Investigating Bees - *Bee*ing Curious!

Introduction

When we were first introduced to the topics "bees" we admitted that we knew very little about this unique little animal/insect. Although growing up with bees being sighted from time to time in our environments we all agreed that the most we knew about bees was that all bees gave a painful sting (which for some people could be life threatening) and that they fly from flower to flower busily making honey.

From our very first discussion, we became very aware of the role we play in guarantying the survival of bees in our environment.

In fact our survival depends on them!!

Early into our research we realised that **biosecurity** (keeping out and controlling animal and plant diseases and pests such as weeds, pest animals and insects to help keep NSW and Australian ecosystems, agriculture and communities safe) plays a vital role in bees survival and our global future.

We decided that the key focus words for bee survival were:

Prevent – stop unwanted pests and diseases before they enter Australia.

Manage – if established do your part in helping bring under control and hopefully eradicate.

Ensure – we respond appropriately to trading obligations

Maintain – work towards improving our biosecurity systems at all times.

AND

Us - individuals - don't wait to be told- be vigilant and act immediately if you think there is an issue related to bees survival. Know where to go for advice and follow through if possible. We found that discussions with bee farmers was invaluable!!

In the very early stages of our research one of us was looking through an old Out Back magazine when they stumbled across an article Bee Prepared. The article was about an isolated population on Kensweck Island, Queensland. Here an experimental apiculturist Roger Goebel introduced honey bees in 1985 in an attempt to create a disease-free population. We had just become

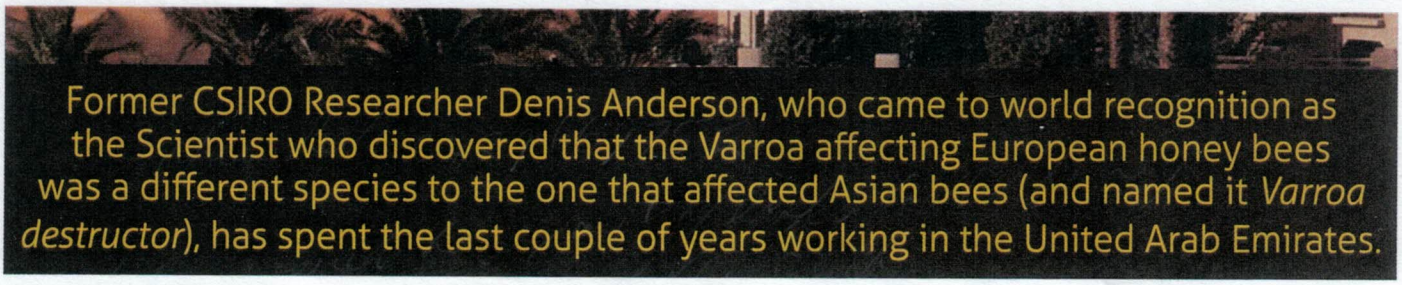
"bee alert" and found the article great motivation to look more closely at the role bees play in our future and do our bit in making others more aware and all contribute in our own varying ways.. This was our first real awareness of bee diseases and their impact on global food production (Biosecurity brought to attention again!)

As we quickly realised that bees have long been the barometers of the food of the world and that Australia is the last Varroa-free (a desease we would learn more about later) stronghold on our planet we started to look at evidence of bees in our home envirinments more closely.

We recorded the things we saw and discussed them.The initial result of our discussion was that bees are everywhere,however until we become more aware, we often pass them by with little thought to the vital role they are playing in the environment.

Very early in our research and observations Andrew stopped on his way to Inverell to observe these honey bees It was 4:00pm and very hot.

An article from The Australasian Beekeeper magazine which helped to convey to us how inportant bees are globally and really start to think "What can we do?" to improve bee populations in Australia.



Former CSIRO Researcher Denis Anderson, who came to world recognition as the Scientist who discovered that the Varroa affecting European honey bees was a different species to the one that affected Asian bees (and named it *Varroa destructor*), has spent the last couple of years working in the United Arab Emirates.

The UAE is one of the harshest environments on earth to keep honeybees (it is basically desert). Denis Anderson has been employed by Abu-Dhabi Food Control Authority (ADFCA) for 3 years – leading a honey bee R&D project in the United Arab Emirates. Denis has been living in Al Aín, a city of Abu Dhabi Emirate located close to the Oman border. He has been tasked with developing methods to keep honeybees alive throughout the year in order to develop a line of honeybee that is adapted to UAE conditions. The ADFCA has recently succeeded in the development of a UAE-specific bee breed capable of adapting to its unique climatic conditions.

While attending the Global Forum for Innovations in Agriculture GFIA 2018, I was able to listen to his presentation, but also to meet with him and discuss his work. It was really interesting learning about beekeeping from the other side of the world. The take home message for me was that here in Australia our summers are getting longer and our days are getting hotter. The problems that the UAE currently face could be common place around the globe in the next 100 years or so. Queen breeding stood out as well.

Prior to Denis arriving in the UAE, no-one was working on how to keep the bees alive. This was not happening. Denis is tackling problems including,

- Lack of bee forage plants,
- Varroa Mite,
- Disease,
- Bee Eating Birds (mostly *Merops persicus*) and
- Heat (summer temperatures in excess of 60°C).

