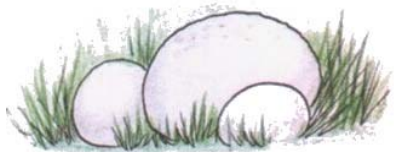
Is it white when young and fresh?

YES

Is the 'ball' more than 10cm across

YES

It is probably a
'Giant Puffball'



Is it less than 6cm across?

YES

It is probably a **'Bovista Puffball'**

NO

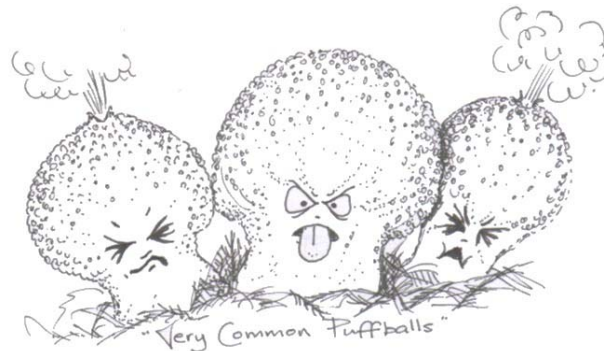
Is it a pale creamy brown when young and fresh?

YES

Is it growing on wood?

YES

It is probably a **'Wood Puffball'**



NO

Is it growing in soil with
a short, fat stem and little
warts on the top?

YES

It is probably the
'Common Puffball'

Still not found it? Don't worry!



KEY E Fungi that look like a blob on dead wood or leaves

Answer 'yes' or 'no' to the questions below; follow the arrows and see if your fungus is here.

Is it black?

YES

NO

Is it on wood?

YES

NO

Is it like black jelly?

YES

It is probably

'Witches' Butter'



Is it on a fallen sycamore leaf?

YES

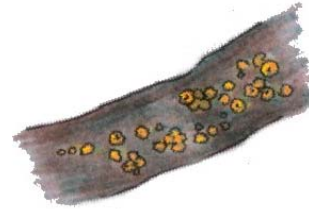
It is probably **'Tar Spot'** fungus



Is the blob small, orange, squishy and on wood?

YES

It is probably **Dacrymyces**



NO

Is the blob small, pinkish, hard and on wood?

YES

It is probably **'Coral Spot'** fungus

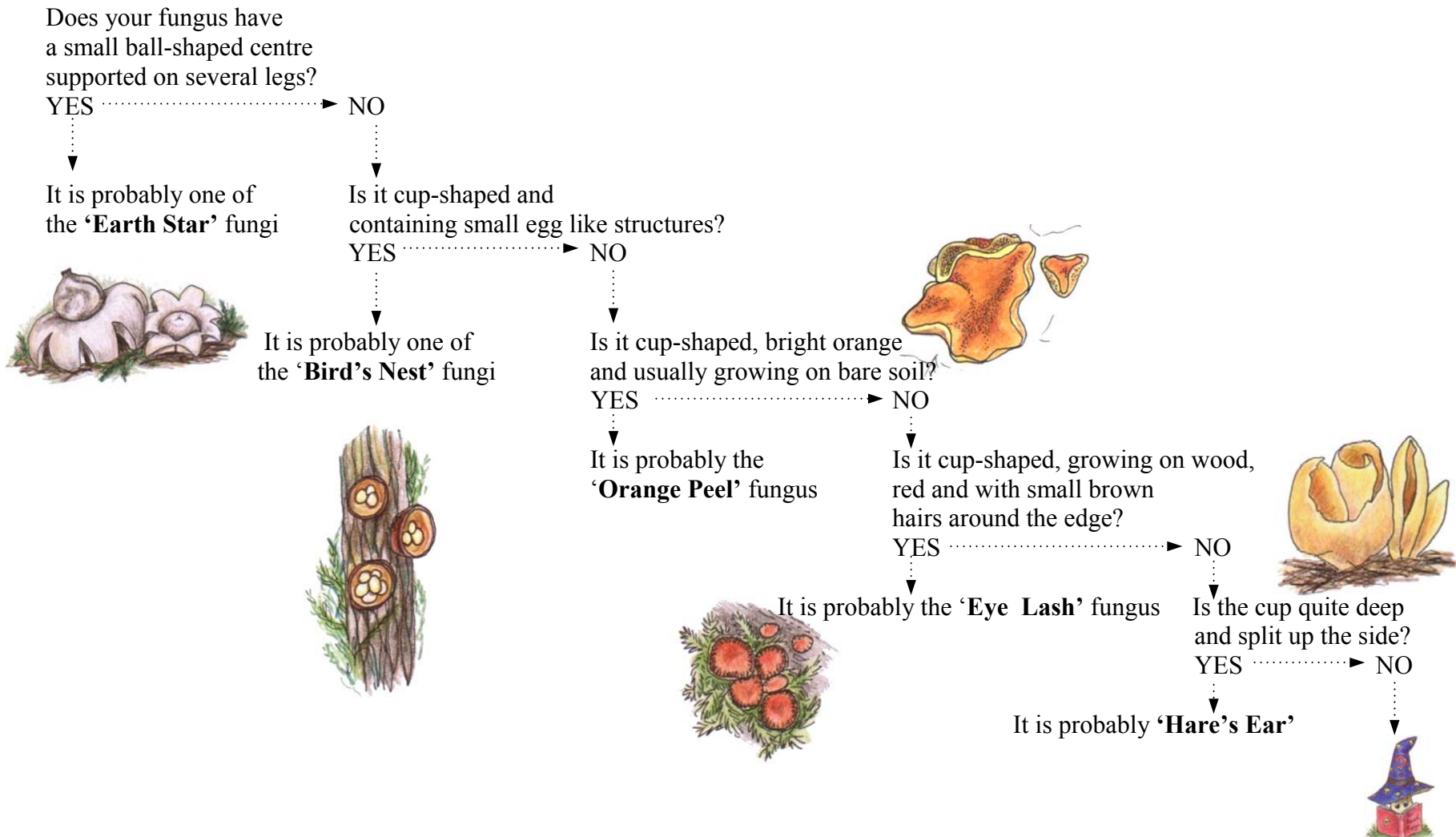


Still not found it? Don't worry!



**KEY F Fungi that are like a cup or a bowl, sitting on the ground without a stem
OR have a small ball-shaped centre supported on several legs.**

Answer 'yes' or 'no' to the questions below; follow the arrows and see if your fungus is here.





The Naming of Fungi

Whilst the common English names are often historically interesting, descriptive and easy to get your tongue around, only a very few fungi have been given such a name. A further problem with common names is that sometimes people will use different names for the same fungus, or the same name for different fungi!

Fortunately, every fungus does have a Latin scientific name and if you look up their meanings these can be descriptive too. The first part of the name tells you what group (genus) the fungus belongs to and the second part of the name is specific to that fungus (species).

We have listed below all of the fungi included in this key. When only one Latin name is given below you will know that you have only keyed-out the fungus as far as its genus. Mycologists (this is what you call the people who study fungi) are finding out new information about fungi all the time, and sometimes a fungus will be given a different Latin name as a result of new research.

