



# HONEYBEE BLUES

## TEACHERS NOTES



SCREEN  
AUSTRALIA



fto

New South Wales  
Film and Television Office

# HONEYBEE BLUES

## Synopsis

*Honeybee Blues* tells the story of the world's disappearing honeybees and the efforts of Australian scientist Dr Denis Anderson to save them from annihilation.

From the native bush and orchards of Australia to the industrial farmlands of the United States and the highlands of Papua New Guinea, *Honeybee Blues* is a scientific detective story that tells a 21st century cautionary tale.

The European honeybee, or *Apis mellifera*, is used for commercial honey production and by a global pollination industry worth up to \$100 billion. Without it we would lose a third of the world's food supply.

But honeybees are under threat from all directions. Industrial agriculture and habitat destruction have taken a toll but the biggest threat is a deadly parasitic mite which Anderson discovered and called *Varroa destructor*. It has decimated bee populations everywhere except Australia which is now the only country that still has European honeybees living in the wild. While in Papua New Guinea Anderson discovered another lethal mite, *Varroa jacobsoni*, that adds to the threat to the world's honeybees.

Denis Anderson believes the solution to eradicating the Varroa mite lies in the genes of the honeybee. He is trying to switch off the honeybee gene that tells the Varroa mite to reproduce. If he succeeds, he could save the last of the world's wild European honeybees from extinction.

The film features observational sequences and interviews with biosecurity officers, bee exporters, pollinators and honey producers. Combining macro photography of the insect world, a lively blues soundtrack and animation sequences, *Honeybee Blues* tracks the incredible journey of the world's oldest domesticated animal and its predators around the globe.

## Denis Anderson's Passion



Since his childhood growing up in the bush on a small property near Temora in rural NSW, Dr Denis Anderson has loved nature.

Denis says he was always happy mucking about in the bush, looking for wild things, although he didn't know there were any jobs where people could work in that area, looking at wild things and making money out of it.

## Curriculum Links

This program will have interest and relevance for teachers and students at secondary and tertiary levels, with some possible interest at upper primary levels. Curriculum links include Science (Biology, Agriculture), Environment (SOSE/HSIE), Business Studies, English, Careers and Media Studies.

## Introduction and Background

Honeybees are important to us in a number of ways. Their honey is in high demand in Australia and a valuable export. The honeybee industry makes a direct contribution to our economy of some \$60 million a year. As well, honeybees are essential in pollinating many of our commercial food crops with an estimated benefit to the economy of some \$2 billion annually. This is just in Australia.

Bees play the same role worldwide. Much of the world's population is dependent on their activities. But outside Australia, honeybees are in trouble. The deadly parasitic mite called *Varroa destructor* has spread disease in bees worldwide. In a number of areas the bee population is crashing mysteriously and the mite may well be the culprit.

## For Teachers and Tutors: Activities

*Honeybee Blues* introduces and illustrates a number of important issues across a range study areas. A variety of themes and topics are listed below in each of these areas. The issues can be explored in different ways to suit the needs of students through one or more of the following:

- Class discussion/debate
- Small group discussion/debate
- Discussion in pairs
- Report/presentation by groups to class
- Research project – individual or group
- Write one page summary of topic
- Draw posters
- Role plays

(A few suggested activities are described.)

## Establishing prior knowledge

Topics might include:

### Bees and beekeeping

- Different species of bees – domestic and wild
- How bees make honey and why
- The life of the bee – workers and queen bees
- How bees navigate

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- How they tell other bees where the nectar is
- Bee keeping – amateur and commercial

## Activity

A class visit to a working beehive and/or a honey factory.

## Mites

- Mites are **not** insects. (How can you tell?)
- What group of animals do they belong to?
- Ticks are related to mites. They also transmit diseases to humans and other animals. What are some of these diseases?
- What are some other examples of disease organisms transmitted by mites, ticks and insects?

## Invasive animals, plants and diseases

Because of its isolation, Australia has been protected from many animals, plants and diseases which cause damage in other parts of the world. When new species do arrive, if they have no natural predators they may become major pests.

- What invasive animals have caused problems?
- What invasive plants have caused problems?
- What diseases of humans and other animals have caused problems?
- What diseases if they became established in Australia could cause problems with:
  - humans?
  - other animals?



## The work of a scientist

While studying science at the Australian National University, Denis Anderson met Professor Adrian Gibbs, the scientist responsible for first identifying viruses in honeybees. His interest was sparked.