Each Autumn (September) tens of thousands of package honeybees are imported into the UAE from Egypt. These are placed in boxes and used to gather honey from Sidir plants (*Ziziphus spina-christi*) which flow during October. At the end of the flowering most of the hives dwindle and die and more Egyptian packages are imported during Spring (March) for flowering of Samar (*Acacia tortilus*) in April. Then during the summer months (June-Aug) almost every hive dies. This is repeated year after year.

Over the last 3 years, Denis has addressed many issues that that have been contributing to the die off.

Except for Samar, which occurs naturally near the mountains of Oman, bee forage is grown in plantations and every plant is watered with water from desalination plants. There is no natural water.

The imported bees are infested with Varroa and other diseases, and the summer temperatures are well above 50°C. Denis said that last year they were well over 60°C which leads to wax melt down. If any hives survive the summer, they are finished off by bee-eater birds (mostly *Merops persicus*), which migrate through the UAE each September. The migration lasts for about 1 month.

Denis has implemented a program that will enable honey bees to survive all year round in the harsh UAE environment. Measures including supplementary feeding, and new and better forage plants have been introduced. Denis has also built shelters under trees and feeds bees internally over summer.

^ *Denis Anderson presenting at the Global Forum for Innovations, Abu Dhabi, 2018*

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THE AUSTRALASIAN Beekeeper

Love Food? Love *Bees* Reflection

We studies numerous pictures, videos and real life bees in action to gain a more comprehensive understanding of the relationship between plants and bees. Printed images were excellent for seeing up close the actual pollen on the bees and their activity on and in some cases in plants. Observing the bees in their natural habitat was a bit tricky as we could not get too close for the obvious reason we might get stung.

After all the observations, we concluded that:

Bees are the only animal on our planet that can make or break our **food** supply. We rely on bees to **pollinate** our food crops (**fruit and vegetable**) as well as many other **flowers** that just look pretty or unusual and give us that "good" feeling. Some flowers, such as zucchini, we can eat. From research we learnt that there are about 2000 species of **native honeybees** that live in Australia, most being solitary. The few social native bees are the only ones to produce honey, which is what we know as "sugar bag" honey. There are about 350 species alone that have been recorded in a 100km radius of Sydney, Blue Mountains, Lithgow and the Illawarra. (We also learnt that these area are often have high pollution which is a concern for the bees survival) Native honeybees come in a range of colour and sizes but produce much less honey than the introduced European honey bee, which it appears we tend to rely on the most to keep our food source going. European honeybees (typically 12mm in size being yellow or brown with black stripes) have three sub-species in Australia – Italian bees, Caucasian bees and Carniolan bees. Bee farmers select which species they will use according to locations and weather conditions to maximise honey production and in turn great pollination of plants. Native bees do not sting whereas the honeybee (with the exception of the drones) can sting serverly.

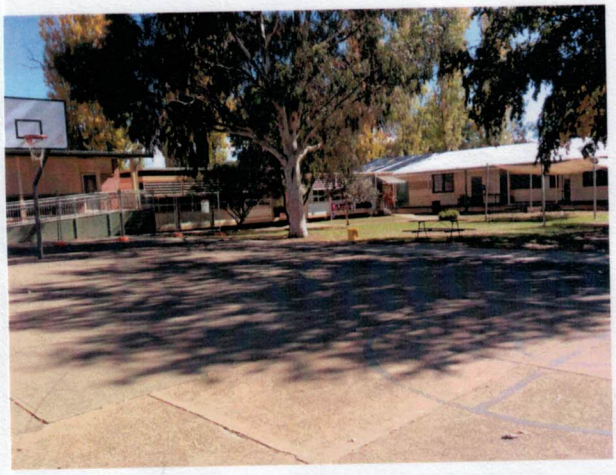
As pollution is needed for many plants to reproduce bees are our No1 "***collectors and distributers***". They collect **nectar** and **pollen** from the flowers of plants which stick to the hairs of the bodies of the female workers. If you observed closely bees working inside some flowers you could see the pollen on their bodies. This was noticeable at times on plants in our school agricultural students' garden beds.

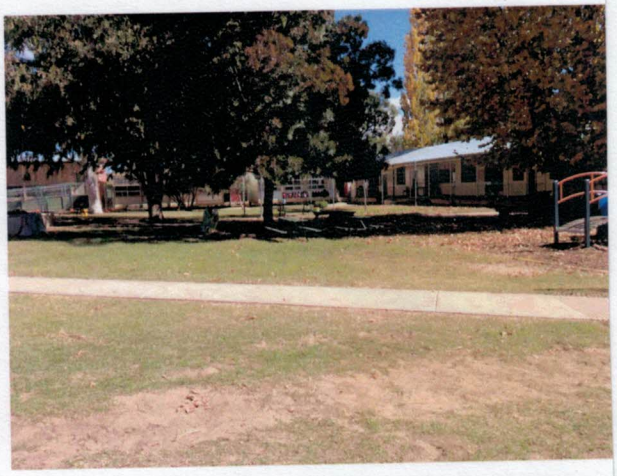
We started our research by taking a walk around our school grounds and being more observant to what we saw when we looked a little closer where ever we went. We continued these observation walks regularly – early in the school day, around midday and late afternoon.We noticed early on that the bees were only obvious, in the hotter part of the day, on plants which were flowering (some plant flowers appeared to have more bees than others (temperature making no difference here so we determined that it may have been related to pollen content, and that the bees were busier as the day warmed up. The reason why we would later ask our guest speaker) We also noticed bees appeared to be more active in the vicinity of water. We were later to learn that bees drink 11.5 litres of water, per hive per day and that during extreme hot,dry weather bee farmers at times cart water to the hive sites to ensure the bees get sufficient water to work effectively.