Amethyst Deceiver.....	<i>Laccaria amethystea</i>	Giant Puffball.....	<i>Langermannia gigantea</i>
Birch Polypore.....	<i>Piptoporus betulinus</i>	Hare's Ear fungus.....	<i>Otidea onotica</i>
Bird's nest fungi.....	<i>Cyathus</i> or <i>Crucibulum</i> or <i>Nidularia</i> species	Hedgehog fungus.....	<i>Hydnum repandum</i>
Blusher.....	<i>Amanita rubescens</i>	Many-zoned Polypore..	<i>Trametes versicolor</i>
Bovista Puffball.....	<i>Bovista</i> species	Milk Caps.....	<i>Lactarius</i> species
Candle-snuff fungus...	<i>Xylaria hypoxylon</i>	Orange Peel fungus.....	<i>Aleuria aurantia</i>
Chanterelle.....	<i>Cantharellus cibarius</i>	Penny Bun.....	<i>Boletus edulis</i>
Common Puffball.....	<i>Lycoperdon perlatum</i>	Plums and Custard.....	<i>Tricholomopsis rutilans</i>
Coral Spot fungus.....	<i>Nectria cinnabarina</i>	Polyporus	<i>Polyporus</i> species
Dacrymyces.....	<i>Dacrymyces</i> species	Porcelain fungus.....	<i>Oudemansiella mucida</i>
Dead Man's Fingers....	<i>Xylaria polymorpha</i>	Root Fomes.....	<i>Heterobasidion annosum</i>
Dryad's Saddle.....	<i>Polyporus squamosus</i>	Scarlet Hood.....	<i>Hygrocybe coccinea</i>
Ear pick fungus.....	<i>Auriscalpium vulgare</i>	Shaggy Ink Cap.....	<i>Coprinus comatus</i>
Earth Star fungus.....	<i>Geastrum</i> species	Stag's Horn fungus.....	<i>Calocera viscosa</i>
Earth Tongues.....	<i>Geoglossum</i> or <i>Trichoglossum</i> or <i>Microglossum</i> species	Stinkhorn.....	<i>Phallus impudicus</i>
Eye Lash fungus.....	<i>Scutellinia scutellata</i>	Sulphur Tuft.....	<i>Hypholoma fasciculare</i>
Fly Agaric.....	<i>Amanita muscaria</i>	Tar Spot fungus.....	<i>Rhytisma acerinum</i>
		Witches' Butter.....	<i>Exidia glandulosa</i>
		Wood Puffball.....	<i>Lycoperdon pyriforme</i>

More Reading

If you have enjoyed this key and would like to try something a little bit more challenging, try:

‘An initial guide to the identification of Mushrooms and Toadstools’

available from Paul Nichol, Strawberry Howe,
14 Horncastle Road, Woodhall Spa, Lincs LN10 6UZ

Other useful books:

‘Mushrooms and other fungi of Great Britain and Europe’

by Roger Phillips, published by Pan Books 1981

‘Collins How to Identify Edible Mushrooms’

by Patrick Harding, Tony Lyon and Gill Tomblin,
HarperCollins Publishers 1996

‘How the fungus got its spots—an explainer’s guide to fungi’

available from the the BMS Librarian,
c/o British Mycological Society,
Joseph Banks Building,
Royal Botanic Gardens Kew, Richmond Surrey, TW9 3AB



‘Fungus Fred goes Foraying’

by Maggie Hadley

Most of the information that you need to use this key can be found using a ‘dental’ mirror to look underneath the fungus’ cap!

These can be obtained from :

Scientific and Chemical Supplies,
Carlton House, Livingston Rd, Bilston,
West Midlands, WV14 0QZ. Tel: 01902 402402

There is lots of information about fungi on the internet. Here are some addresses to get you started:

<http://www.britmycolsoc.org.uk/> Website of the British Mycological Society

<http://www.nifg.org.uk/home.htm> Website of the Northern Ireland Fungus Group—lots of good links and ‘fascinating facts’.

<http://www.rbge.org.uk/research/celtica/fc.htm> The Royal Botanic Gardens Edinburgh 'Flora Celtica' site has information on fungal uses in the section on Scottish Plant Uses

And finally.....

Remember we asked you why were stinkhorns, earth stars and bird’s nest fungi related to puffballs? The answer’s in the Latin words describing them - ‘gasteroid’ which has the same root as ‘gastric’ and refers to a stomach; the spores of all these fungi develop inside a closed, or ‘stomach-like’ fruitbody - at least in the early stages!



Text by Liz Holden, illustrations by Kath Hamper

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Additional copies of this key may be obtained from:

Liz Holden
Allanaquoich
Mar Lodge Estate
Braemar
Ballater
Aberdeenshire AB35 5YJ



British Mycological
Society promoting fungal science

The authors are pleased to acknowledge the support of
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Introductory Parachute Games – some suggested questions and responses for running under the ‘mushroom’

1. Who has seen a wild mushroom or toadstool growing?
2. Who likes mushroom soup?
3. Who has eaten Quorn burgers?
4. Who likes drinking hot chocolate?
5. Who likes drinking lemonade?
6. Who's taken penicillin medicine – the pink tasty stuff that isn't Calpol?
7. Who's seen mouldy bread?
8. Who likes soya sauce on their food?
9. Who's parents make wine or beer at home?
10. Who likes marmite?
11. Who likes Stilton Cheese?
12. Who had toast for breakfast?
13. Who had milk on their cereals this morning?
14. Who has eaten a mushroom product already today?

Brief comments that can be made between questions once everybody is back around the edge of the ‘chute. N.B. keep it simple and fun.

1. The mushroom or toadstool that you saw is just one part of the fungus – the bit that makes the spores – more about that later.
2. Made with mushrooms – like the ones you see in the shops.
3. Quorn is the trade name for a food product (myco-protein) made from a thread like fungus – not all fungi produce a big mushroom or toadstool – we might see some different shapes today.
4. Chocolate is made from cocoa beans that grow in a pod on a tree. A fungus is used to ferment (break down) the bean and separate it from the pod.
5. Citric acid is used in fizzy drinks – look on the labels! Citric acid is a chemical produced when certain fungi ferment sugars.
6. Penicillin is a fungus that sometimes forms a blue/green crust on old cheese or bread. In 1928, Alexander Fleming discovered that Penicillin contains substances that can kill bacteria and these have been the basis of many antibiotic medicines ever since.
7. Well you have probably seen a member of the Penicillin family – don't try and use it for medical purposes though!
8. Soya sauce is made from soya beans that are soaked, mashed and then fermented with two different mold fungi.
9. Alcohol is one of the other main products of a yeast fungus fermenting sugars – sugars from cereal grains for beer and grapes for wine.
10. Marmite is made from the used yeast fungus from the brewing industry.
11. Most of today's cheese is made using a fungal extract to solidify the milk. Stilton cheese has an extra fungus growing through it to give it more flavour!
12. Toast is bread and we like our bread light and fluffy – a yeast fungus makes that happen.
13. Milk comes from cows and the cows have tiny fungi in their stomachs to help them digest all the grass that they eat. Without the fungi to help there would be no milk.
14. This should be everybody who ate a breakfast!



WATER

WATER

WATER

WATER

WATER

WATER

WATER

WATER

WATER

Make a Mycelium Posts

Make a Mycelium Props Box

Contents:

20 x 'kite' cards with 25m of builder's nylon string on each

30 containers (plastic flower pots or similar)

small pot of pins to attach containers to stakes

40 each of 4 different coloured fimo 'counters' = food particles

large numbers of red balloons

string cut into lengths + spare string for tying to balloons

large amount of 'tested' toilet paper

7 water dropper bottles

5 balloon puffers

8 x keys

19 dentist's mirror

Parachute fungus games props box

Contents:

1 large light weight ball = parasitic spore

15 small foam balls = recycler spores

15 small foam balls (different colour) = mycorrhizal spores

1 x whistle on string

small box containing 1 dropper bottle of water

toilet paper

small number of red balloons

Mushroom

Murder

Mystery

Props Box

Indoor

Props Box



Can you spot the odd one out?

**One of these items does not need a
fungus to create the final product!**

Fascinating Facts: here are just a few for starters, you can find others in the references in the leader's notes – use them as you like.