Thirty years later he is one of the world's leading bee pathologists, with expertise in insects, microbes and genetics. He has devoted his life to protecting the future of the European honeybee and with it a global pollination industry valued at up to US\$100 billion a year.

- What kinds of scientists might be involved with bees and honey production?
- What sort of background might Denis Anderson have to help him in his career?

After discussion look at Denis Anderson's CSIRO profile: [www.csiro.au/people/ps2dv.html](http://www.csiro.au/people/ps2dv.html)

## Key words and concepts

- Queen bee
- Worker bee
- Apiary
- *Apis mellifera* – the European honeybee. By far the dominant bee used in the honey production and pollination industries. This variety of honeybee – both domestic and wild – is responsible for pollinating about one-third of the world's food supply. The European honeybee was first brought to Australia in 1810. It is now under threat in many countries.
- *Apis cerana* – the Asian honeybee. It is distinctly smaller than the European honeybee and has more prominent abdominal stripes. In the wild, it prefers to nest in small spaces, such as hollowed out tree trunks.
- *Varroa destructor* – mite found on the European honeybee
- *Varroa jacobsoni* – mite found on the Asian honeybee and, since Denis Anderson discovered in 2008, on the European honeybee
- Biosecurity
- Colony collapse disorder (CCD) – A phenomenon first reported in late 2006, CCD occurs when the worker bees abandon their hives, causing the colony to collapse. Researchers are investigating the roles played by viruses, fungi and pesticides, as well as stress factors such as infection by the Varroa mite, poor nutrition and the disruption of the honeybee's natural life cycle by transporting them long distances to pollinate crops. There is a growing consensus among scientists that CCD is the result of a combination of these factors.
- DNA sequencing
- Bee lining – the method used to locate wild bee colonies by capturing and marking foraging worker bees, then releasing them from various points to establish the direction and distance of the colony's home. Sugar is placed in dishes to attract the bees.
- Swarm
- Monoculture (industrial agriculture)
- Habitat loss
- Leatherwood

## Managed hives of honeybees

Honeybees *Apis mellifera* were first introduced to Australia in 1810 by Samuel Marsden who imported an unknown number of colonies from England. These, however, failed to establish and eventually died out as did the hive introduced to Tasmania in 1821 (Ziegler 1993). A second introduction in 1822 to mainland Australia was successful and further introductions to other parts of the continent over the next 50-60 years introduced other races and apiaries were established in each state (Eagland 1958; Manning 1989, 1992; Wills 1989; Oldroyd *et al.* 1993; Ziegler 1993). Source: [www.environment.gov.au/biodiversity/invasive/publications/bees/distribution.html#managed](http://www.environment.gov.au/biodiversity/invasive/publications/bees/distribution.html#managed)

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## Viewing the film

The film can be viewed in one sitting. Alternatively it can be paused at different stages for discussion. There are a number of ways this might be done.

For example, the film could be viewed in three segments:

1. Introduction – to 23 minutes in – (deals with background, discovery of mite in Papua New Guinea and the incursion of the Asian Bee). **Pause** where Wim de Jong says, “It still excites me every time I get on the track of one...don’t let them get away from ya!”
2. 23–41 min (Deals with export of bees to the USA – more tracking of the Asian honeybee in Queensland and problems with the mite and monoculture in the USA.) **Pause** where Denis says, “I’m sorry girls, you know, you’re doomed!”
3. 41 min to the end. (Deals with problems of insecticides, logging and monoculture in Tasmania, finding the Asian bee nest in Queensland and Denis’s plan to switch off the honeybee gene that tells the mite to reproduce.)

## After viewing the film

Follow up on some of the topics discussed before viewing.

Further topics:

### Biology

- Domestic bees
- Wild bees in Australia and around the world
- Dangerous bees
- Bee life cycle
- How bees navigate. (Note that some pesticides may affect bee navigation – see under ‘pesticides’ in the Agriculture section.)



### Pollination

- How do bees pollinate plants?
- Why is this so important?
- Plants that need pollination
- Other insects besides bees that pollinate



**Denis:** “Once you stick your head inside a bee colony, it’s a bit like sticking your head inside a town”.

### Bee navigation

- How do bees find their way back to their hives?

### Genetics

- How did Denis Anderson use DNA sequencing to find out what species of mite he had discovered in Papua New Guinea?
- In what ways is DNA sequencing used for testing with humans?
- How might Denis use genetic engineering to defeat *Varroa*?