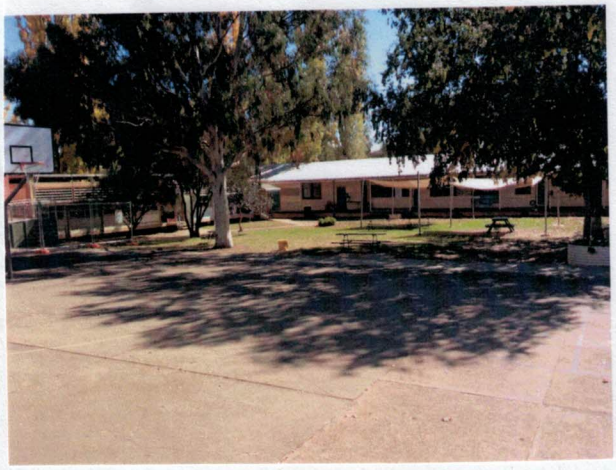
We observed very few other insects on around the plants we initially checked and with future follow up (a few small spiders and a cocoon). Reasons for we were not able to determine, however the weather was very hot and dry and this may have contributed. We did notice after one very small rainfall the bees were busier the next day.

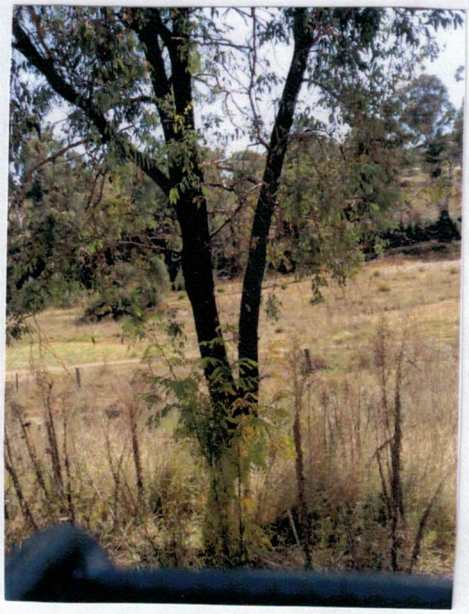
From these initial observations we realised we had much to learn and over time researched using the internet, using printed media and very importantly discussions with actual bee farmers and Department of Agriculture personnel. One of the greatest challenges we faced was understanding the differences in bees – native and introduced – and their preferred habitats and the role they play in ensuring we continue to grow food with the very important help of bees.

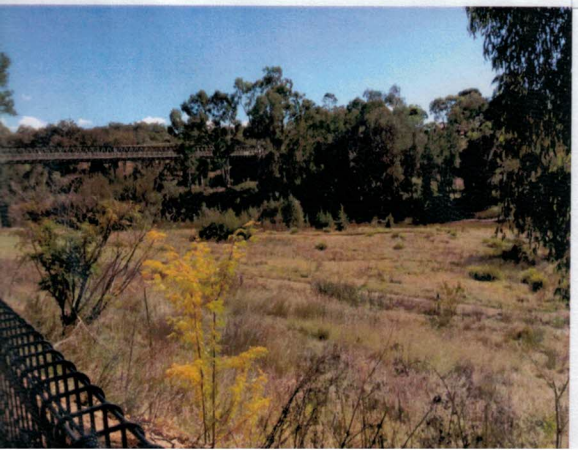
These are the main areas in and around our school grounds where we did our main observations.











Research – *Bee* Informed

We commenced our general research by studying coloured images of bees working flowers. In some images the bees appeared to be on the edge of the flowers where the pollen was, while in other larger flowers they could be seen right inside the flower. We also viewed videos explaining various bee activities and the role they play in being responsible for almost three quarters of the world's food supply.We were reminded that bees pollinate a huge variety of plant flowers from our pretty garden ones to vegetable,fruit and cereal crops. Our research would also extend to conversations with people who deal with honeybees daily as part of their yearly incomes.Talking to beekeepers face to face was most valuable as they were really able to improve our understanding by answering direct questions.

We next researched both the nativebees and honeybees, again through computer research, conversations with beekeepers and bee magazines.

We researched the seven main honeybee breeds – African, Buckfast, Carniolan, Caucasian, Cordovan, Italian and Russian. After conversations with commercial beekeepers we learn that the Cariolan, Caucasian and Italian were the most popular breeds in our greater area. This was because of their suitability to certain habitats, and therefore performance as honey producers, and temperament.

We also looked closely at the ten most common nativebees.

These bees were:

Green Carpenter Bee

Stingless Bee

Yellow and Black Carpenter Bee

Teddy Bear Bee

Blue Banded Bee

This NativeBee was found in our classroom. Where did it

Masked Bee

Homalictus Bee

Reed Bee

Resin Bee

Leafcutter Bee

Green Carpenter Bee

With a body length of two centimeters and a brilliant blue-green colour, the green carpenter bee is very distinctive. It nests in dry flowering stalks of yaccas (grass trees) and in trunks and branches of dead banksia.