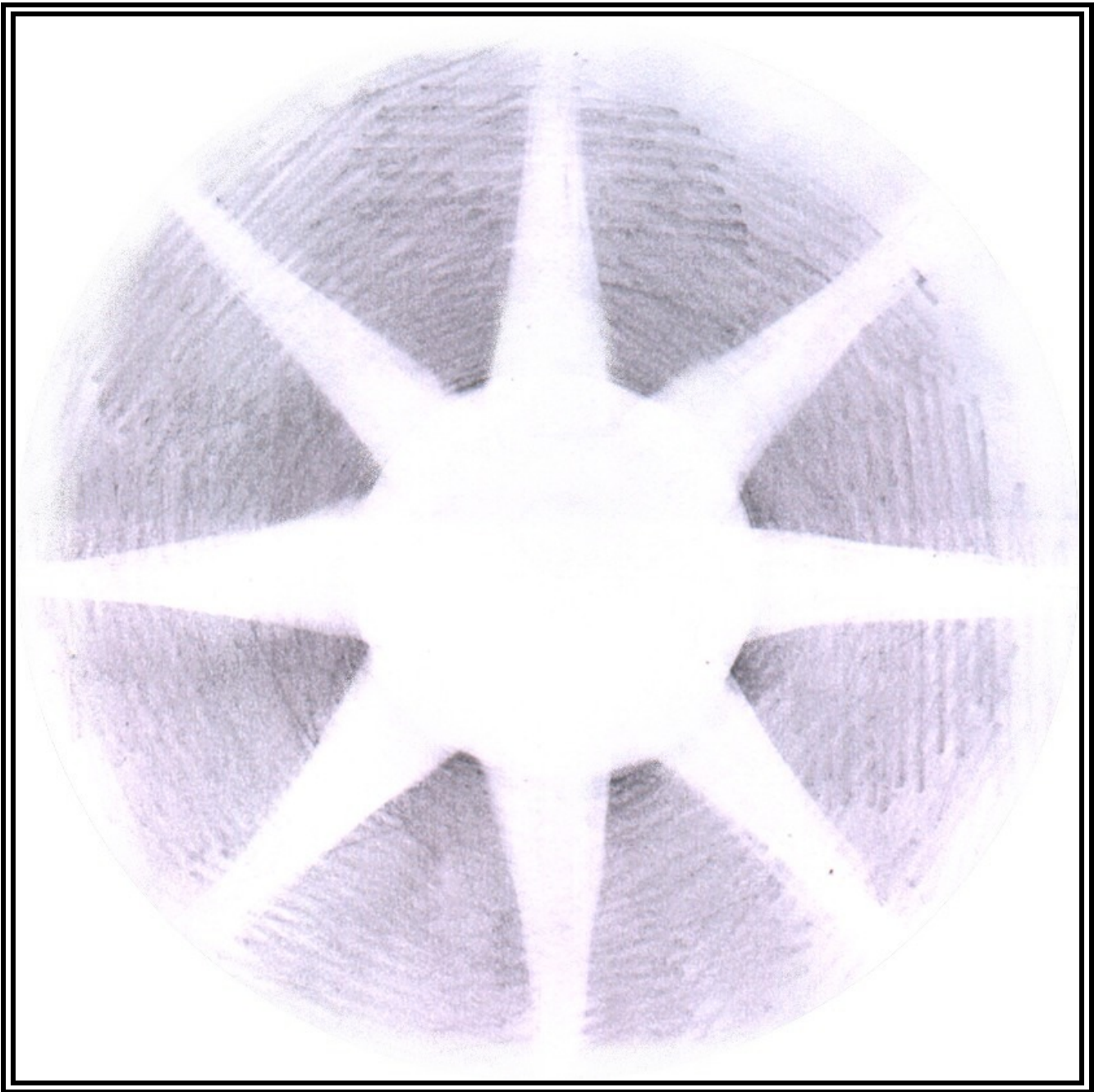
- It was not always so easy to go on fungal forays. In ancient Egypt, the consumption of mushrooms was a privilege restricted to the pharaoh and his family – a commoner was forbidden even to touch one!
- Mushroom poisoning was a problem even in ancient Rome. Emperor Claudius died at the hand of his third wife Agrippina, who fed him a poison mushroom in order to ensure that her son Nero would become the next emperor.
- People have also been using fungi for purposes other than food for thousands of years. Tinder material prepared from the bracket fungus, *Fomes fomentarius*, was found with the frozen remains of a Neolithic man in an alpine glacier in 1991, and have been dated to 3350 – 3100BC
- Fairy rings in Germany are allegedly caused by dragons flying in circles and scorching the earth beneath them with their tails.
- An individual Honey Fungus (*Armillaria* species) is claimed to be the world's largest and oldest living organism. It is estimated to be 1500 years old and to weigh more than 10,000kg.
- It is said that the ancient highlanders used to pack their circular shields (targes) with dried material from the Birch Bolete (*Piptoporus betulinus*). The fungus is light and tough and is a good shock absorber. It was also used for honing blades (the Victorians called it the 'razor strop' fungus and cleaned and sharpened their old fashioned razor blades on it). Good job that this fungus also has some antiseptic qualities!
- One bracket, a Dryad's Saddle (*Polyporus squamosus*), is recorded as reaching a weight of 14kg in only three weeks.
- The first discovered antibiotic – penicillin – is from a mould *Penicillium notatum*. The discovery was probably one of the greatest medical advances of the 20th century.

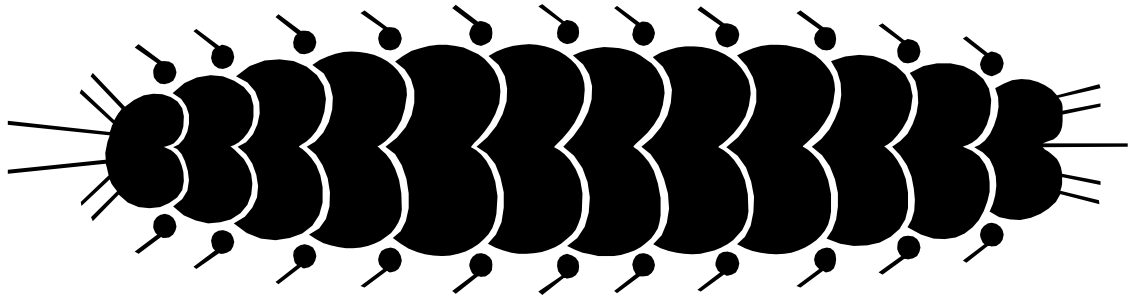


Fungal Food Chains: templates

- Explanatory text
- The Sun
- The Beetle larva
- The Frog
- The Fox
- The Hawk
- The Slug
- The Blue tit
- The dead Birch tree
- The live Birch tree
- The Fly Agaric
- The Birch Polypore

There are two complete but mixed up food chains here. Each card represents one step in the food chain. Can you sort them out to show how the sun's energy is passed along the chain right to the top predator?