### Environmental studies

- Make a list of invasive animals and plants.
- How did they enter Australia (and other countries)?
- The European honeybee is not native to Australia, but it’s not considered a pest. Why not?
- List some introduced animals and plants which are **not** pests.
- How might *Varroa* enter Australia?
- How might the Asian bee enter Australia again?

### Examples of threats

1. A recent major threat to Australia was the fire ant.

### Activity

Individually – or in a group – research the story of the fire ant.

- Why could the fire ant be such a problem?
- How did it invade Australia?
- How is it being dealt with?

Make a 5 minute presentation to the class.

(See [www.dpi.qld.gov.au/fireants](http://www.dpi.qld.gov.au/fireants))

2. European honeybee populations in New Zealand are infected with the *Varroa* mite.
  - How could the mite have reached New Zealand?
  - What effect has it had on the New Zealand honey industry?
  - What are the lessons for Australia?

See: [www.nzherald.co.nz/biosecurity/news/article.cfm?c\\_id=500816&objectid=10507367](http://www.nzherald.co.nz/biosecurity/news/article.cfm?c_id=500816&objectid=10507367)

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3. Tasmanian Devil populations have declined significantly due to an infectious cancer.

- How is the problem being handled?
- In what ways is the Tasmanian Devil situation similar to the threat to the honeybee in Australia?
- In what ways is it different?

See: [www.tassiedevil.com.au](http://www.tassiedevil.com.au)

## Quarantine

The Australian Customs and Quarantine Service works to prevent the entry of invasive species and diseases and also to prevent the importation of illegal drugs.

- How do customs officers try to keep out invasive species and diseases and also illegal drugs?
- In what way are these methods similar and how do they differ?
- How can they prevent the *Varroa* mite entering Australia?
- What disease(s) recently passed through quarantine, which shouldn't have?
- What communication strategies could be used if the *Varroa* mite was found to have entered Australia?
- What is biosecurity and how is it affecting people who travel around the world?

## Activities (class/groups)

Role plays with different scenarios on quarantine issues, for example:

- A hive of diseased bees has been found at Cape York in north Queensland. Your task force has been set up to make sure all diseased bees are eliminated and to prevent the disease entering Australia in the future. Take different roles:  
Scientist, Honey Producer, Quarantine Officer, Education and Publicity expert. Develop your plan and make a presentation to the class.
- A passenger, who is a bee breeder, is returning from Europe and illegally carrying some live queen bees in a pen. The customs officer suspects something is wrong. Roles: passenger(s), customs officer(s)
- A yacht arrives at Thursday Island in far north Queensland. It has almost certainly sailed from Port Moresby in Papua New Guinea. There is therefore a possibility that infected bees are on board. Customs officers board the yacht and confront the skipper and crew. Roles: customs officer(s), crew
- Make up some other scenarios.

## Agriculture

### Monoculture (industrial agriculture)

Two examples of monoculture are described in the film, one in California and one in Tasmania.

- What are they?
- What does monoculture involve?

- Why it has become common round the world?
- What are the advantages of monoculture?
- What problems can arise from monoculture?

### Activity

In organic farming, no inorganic fertilisers or pesticides are used. Stage a debate on monoculture between 'factory farmer(s)' and 'organic farmers (s)'.

## Pesticides

In countries including Australia beekeepers have to use strong pesticides.

- Find out about neonicotinoids.
- What problems do pesticides cause?
- What happens when you treat *Varroa destructor* with pesticides?
- What are the alternatives to pesticides?

### Activity

Stage a debate on pesticides in agriculture between 'factory farmer(s)' and 'environmentalist(s)'.

As an extension activity, you may wish to find out more about a research project being conducted by the Visual and Sensory Neuroscience group at the Queensland Brain Institute (<http://www.qbi.uq.edu.au>). The study uses the honeybee as a model to investigate how small animals make use of visual and olfactory information to navigate their environment, forage for food and solve complex problems and also looks at the effects of pesticides on the honeybees' navigation. (See also the *New Internationalist* article in the References list.)

## Habitat loss

Loss of habitat reduces the diverse sources of pollen (nutrition) for bees. Access is being restricted for beekeepers to national parks and other protected areas. The Queensland Government has declared that the stationing of hives in National Parks must cease from 2024.