Yellow and Black Carpenter Bee

These 15 to 24 mm long bees are the largest native bees in Australia. The females have a glossy black abdomen and bright yellow fur on the thorax. Males are covered uniformly with yellowy brown or olive fur. They are called carpenter bees because they cut nest burrows in soft timber. These carpenter bees like a warm climate.

Stingless Bee

Australia's own native honey bees are tiny (3 - 5 mm), black and stingless! Inside their nest are a queen, males, and thousands of worker bees. They usually nest inside hollow trees but in northern areas they also nest in urban situations such as inside wall cavities or underneath concrete footpaths.

Reed Bee

Reed bees are slender black bees less than 8 mm long. Some species have a red abdomen. They nest inside dry pithy twigs in plants such as raspberries and blackberries or in the dead fronds of tree ferns. Today many nests can also be found in dead canes of the weed *Lantana.*

Teddy Bear Bee

Most species of these furry brown bees are 7 to 15 mm long. They build shallow nest burrows in soft soil and sometimes nest underneath houses…**I wouldn`t give it a cuddle though!!!**

Leafcutter Bee

These amazing 6 to 15 mm long bees cut neat circular cuts on the edges of leaves in gardens. Leafcutters use the disks of leaf as a nest building material. They particularly like the soft leaves of roses.

Blue Banded Bee

These bees (mostly 8-13 mm long), with glittering stripes of blue or whitish hair across their black abdomens. They are often seen darting around the flowers of lavenders and abelias. The females build nests in shallow burrows in the ground but they can also nest in mud brick houses or soft mortar.

Resin Bee

Resin bees come in many colours and sizes. For example there are large black 14 mm bees with white tufts of hair, and small 8 mm black bees with bright orange abdomens. They nest in pre-existing holes or gaps. They are called resin bees because they collect resins and gums to build between their brood cells and to seal their nest holes.

Homalictus Bee

Although very small. Most grow less than 8 mm long, the glittering Homalictus bees come in an array of colours. Golden blue, coppery red and green tinged with purple, red or gold are just a few of the colours listed by scientists. Homalictus bees dig branching nests in the ground. Many females may live together in each nest, taking turns to guard the narrow nest entrance.

Masked Bee

These black bees (most less than 10 mm long) are called 'masked bees' because they have pale markings on their faces. Masked bees have very little hair and carry pollen to their nests by swallowing it. The nests are usually in pre-existing holes in wood.

We invited Dale and Jess Jones, local beekeepers (apiarists) who live in the Bundarra district to talk to us about their bees and what is involved. Jess told us that:

European honeybees (Apis mellifera) are the most common species used for beekeeping in Australia. These bees are kept mainly for honey, bees wax, package bees and now ever more importantly to provide pollination services for food and seed crops.

From our own individual research and Jess's information we became familiar with pests and disease that will do enormous damaged to hives and in turn bee activity.

We learnt that the two main pests that infest hives are the small hive beetle and the wax moth. Both these pest destroy the structure of the honey comb. For biosecurity reason the occurrences of small hive beetle must be reported to the Department of Agriculture in some states.

We also learnt that the two main diseases in Australian hives are the American foulbrood disease and the European foulbrood disease. Both are bacterial disease.Colonies of bees infected with American foulbrood disease must be destroyed. Both disease must be reported to Departments of Agriculture to help stop it spreading and hopefully one day prevent. Beekeepers must register their hives to help monitor pests and disease.

Australia is very fortunate in that it is the only country in the world that does not have Varroa mite which has decimated honeybee populations around the world. This has been mainly the result of Australia's strict quarantine controls, especially in regards to directly imported queen bees.

When Jess visited she brought bee specimens along for us to observe. Two live drones were brought in for us to handle as they do not sting. There were also specimens of a queen and two workers, safely housed in a special little cage as they do sting!) for us look at closely. We asked many questions and more arose as Mrs Jones explained the whole process to us. The Jones's do not breed their own queens. They purchase their queens from a breeder in Bathurst.

We were also able to speak with Mr Graham Baker, another beekeeper, from Glen Innes. Graham told us that he uses Italian bees for their productivity and temperament. While it is most important that bees produce good supplies of honey it is also good to a have quiet bees you can move about in. We came to a conclusion that this appears to be the case with all live stock. An example of this is cattle farmers like quiet cattle, which are easy to work, have quiet calves and in turn produce superior meat for consumption.

Graham also told us similar information to Jess in that the queen mates once in her lifetime and lays the eggs. If beekeepers breed their own queens decide which females they want to keep to breed from. If eggs are not fertilised they become drones which in turn will fertilise the eggs. Drones can go between hives and one queen can be fertilised by up to twenty drones.

Another apiarist we contacted had some of his hives on a property near Gum Flat, Inverell. He was unable to show us his hives as he had to move his bees to the Black Mountain area as the blossom had dried up at Gum Flat. This reinforced with us the importance of flowers/blossom, whether it be on trees, garden flowers, vegetables or cereal crops.