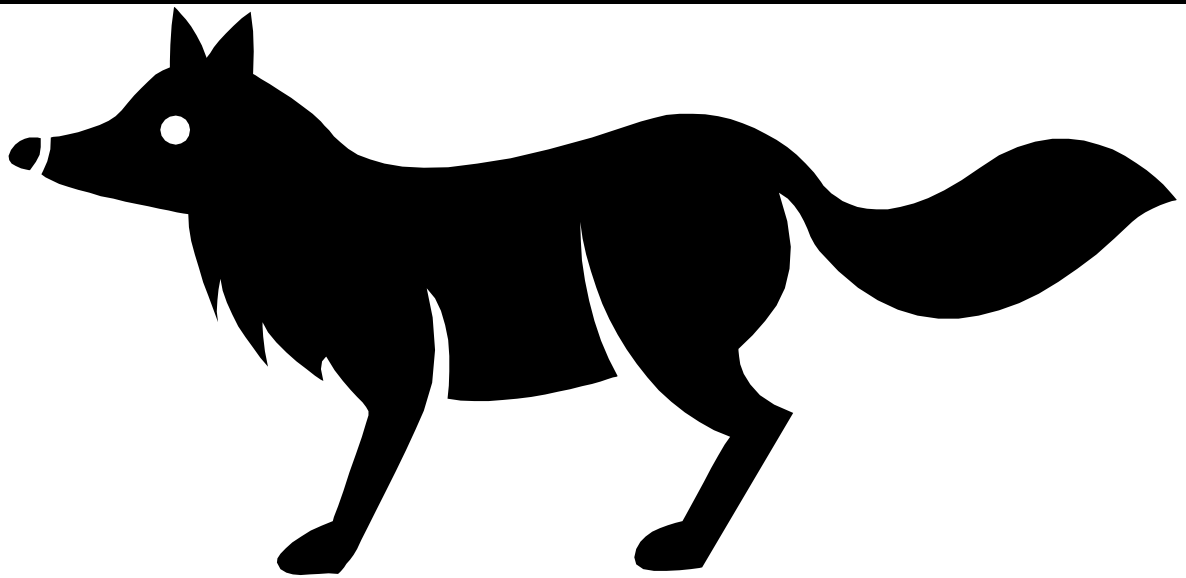




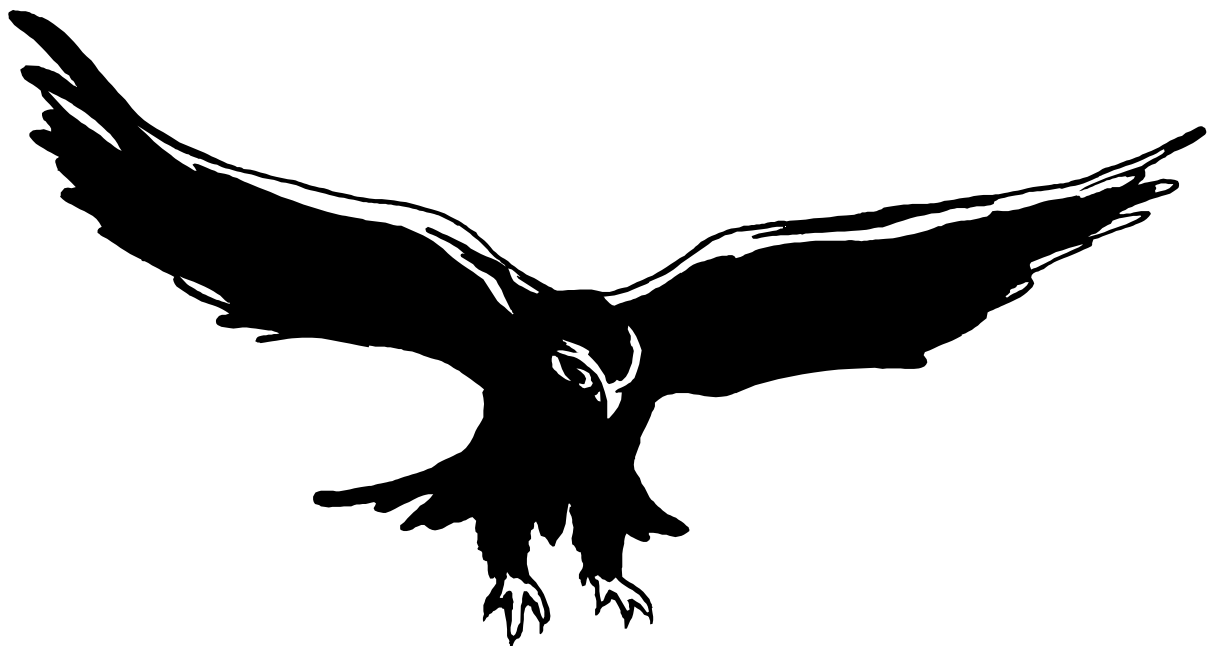
beetle larva



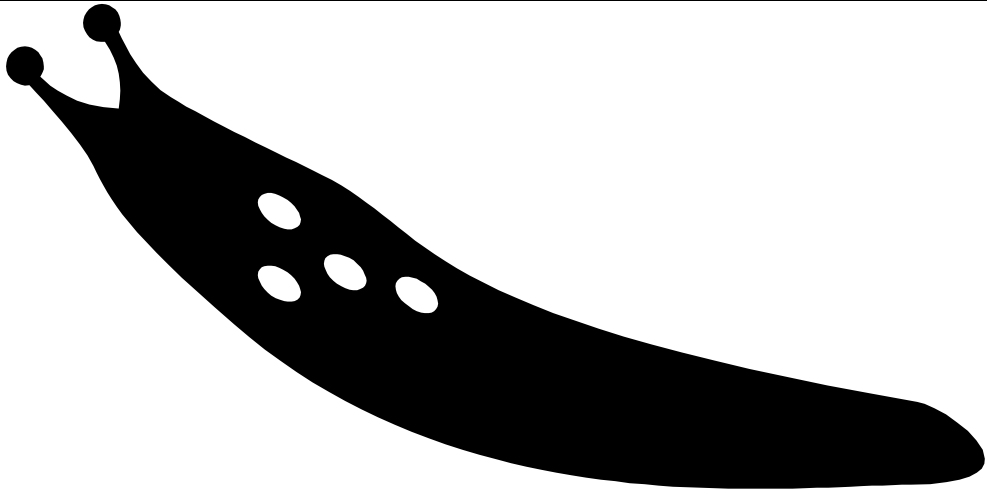
frog



fox



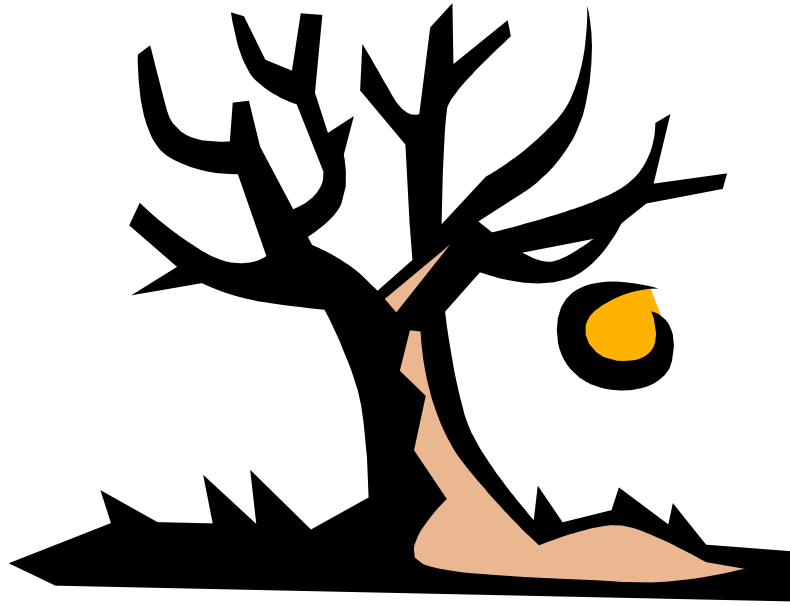
hawk



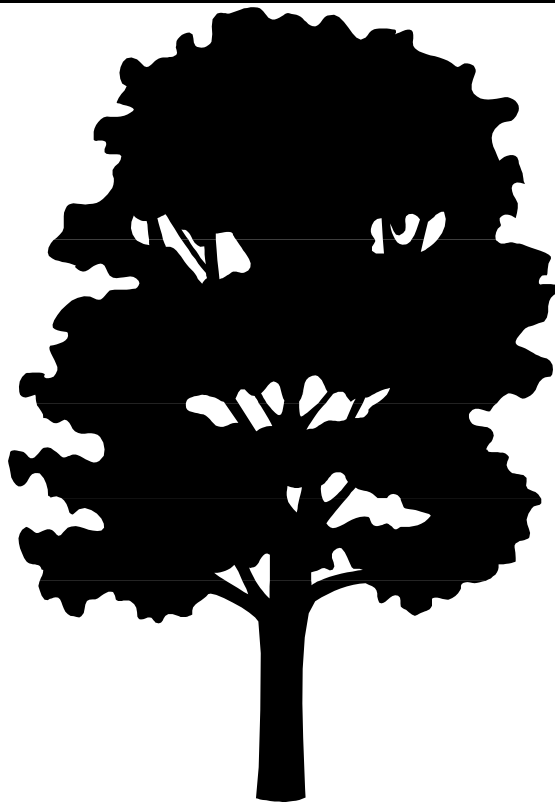
slug



blue tit



dead birch tree



live birch tree



Fly Agaric



Birch Polypore

Make a Mycelium

Suggested template for thick card 'string winder' in 'Make a Mycelium'



Short cut in card to help secure string on the card.

Cut in card to secure the loose end of the string.

Mushroom Murder Mystery Leader's Crib Cards

1.

- **Divide group equally into trees and fungi**
- **Move the trees into a rough semi-circle** (not too far away, just enough that the fungi have to move around to find their tree)

Mushroom Murder Mystery

2.