- Why are national parks and other protected forests attractive for beekeepers?
- Why do environmentalists want European honeybees banned from the parks?
- What is the effect of European honeybees on native bees?

### Activity

Stage a debate between beekeepers and environmentalists about banning European honeybees from national parks. (A good source of information is the National Parks Association of Queensland website: <http://www.npaq.org.au/our-policies.html#bees>.)

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## Honey

Different types of honey.

## Activities

- Visit your local shops – supermarket and health food stores – and research types of honey.
- Class collect samples of different types of honey for tasting.
- Where are the main honey producing areas around Australia?
- If there is one, describe the honey industry in your local area.
- What gives honey its different flavours?



Denis Anderson's favourite honey is produced from the nectar of Australia's River Red Gum. Like the honeybee, the tree is endangered in some of its main habitats because of reduced flooding, together with destructive logging and grazing. Denis believes that River Red Gum honey may also be under threat.

- Leatherwood is mentioned in the film. What other plants and trees in Australia are well known for honey flavours?
- Honey is eaten – in what other ways is it used?
- How is honey used medicinally?
- What shape is the cross-section of a honeycomb cell?
- Why is the honeycomb cell this shape?
- Where else is this shaped used?

## Beeswax

- Why was beeswax important in the past?
- What is it used for now?
- What has replaced beeswax?

## Activity

See if you can find some samples of beeswax products to bring into class.

## Business studies

You have decided to start commercial beekeeping.

- Find out the costs of setting up a honey business.
- Write a business plan for your first five years.

## Careers

If we can keep the *Varroa* mite out of this country, beekeeping looks like being an important growth industry in Australia.

## Beekeeping

- What kind of careers are there in beekeeping and honey production?

## Research science



*"I come out here into this environment and do a job like this and you know in two weeks time I'm in a DNA lab in Canberra."*

- Describe all Denis's different activities during his work as a research scientist.
- What kinds of activities might other research scientists be involved in?
- What qualifications and training would a scientist like Denis require?

## Veterinary Science

- How might vets be involved in quarantine protection?
- What qualifications are needed to become a vet?

## Quarantine protection

- What trades and professions might be engaged in quarantine protection?
- What training does a customs officer need?

## Media Studies

*Honeybee Blues* tells an important story.

- How do the filmmakers use the medium to tell this story in an entertaining way?
- Music – what sort of background music is used? How does it support the story?
- At one stage (approx. 25 min 30 sec) we hear a radio news broadcast. How does this help link the story?
- Various 'still picture' illustrations are used to give scientific background. List the different types.
- How is animation used in the film?
- A good deal of the film is linked by 'voice-over' narration, with the unseen narrator reading a script. In what other ways have the filmmakers used people speaking to provide information and link the story? (There are several other methods used.)
- There's a good deal of travelling in the film. How does the film maker convey this?
- How is additional information conveyed during the travel sequences?

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- The leading character is scientist Denis Anderson. Who are the other characters taking part and how do they help to tell the story?
- A major 'story' in the film is Denis's visit to Papua New Guinea to investigate reported problems with honeybees and his discovery that a second species of the *Varroa* mite is infecting hives. What other stories are interwoven in the film?

## Activities

- In pairs, devise a 2–3 minute interview for radio with Denis Anderson about the problems covered in the film and why they are so important. One person takes the role of Denis, the other person pretends to be the interviewer. You may like to record this.
- Writer/Director Stefan Moore says: "Originally I wasn't sure that I was going to do it [the film] because I knew very little about bees and very little about Denis Anderson. After I started reading up on bees and realised what amazing creatures they are, I was hooked."

If you were given funds to write and direct a film about the problems of the honeybee (or a similar story) what would you do before you started shooting? (Individually or in a group, draw up a production plan and schedule.)

- Says Stefan Moore: "My soundman was stung, my cameraman was stung so badly in the eye we were worried he would not be able film the following day".

List the dangers film crews can face when making documentaries.

What is the role of a film safety officer? Draw up guidelines which a film safety officer might provide to a documentary production such as *Honeybee Blues*.



***"Most of the problems that we have with the European honeybee around the planet are the result of human behaviour. So wherever we move around the planet we take the bee with us, we create problems for it and we have to look after those problems – unfortunately."***

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## Honeybee Blues

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Executive Producer: Susan MacKinnon  
Producers: Susan MacKinnon, Anna Cater  
Writer/Director: Stefan Moore  
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