

THE FOOD WEB WEEKLY

SUMMER 2006

THE LIFE AND DEATH OF THE HOLLY LEAF MINER

Next time you walk past a holly tree look closely; you may find a small invader feasting on the cells of the leaf. The invaders are the larvae (miners as they are fondly known) of the leaf mining fly (*Phytomyza ilicus*). These larvae have hatched from eggs laid on the holly leaves by the leaf mining fly. Eventually the larvae will pupate into the pupa. From the pupa will emerge the successful fly. The whole cycle may begin again.

Sadly not all miners are successful. Some miners never make it to 'fly hood'. Birds, such as the blue tit, feed on the larvae, leaving a v-shaped tear on the leaf as evidence of doing so. Blue tits are predated by sparrow hawk. Blue tits also feed on greenfly and aphids which are pests in gardens.

Parasites also feed on the miners. A parasitic wasp called *Chrysocharis gemma* inserts a single egg through the leaf into the body of the miner. It feeds on it, eventually killing the miner. Evidence of this taking place will be a very small neat hole left on either side of the leaf.

Although less common, another parasite (*Pleurotropis amyntas*) that feeds on the miner is also found to feed on other parasitic species too. Thus making it a primary and secondary parasite.

Never again will you look at a holly bush in the same way. Continuous battles are taking place for nutrients and therefore life!



Top: leaf mine opened by blue tit.
Bottom: Mined Holly Leaf

INTERESTING FACTS:

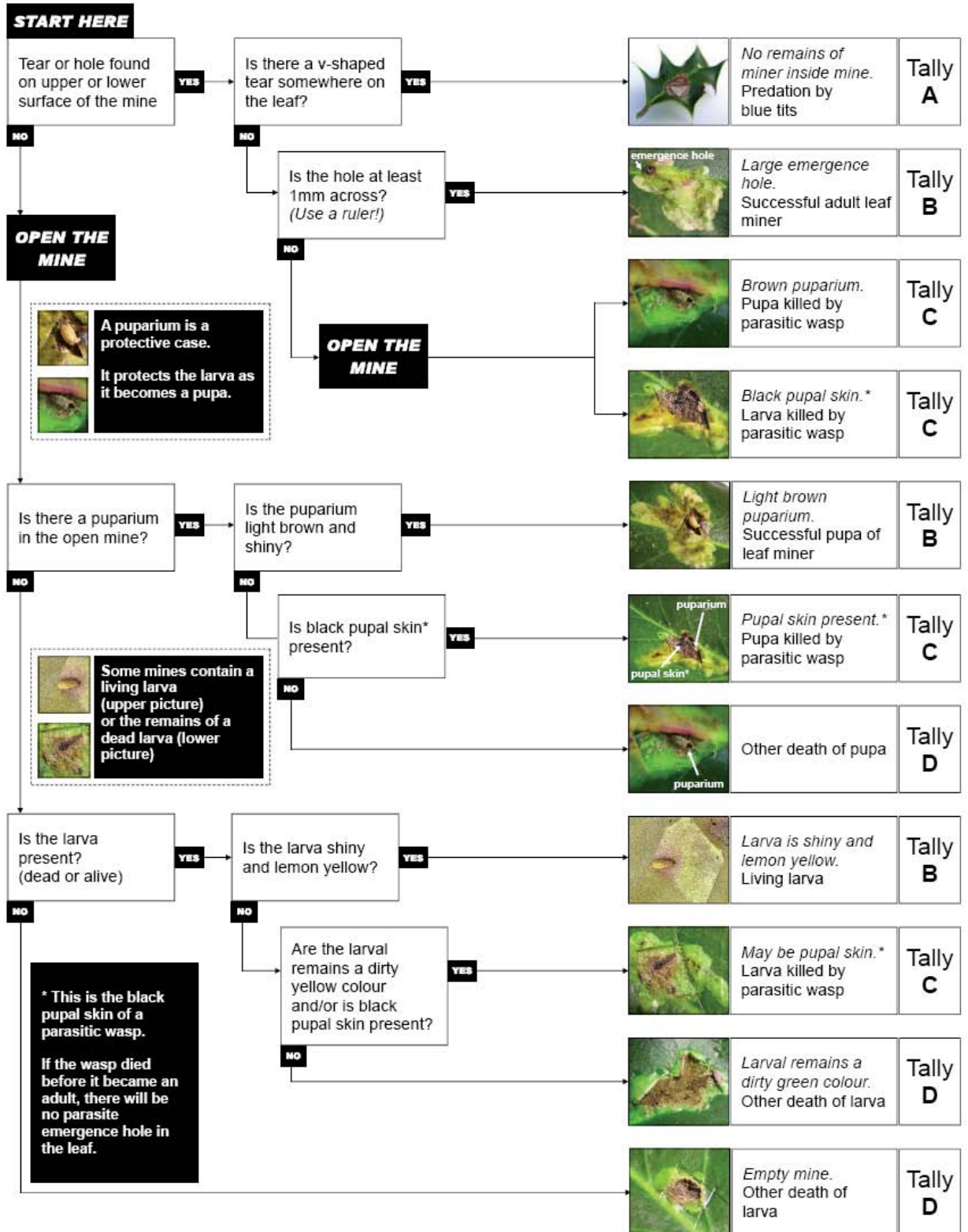
- Holly leaf miners only have one new generation each year.
- Adult flies survive for one month only (May/June).
- The holly leaf miner has limited effect on the holly tree.