- **Give out bags, explaining briefly how to use them** (i.e. Don't look in them yet, they have clues you need to take out when instructed)
- **Fungi can't get their energy directly from the sun** (brief review of the 3 methods that they use - food exchange, recycling and killing their host! Mention that one tree will die here!)

Mushroom Murder Mystery

3.

- **Trees look in your bags and find your leaves. Keep them out.** (They don't need to say what they are yet)
- **Fungi often start their life as a spore.** (The spore germinates and a minute tube emerges. Life is complicated, and the fungus cannot guarantee that its spore will land on a suitable food source - many fungi can only live with a particular species. All our fungi will find a host, but each tree can only have one fungus)

Mushroom Murder Mystery

4.

Fungi look in your bags and find your leaves (attached to the drawstring) and I will dust you with spore powder to set you off to find a tree with the same leaf as you. Remember that each tree can only have one fungus in this case-if the tree is already occupied, you have to move on to another.

Mushroom Murder Mystery

5.

When all are matched up, explain when toadstools occur and what they are for. If the conditions are right, some may fruit (find cocktail umbrellas and put them up) and this is when we can identify you. Fungi look at your photos now.

Mushroom Murder Mystery

6.

Go around the wood (make sure you go to larch last) and ask each pair in turn to identify themselves. If they are mycorrhizal partners, they should exchange mineral salts and sugars now. If saprotrophic, they should produce the recycling card and leaves / twigs – explain the relationship. As each pair is revealed they can shed their own spores!

Mushroom Murder Mystery

7.

The last to be revealed should be the larch / cauliflower fungus. The larch can die (as dramatically as it likes) and should then search it's bag for the piece of wood / quivery beetle. Can anyone explain the wood with the beetle holes and thus why the death of the tree is important to the woodland ecosystem?

Mushroom Murder Mystery

8.

Before gathering up the bags, ensure that the salts and sugars have been swapped back! Make sure all the items go back into the correct bags - list overleaf.

Mushroom Murder Mystery

8. (reverse side)

Fungus bags contain: un-named picture of leaf (attached to drawstring), pot of spores, named photo of fungus, cocktail umbrella. If yellow background, pot of mineral salts. If green background, recycling symbol.

Tree bags contain: Named picture of leaf. Birch, beech and pine should have pot of sugars. Hazel, oak and elm should have leaves or twigs. Larch should have piece of dead wood with beetle galleries, or a quivery bug.

Leader's bag contains: Pot of spores. Prompt cards. Spare salt, sugar and spore pots.



‘The Chanterelle’

I am very good to eat and
can help several different
sorts of tree to grow,
including birch
Scots pine and beech.

Mushroom Murder Mystery



‘The Gypsy’

I help Scots pine trees to grow
and I am quite rare That is because there
is not much of the old pine forest left.

Mushroom Murder Mystery



‘Woolly Milkcap’

I help birch trees to grow.
As my name suggests,
I produce a white,
milk like liquid when broken.

Mushroom Murder Mystery



‘Fly Agaric’

I am poisonous but
very important –
I help birch trees to grow

Mushroom Murder Mystery



‘Wood Cauliflower’

I am a parasite – I attack
old and sick conifer trees
and can even kill them!

Mushroom Murder Mystery



‘Wood Hedgehog’

I am called ‘hedgehog’
because I have spines.
I help birch and other trees
to grow

Mushroom Murder Mystery



‘Wood Woolly-foot’

I am a common fungus of woodlands. I live on leaves and break them down for recycling

Mushroom Murder Mystery



‘The Blusher’

I bruise red when I am
damaged and help birch trees
to grow

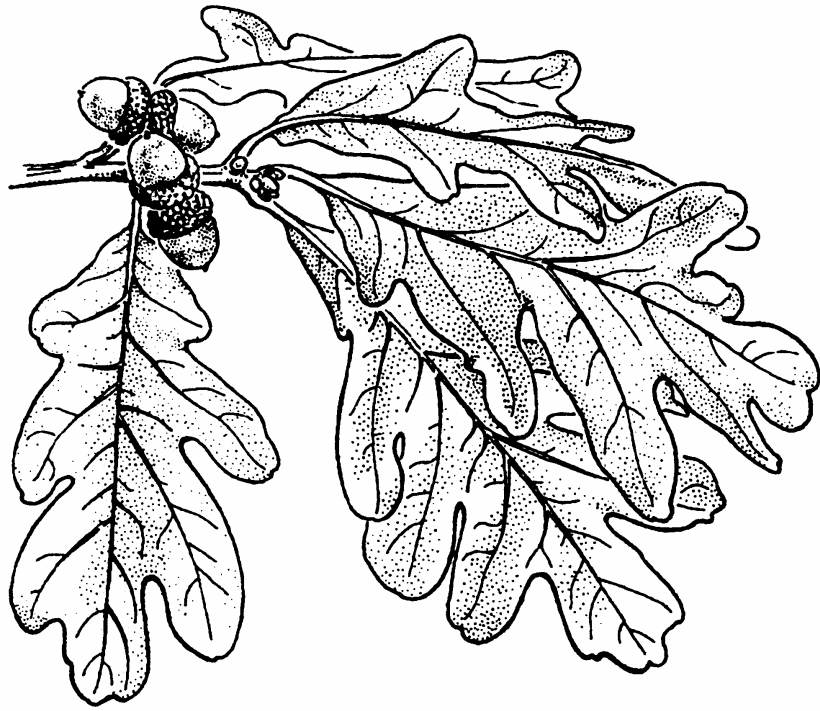
Mushroom Murder Mystery



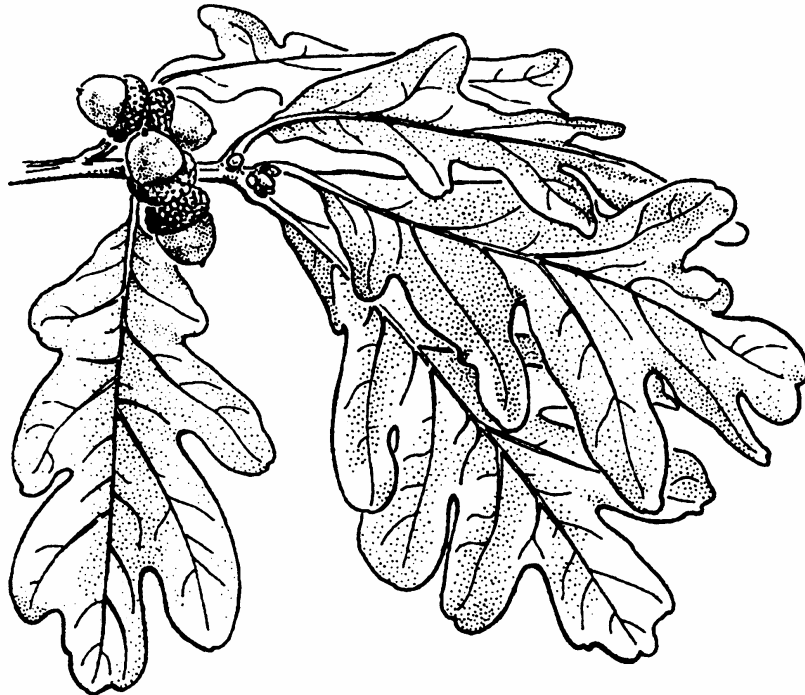
‘Coral Spot’