We also had contact with a man who keeps bees in his back yard.Although we could not visit where he has his hives he sent us some information about how his bees have swarmed, the reasons for and what he did with them.

In our local area we were able to study one native bee hive. These small black bees have been working in the same fence strainer post for over fourty years. On observing the hive closely, in the early part of the day you can hear the bees working inside the post, smell honey inside the post and feel the sticky from the bees going in and out around several small entrances in the post. As the day heats up you can see the bees coming and going. This proved to be valuable experiences when comparing the information that our visiting apiarist presented.

Area where native bees

Native Bee Hive

Native Bees
Hole in strainer post

Native Bees coming in and out of post hole.

During our discussions the subject nativebees versus introduced honeybees(and their impact on the natural environment) was brought up. Our teacher attended a workshop on how to preserve native habitat for endangered birds. One speaker said that the introduced bees will eat the lerps on the leaves of certain trees that are an important food source for some endangered birds. Graham Baker told us that honeybees will suck the honey (honey dew)out of the lerp, however they do not eat the grub which birds eat.There seems to be some conflict of information around this topic. Graham also told us that he believes all can live together. He has seen a nativebee and honeybee both working he pollen on a black thistle (itself an introduced species of plant).They appeared to be coexisting very happily!

If there was competition it appears to be from feral honey bees. These bees occur in colonies, often tree hollows. They have no connection from hives maintained by beekeepers. Their impact on native bees is that they appear to compete for their hollows and food resources. As hhollows take up to fifty years to form this competition must impact on our native species.

There has been quite a bit of information in the news lately about bee health and the use of neonicotinoids insecticide. This chemical is banned in some countries, however as yet not in Australia. If users read the instructions on the labels on products which contain this chemical carefully we should be able to reduce the risk of exposing bees to it and further reduction of healthy bee populations.

INVESTIGATE: bees

Research template

Name: Elise Smith

Date: 04/05/2018

Species of bee: Teddy Bear Bee

Native or introduced? Do they occur in Australia? If yes, where do they live? The Teddy Bear Bee is native and it occurs in Australia, from queensland through NSW and into Victoria.

Do they live in hives/colonies [social] or individually [solitary]? They build the nests in the soft soil of a creek bank. They build their nests close to other nests.

Where do they prefer to live? They like to live in the soil of a creek bank.

Do they store honey? They store honey in sacks that look like grapes.

Do they pollinate plants? They are good at pollinating, macadamias and tomatoes.

Are they attracted to particular plants? The Teddy Bear Bee likes Abelias, Buddlejas and Blue Flax lilys

INVESTIGATE: bees

What do they prefer to nest in? They like the soft soil in the river bank.

Do they need water nearby? The Teddy Bear Bee needs water faily often so water needs to be pretty close.

Tell us something unique about this species: Their chubby fluffy bees that nest in the soft soil of river banks. Their the cutest bee species in know... But I wouldn't try to have a cuddle with one!

Sources of information: The Teddy Bear Bee nest in the soft soil of river banks, they are native bees and occur in Australia, From QSL through NSW and into Victoria. These Bees are good pollinating macadamias and tomatoes. The Teddy Bear Bees like Abelia, Buddleja and Blue Flax lilys.

Observation Records- *Bee*n Looking

We observed numerous locations during our research. We revisited sites on different times of the day and recorded what we saw. There was very little evidence of other insect activity, even though in places we looked behind bark on the trees and in leaf litter. Our main observation areas were out the front of the school where there are some big trees, down the side of the school where the trees are smaller but closer to the Gwydir river and water, the school ag plot and a nature reserve in Bundarra.

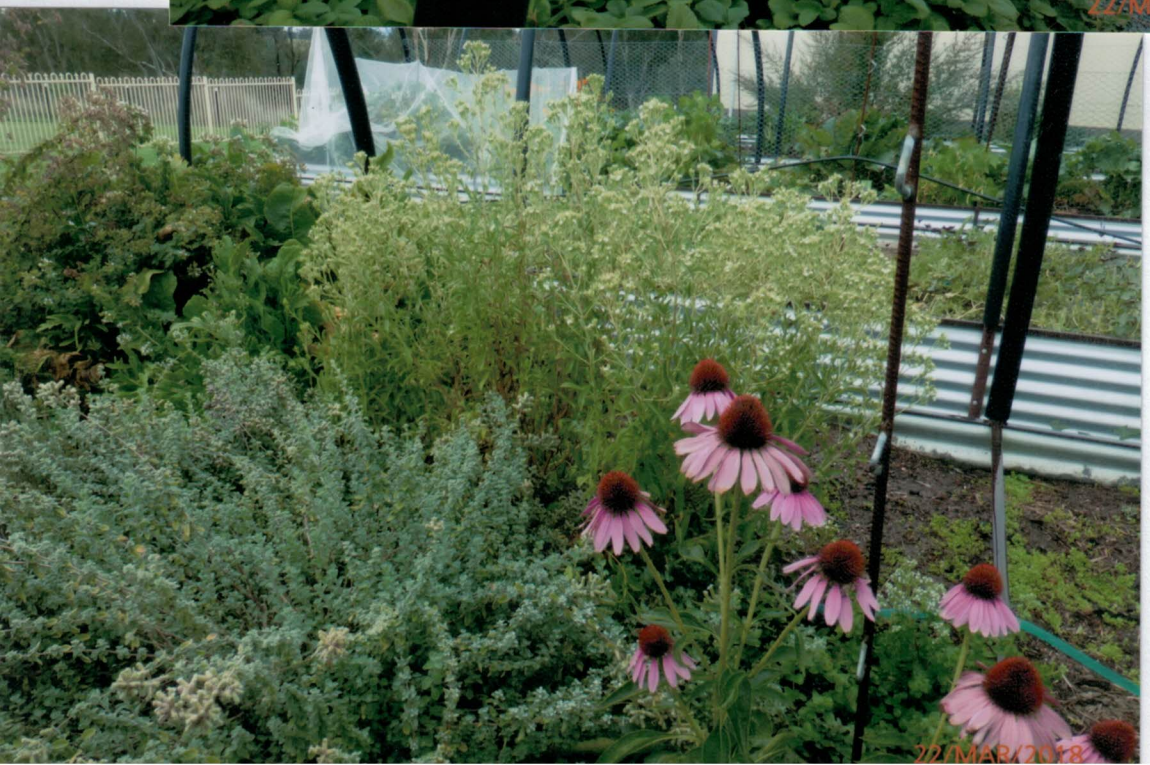
The only insects we saw were a very small, clear type spider that disappeared before we could get a good look at it and a brown cocoon.