LIFE OR DEATH? ANSWER THE QUESTIONS

1. Draw a life cycle for the holly leaf miner. Use the following words; **larvae (miner), eggs, adult fly, pupa**
2. a) What is a parasite? b) How do they stop the holly leaf miner from maturing into a fly?
3. Some energy does not continue along the food chain. Where does this energy go?

What happened to the holly leaf-miner?

SHEET 1 - HOLLY LEAF-MINER PHOTOGRAPH TRAIL





Observation Sheet

	Branch number									
	1	2	3	4	5	6	7	8	9	10
Number of leaves without mines										
Number of mines										

Looking around this habitat what other plants are found near your holly tree?

Would they affect the holly tree you are studying? How?

Did you have any difficulties in doing this practical?

Recording Sheet

Start in this Column			What happened to the Holly Leaf Miner	Tally	
Tear or hole found on the surface of the mine, this can be on the upper or the lower surface	V-shaped tear possibly a peck mark from a beak, no remains of miner inside the mine		Predation by blue tits	A	
	Small round exit hole found on mine	Large exit hole (>1mm)	On opening the mine a shiny light brown puparium is found	Successful adult leaf miner	B
		Small exit hole like a pin prick	On opening the mine a brown puparium is found with a black pupal skin next to it	Pupa killed by parasitic wasp	C
			On opening the mine a black pupal skin is found but no brown puparium	Larva killed by parasitic wasp	C
No hole or tear present on the upper or lower surface of the mine	On opening the mine a puparium is found	Puparium shiny and light brown		Successful pupa of leaf miner	B
		Puparium dull and dark brown	Black pupal skin can be seen inside the puparium	Pupa killed by parasitic wasp	C
			No black pupal skin inside the puparium	Other death of pupa	D
	On opening the mine a puparium is not found	Living larva present, shiny and lemon colour		Successful larva of leaf miner	B
		Remains of dead larva present	Black pupal skin present, lying away from the remains	Larva killed by parasitic wasp	C
			No pupal skin, remains are dirty yellow colour	Larva killed by parasitic wasp	C
			No pupal skin, remains are dirty greenish colour	Other death of larva	D
		No conspicuous larval remains		Other death of larva	D



	Group Number / Tally Totals						Class Total
	1	2	3	4	5	6	
A Predation by blue tits							
B Successful larva, pupa or adult leaf miner							
C Larva or pupa killed by parasitic wasp							
D Other death of larva							
E Number of leaves without mines (from sheet 1)							
Total number of mines sampled (A + B + C + D)							
Total number of leaves and mines sampled (A + B + C + D + E)							

1. Draw a labelled flow diagram to cover all the possible pathways for energy from a holly tree. Use each one of the following labels **once** on the diagram.

- | | | |
|------------------------|----------------------------------|-----------------------|
| Holly tree | Parasite1 (<i>C.gemma</i>) | Adult leaf mining fly |
| Holly leaf miner larva | Parasite 2 (<i>P. amyntas</i>) | Blue tit |
| Natural death of miner | Sparrow hawk | |

2. Now use the class results to help you draw one pyramid of numbers diagram. Label each level with the species name and the type of feeder that it is (e.g. carnivore, herbivore)

3. Use your results to help **explain** your answers to the following.

(a) If the parasite (*C. gemma*) were to decrease in frequency due to a sudden change in environmental conditions, what effect would this have on

(i) the number of holly leaf-miners?

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(ii) the number of blue-tits?

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(b) If the parasite (*P. amyntas*) numbers increased rapidly, what effect would this have on (i) the holly-leaf miner?

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(ii) the other parasites?

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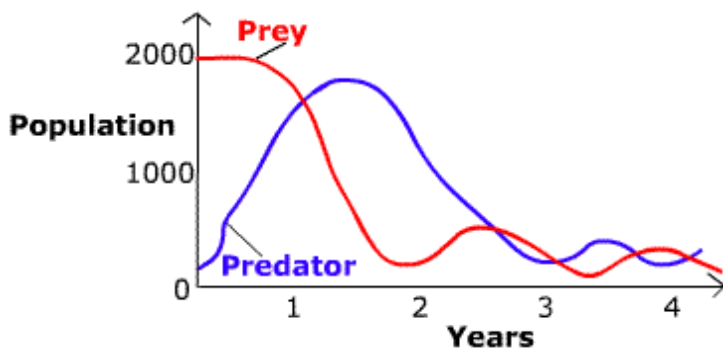
(c) If more sparrowhawks were introduced into the Squares by humans, what effects would this have on the food chain?

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4. Extension.

The graph shows how the numbers of a prey species and the numbers of a predator species change over a period of four years.



(a) Using the graph above can you explain the changing population numbers of both predator and prey numbers over the years?

(b) Draw a graph to show the effect on the leaf miner population if parasite numbers increased dramatically.

Evaluation

1. Consider your method. List the difficulties that your group found. Suggest improvements that could be made so other groups will not encounter the same problems.

Difficulties found	Improvement
<i>To identify the plant species</i>	<i>To name the species with own name and take a photo. To use a name that will remind us of what it looks like.</i>

2) The Royal Horticultural Society (based near Victoria station), many of whose members are plant experts, is concerned that the leaf mining fly population is going to rapidly increase in the future. They would like you to present your findings at a meeting. How confident are you in your data? Do you feel you have enough to discuss with the society? Explain your answer as if you are writing for the Society members.

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