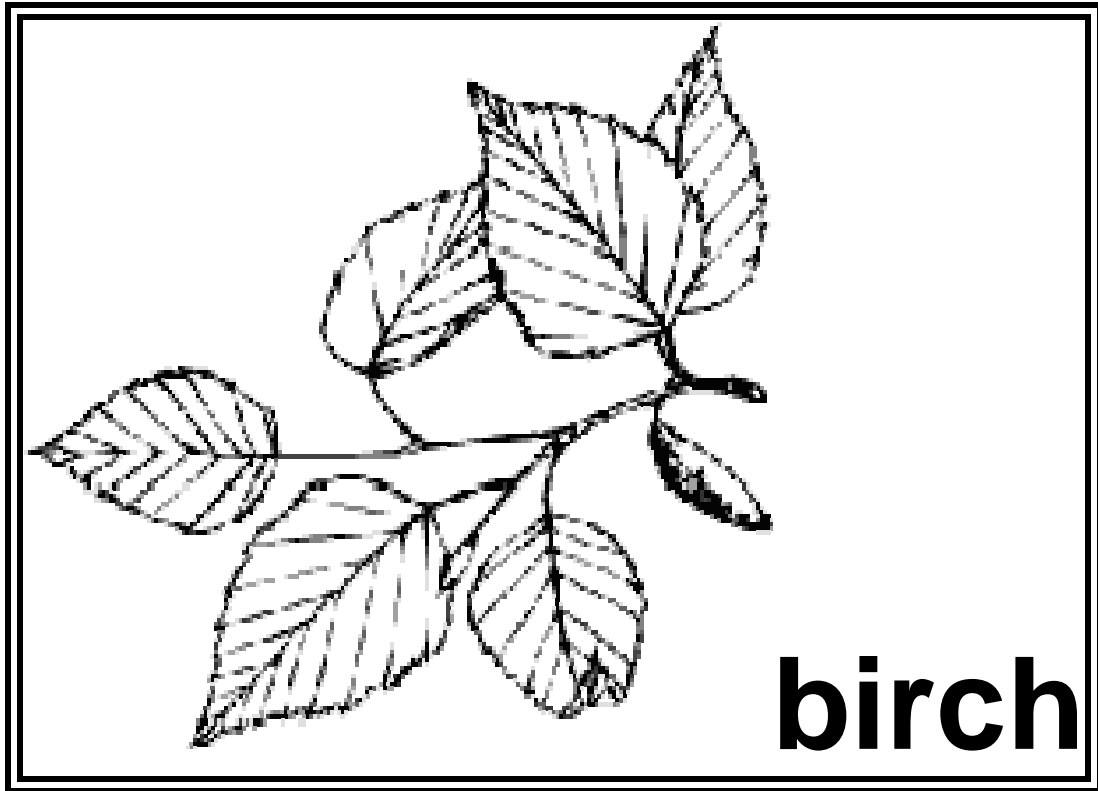
I am a colourful and common
recycler of dead twigs
from broadleaved trees

Mushroom Murder Mystery

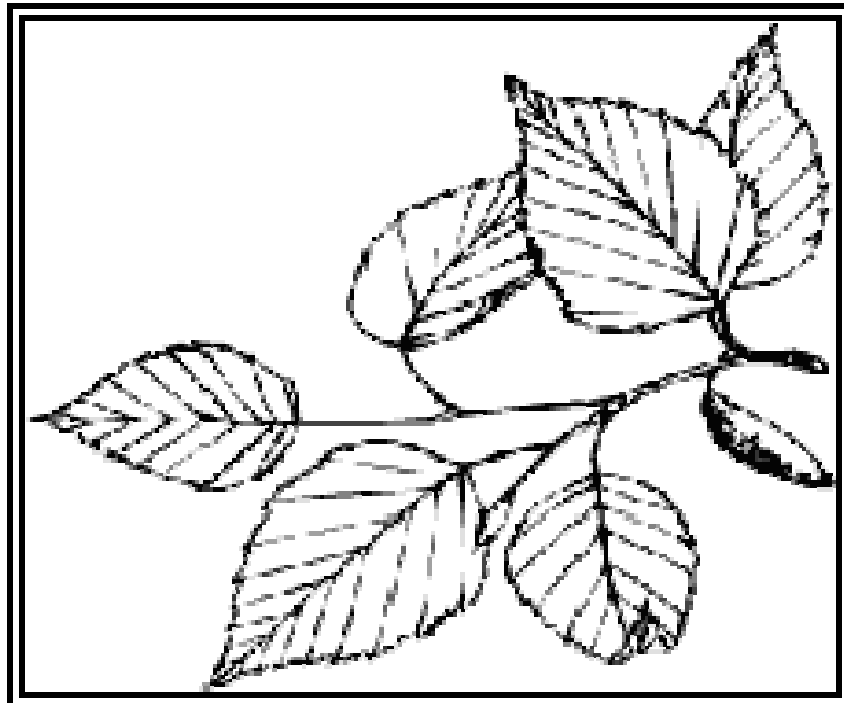


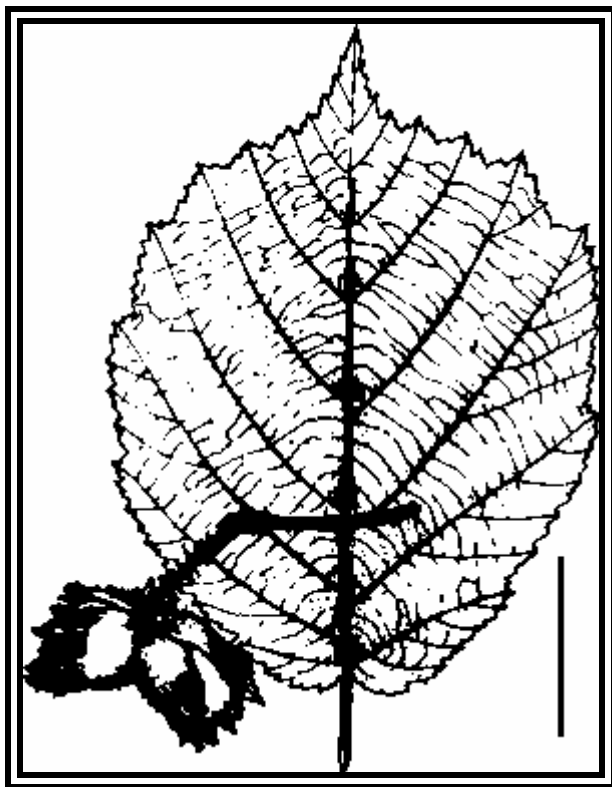
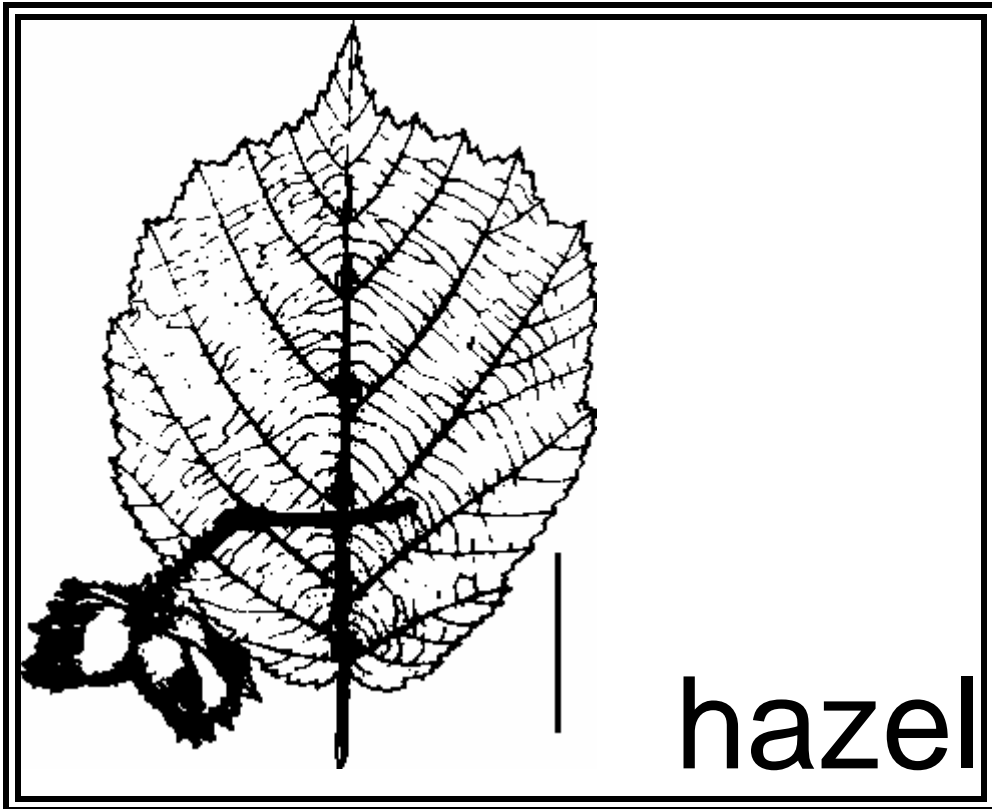
Oak