Our observation sheet records provided us with very basic information, however we mentioned this to the beekeepers and they told us that weather conditions do play a major role in this. Also, our teacher said that at the sustainability workshop she went to they were trying to find spiders in leaf litter and in bark and the spider expert, Stuart Harris, told them that they were having trouble finding spiders because it was autumn. We concluded that this, and on some days extreme heat, was probably why other insect activity was no visible.

A bare spot in our school playgrou

Having a look at the ag plot and observing bee activity.

Up close image o vegetable and flowers in the a plot.



Bee activity was particular active on these pink flowers.

Bees observed working native bottle brush along the Gwydir River below Copeton Dam.

This photo was taken during the hottest part of the day and although there were not a lot of bees they appeared to be moving between flowers very quickly. On other occassions when we observed bees, in different areas, they seemed to spend more time on a particular flower. We wondered if this was because there was more pollin in those particular flowers.

INVESTIGATE: bees

Observation template

Name: Andrew

Date: 20/3/2018

Location name, features and description

Describe the area (ie plants, buildings, water nearby, shelter or shade etc) or draw a map ↑ Rosemary bushes near K/1/2 classroom, ~~roaming~~ Fish pond located in front All of the above was checked daily. We also checked the Ag Plot and they were far busier.

2. At the Ag Plot there were some pink flowers, that the bees were far more attracted to, than ~~e~~ anywhere else. ~~There~~

3. We checked out some trees on the bridge side of the school and saw a few in ~~xx~~ various places fairly spread out. This area may have been used for a hive.

4 We also checked some old gardens where there was not any.

5. Another place that was checked was at the corner of the school where there were some ~~trees~~ flowery bushes that bees were pollinating/scouting.

Time of day

Weather Hot

1.

Type of insect	Number observed	What were they doing?
Bee	3	Pollinating
Bee	6	Roaming
Bee	Well covered	possibly collecting pollin for the green
Bee	5-10	Possibly scouting areas for a hive
Hunstsman	1	Building a web

Observation record number ___ of 1, 2, 3, 4 and 5 of 5.

Next observation planned: every lesson

* On the way to town we stopped at Sandy Creek and saw

INVESTIGATE: bees

Observation template

Name: ~~Brown/red wasp~~ Ella

Date: 9/3/2018

Location name, features and description behind the 5/6 classroom

Describe the area (ie plants, buildings, water nearby, shelter or shade etc) or draw a map little bettles one brown wasp and not much activitey otherwise. small green grass area, big trees and buildings. there is a rive about ~~2-300~~ 200-300 M away.

Time of day 2.00pm

Weather hot, sunny, warm breeze.

Type of insect	Number observed	What were they doing?
Brown wasp	1	flying around a tree

Observation record number 1 of 1

Next observation planned: in lesson time

A leaf cocoon, presumably housing a spider.

This spider moved so fast we couldn't get a really good look at it. It was the only spider we saw during observations.

He was clear, 2mm wide, 1cm long, but he ran away before we could get a photo.

Bees on Rosemary at different times of the day.

Two very contrasting observations. Dakota took this bee drinking from an almost dry creek near her home at Tingha

and

Ella took this bee collecting honey from a flowerbed at Bingara.

Discussion of Results –*Bee*n Looking and Talking

As well as our paper surveys we verbally asked a wide section of our school (K – 12) and community (80 people) "What did they know about bees?"

We were surprised that all but two people mentioned the word pollination and its importance in the world food supply.Most people said things like they are black with stripes, sting, make honey and carry honey in buckets on their legs.

1. Our surveys revealed:
   a) that bees were more active in the hotter part of the day.
   b) the more flowers on some bushes did not necessarily mean more bees. An example here was the rosemary at school had a lot of flowers but not bees, while a basil bush had many flowers and lots of very busy bees. This was interesting as in our research we read we learnt that bees can best detect the colours blue and white and discriminate against other colours. (from What flower colours do birds and bees prefer? Science News – ABC News)
2. Our gardens did not seem to be visited by, obvious to us, other pollinating insects, however we were conscious of the fact that there could be other pollinators we did not see hidden in the bark and grass.