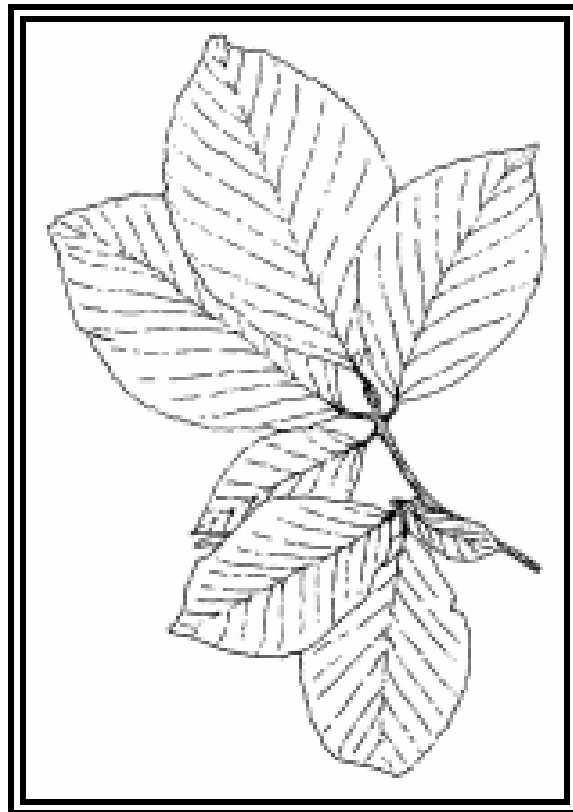
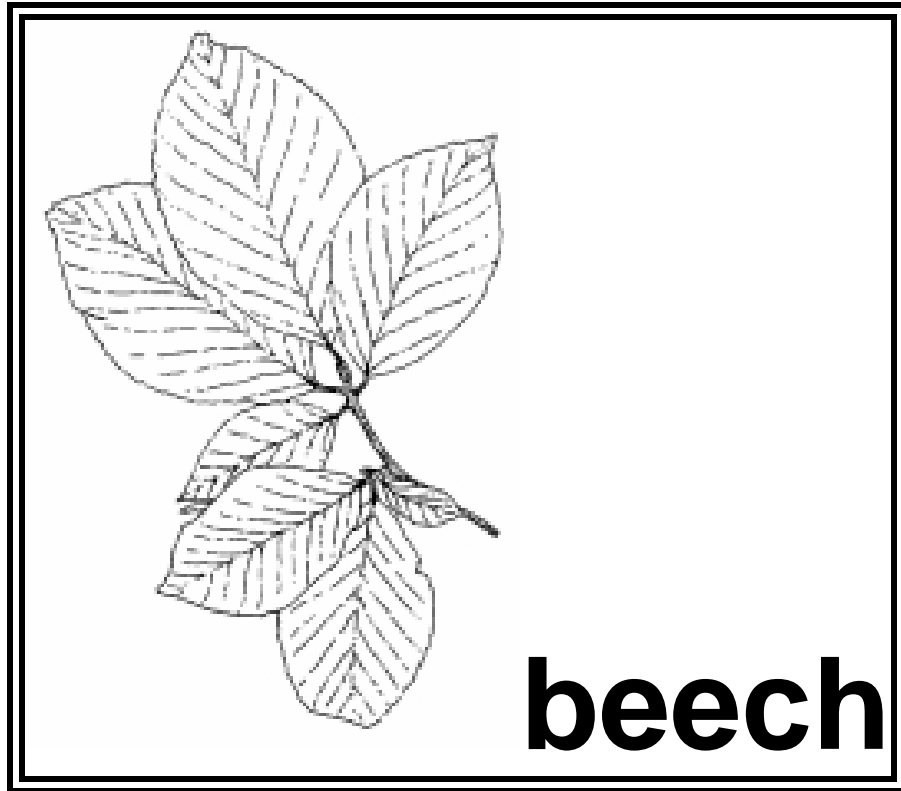


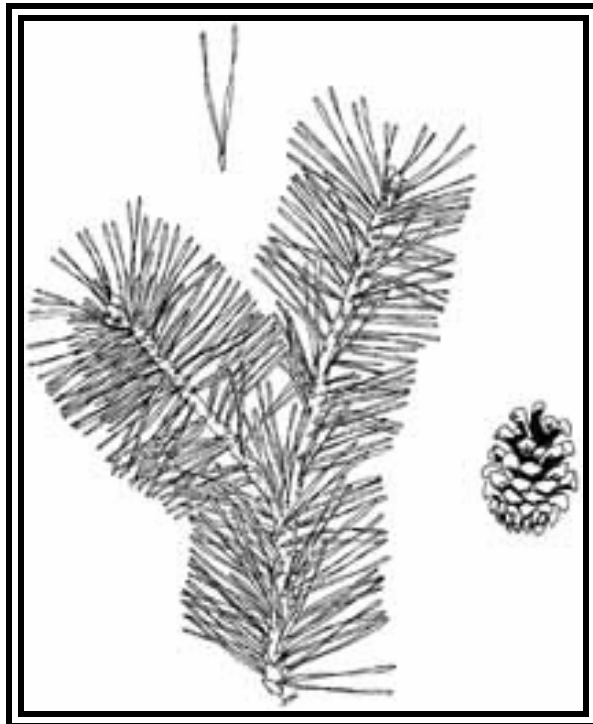
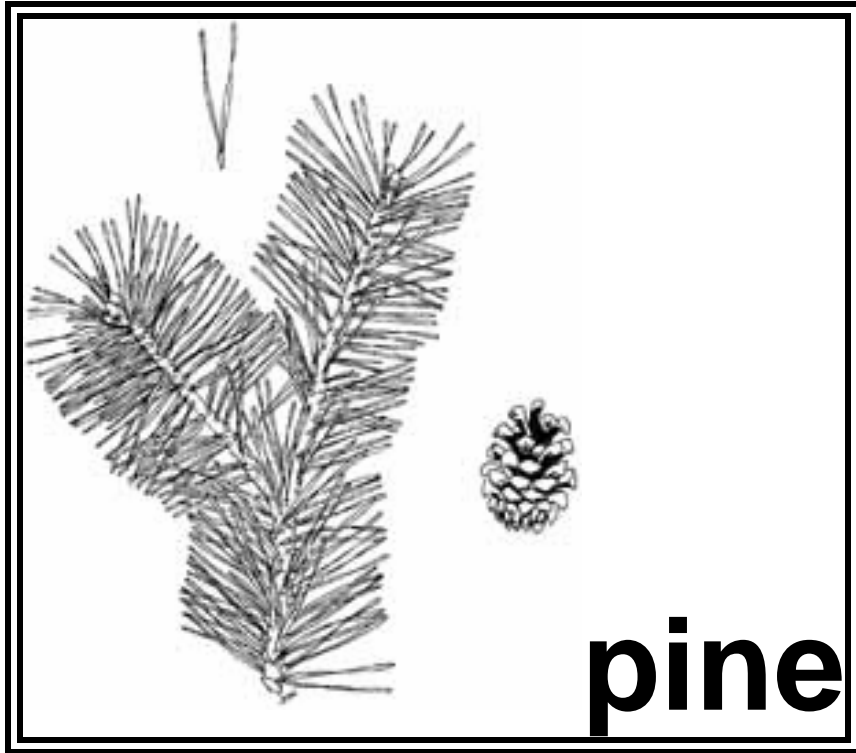


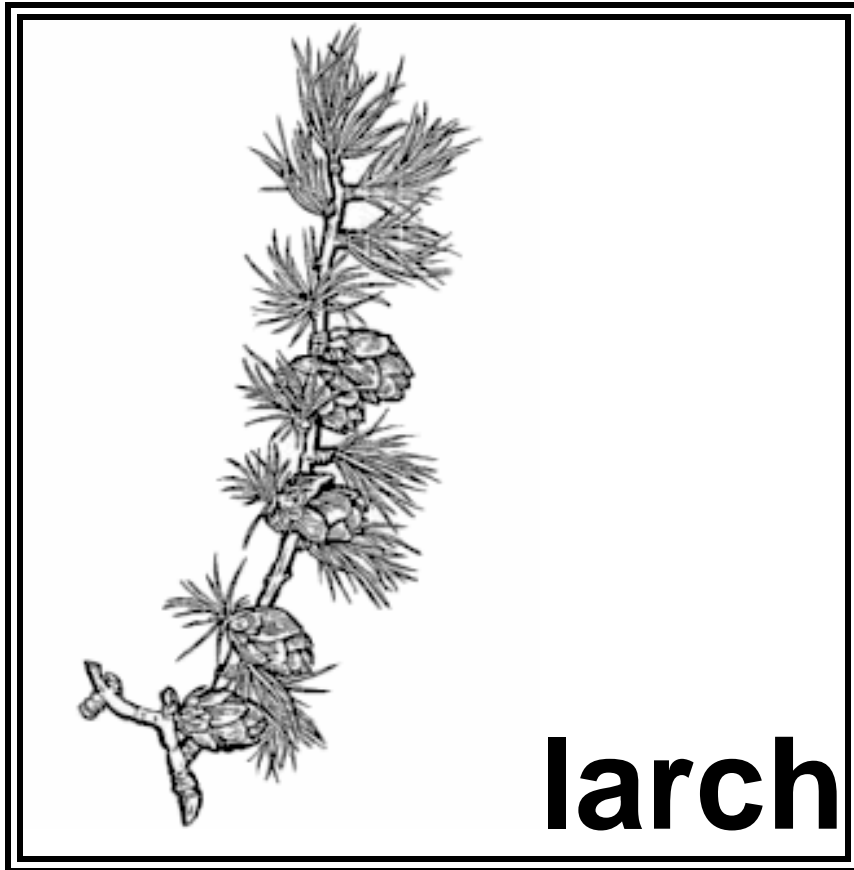
birch





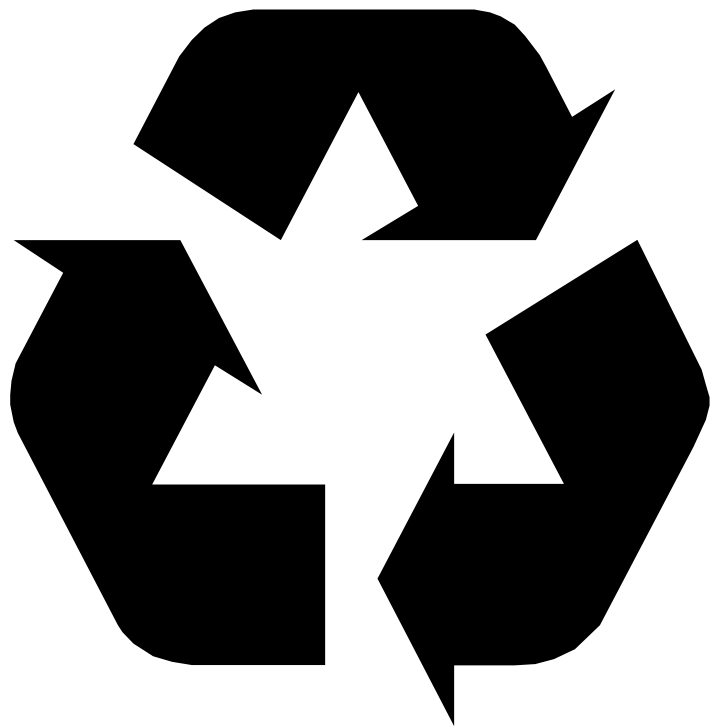
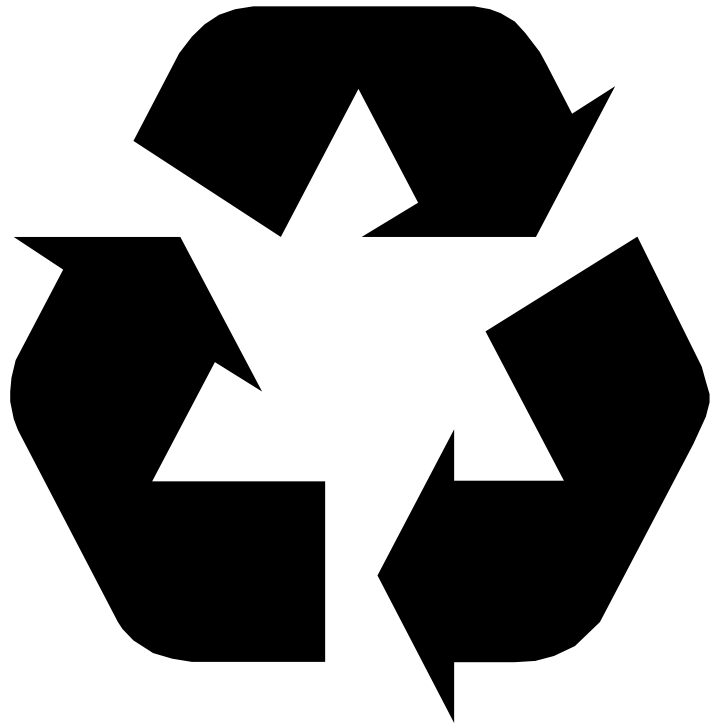




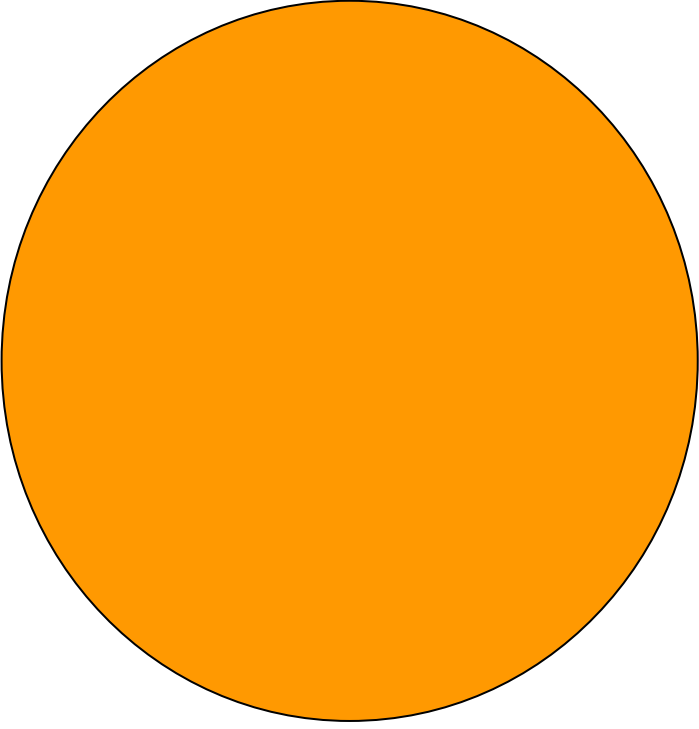


larch

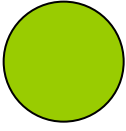




How big are fungal spores?



An orange can often be as much as 8 cm across



A pea is much smaller at around 1cm across

This full stop is about 1 mm across. You would need about 500 fungal spores to cover it!



Toadstools and trees

Some suggested statements for 'Toadstools and Trees'

T = True

F = False

F Fungi are plants

F Fungi are animals

T Fungi are in a kingdom all of their own

F All fungi are poisonous

F All fungi are slimy

T One small nibble of a Death Cap could kill you

F Poisonous fungi should be destroyed

F All fungi are bad news for the trees in a wood

T 90% of higher plants live in association with a fungus

T Spores are smaller than plant seeds

T The spots on a Fly Agaric are left by the veil, which protected the young fungus

F Fungi that attack living trees are bad for the wild forest

T Toadstools are important places for insect larvae to hide in and feed from

F Fairy rings are caused by fire breathing dragons chasing their tails!

T Some fungi can help to stop bleeding

T The effects of some fungi can be seen from space