   Other insect which could visit the gardens or local fauna areas to pollinate plants are:

   bumble bees

   pollen wasps

   ants

   flies

hoverflies

mosquitoes

butterflies

moths

flower beetles.

A hoverfly

3. All sites we studied were the most active with bees during the hottest part of the day. We checked early in the morning as saw very few bees. Again, as soon as the sun started to go down there were no bees. We learnt in our research that bees like to head for their hives and be in them as near to evening darkness as possible.

4. Any areas where there were flowers we saw bees working busily. Our school agriculture plot had the most bees working. There were more plants and a greater variety of flowers. Some flowers seemed to be attracting more bees than others. It was obvious that they stayed on some plants longer than others. The ag plot flowers were a good example, whereas the bees on the rosemary beside the school appeared to be darting everywhere. We concluded the pollen was better, (and/or easier to get) at the ag plot.

5. We came to the conclusion that we should be able to improve bee activity in our school environment. There are several empty flower and vegetable beds that could be planted all year round (at present some stay empty for months) and new areas planted with bee attracting trees and shrubs.

Plan For School Gardens/Grounds –

*Bee*ing *Bee* Aware !

We feel we can definitely improve our school grounds to attract more bees, both native and introduced. Research told us that native bees are resistant to vattoa mite. Should it enter Australia native bees may be able to support crop and flower pollination. We are looking into establishing a hive in the school grounds or in one of the big trees that run parallel to the Gwydir River just outside the school grounds. We learnt that established boxed native beehives can be successfully split to make two, as can a log hive be transferred into a box hive. Research also told us that as people become more conscious of native bees and their important role in world food production more people are breeding them and have available for sale. As we feel encouraging and supporting native bees in our school environment is important we plan to definitely look into this in more detail. This may take time, however we believe we can make it happen.

A honeybee hive would be also be great, however we feel with children around in so many places, and their potential to sting it may not be a good idea.

We need to improve our garden to support our local native bee species and any visiting honeybees which may visit from hives in the district.We plan to plant a more bee friendly garden. Our empty raised garden beds are ideal for this. Planting in clumps will be important as bees are drawn to flowers in clumps of 1 metre or more. Luckly our raised beds are already large enough for this.As bees are drawn to certain colours we will need to research this carefully.We will need to research all this in more detail to ensure we can grow flowers/vegetables all year round to keep the bees busy.

We will talk with our school grounds person about insecticide use. Hopefully they can be kept to an absolute minimum and if they have to be used it will be when bees are likely to be flying (for example, in the hottest part of the day or at night).

Although we are not aware of any native bees or honeybee colonies in the near vicinity of our school we will monitor areas regularly to see if any activity can be spotted. If we should be lucky enough to sight activity we leave as it is however, will ask for expert advice as to what they are and possible duration of time they will be about.

As we have become more aware of bees, particularly our native bees we would like to survey them more closely. As we learnt that many observations about native bees distribution and behaviour is incomplete we plan to photograph and record details of any that may be noticed in and around the school. In spring we have a native bee that is seen (and felt with a slight sting) in the grass in our main playing field. Being more aware hopefully we can study this native bees more closely.

Some of bee friendly plants that we have found will grow in our area are:

Forget me nots, Nasturtiums (large red, orange and yellow flowers and can be eaten), Salvias(bees love the red, blue purple and mauve flowers), Borage (a great bee attracter to vegetable gardens), Bee Balm (bright flowers), Sunflowers (a huge target for bees), Poppies (rich source of pollen and nectar), Cornflowers (mauve, purple and blue varieties all attract bees to our gardens), Cosmos (bright flowers) and Zinnias (bright flower).

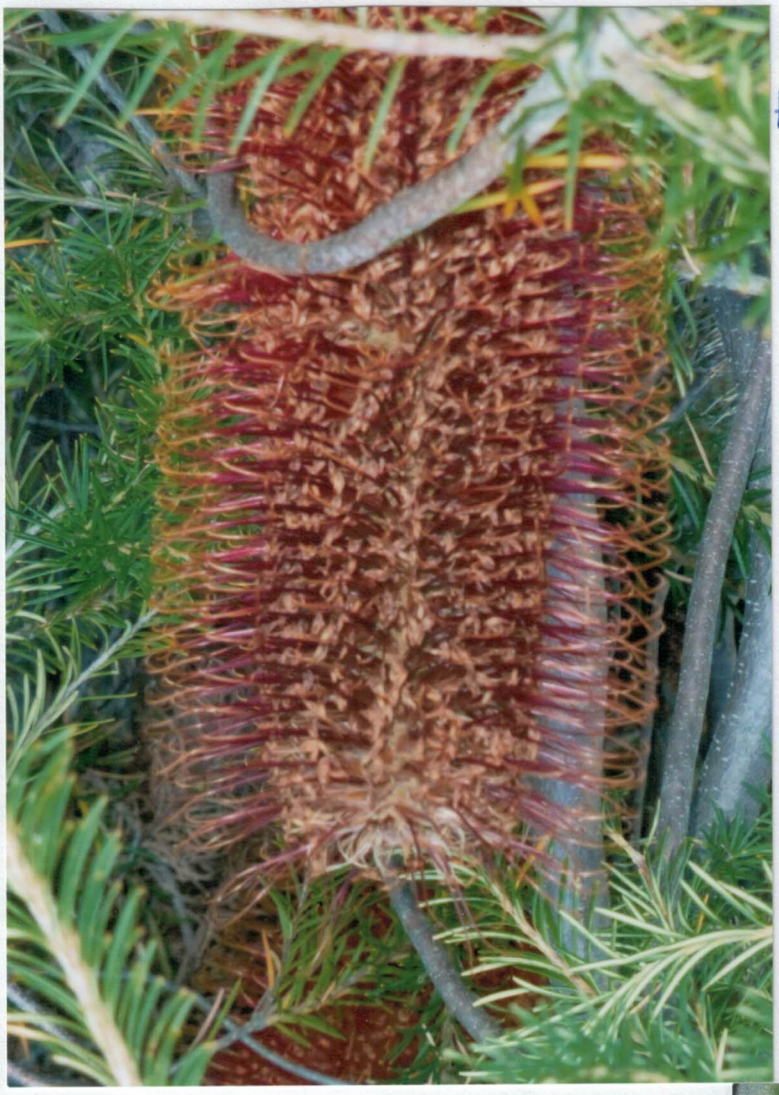
We will ensure our rosemary plants are pruned regularly to encourage growth as we read during research and observed for ourselves that they are perfect for bees.

We also plan to establish a small native garden in a bare patch at the far end of our school plat ground. As well as looking attractive this should develop into a great spot to observe both birds and bees.Banksias are a good choice of a variety of native plants here as bees love getting in amongst their bottle brush like flowers to harvest nectar and pollen. This area of the school could eventually be used to locate a native beehive. In the hope of supporting some burrowing bees , in the area near where we plan to plant a small native garden we will leave some undisturbed ground.

We would also like to make a few bee hotels to hopefully help bees with an artifical nesting site if theyhave had their habitat destroyed by land clearing, fire etc.

We will maintain our fishpond for a water source, however we are very lucky here as we our school runs parallel to the Gwydir River. Therefore, water for the bees is not an issue for us.

The most important thing to remember is to make our garden a year-round food source. Bees need food all year round and a variation in their diet. If we work at staggering the flowering of the plants we choose to grow then we should have a continuous cycle of pollination.



Banksia flower - Bees love!

Sample of a bee hotel we plan to make.

BORAGE *Borago officinalis*

The plant grows huge (you only need a couple or it'll take over) and its tiny flowers are bee heaven, and create an atmospheric haze of blue in a vase.

On a global scale, governments an turning their focus to native pollinators.

^ *Native bee on Jelly bush flower.*
IMAGE BY STEVE FLAVEL

INVESTIGATE: bees

Plan for school grounds

Area of the school or garden?	What will you do? Or change?	Does it need to be discussed or approved?	Who will you approach?	When would you like this to be done by?
Eg empty garden bed at front gate	*plant flowers that flower at different times of the year*	*Yes*	*Principal and GA*	*End of term 1*
Bare corner of playground	Grow native plants	Yes	Principal	End of term 2
Empty garden beds-				
near Library	Vegetables and flowers	Yes	principal	term 2
Side near bridge	flowers	Yes	and	term 2
inner playground	Vegetables	Yes	Ag teacher	Term 2
Ensure Ag plot keeps planted	Variety of flowers and crops	Yes	Ag teacher	
Native bee hive	Organise purchase and placement	Yes	Principal	term 3
monitor estab lished citrus	Ensure correct pruning to	Yes	Grounds person	Yearly
tress	maximise flowering			
Outside 3/4 room	Plant a raspberry	Yes	principal	End of term 2

When will you review this plan? Every term

Honey Game Reflection –

*Bee*n Playing and *Bee*n Thinking

INVESTIGATE: bees

Honey game reflection

Which event had the greatest impact on your honey production? _____

Week 2 's event had the greatest impact on us . This was because the gum trees were flowering resulting in the best honey production during the 12 week cycle.

What would you do differently to minimise or maximise that impact if you played the game again? _____

If we played the Honey Game again we would move all our hives closer to the best flowers (food), ensure good shelter (awareness of extreme heat and cold) and make sure there was plenty of clean water nearby. This should maximise the impact of the immediate environment. We would definitely check the use of any harmful chemicals in the area also.

Identify one of the events that beekeepers cannot influence _____

One of the events that beekeepers cannot influence is the weather (rain and water for the bees). If beekeeper are mindful of this they can help manage it by carting fresh water to their hives. A beekeeper told us that in very dry times landholders, on the properties they have their hives, have asked them to supply water for their bees as they need to conserve what they have for their own stock.

How can they manage the impacts of that event on their bees and honey production? _____

Beekeepers can manage the impact weather may have on their bees and honey production by being mindful of water as we mentioned above and, if possible, in dry times try to have their hives in areas where blossom is closer to natural water. Beekeepers come onto properties and check food and water before moving hives and this is a major help in eliminating events they connotes influence.

What did you learn about the role of beekeepers from playing the Honey Game? _____

From playing the Honey Game we learnt that:

*keeping bees is not easy to begin with – you need to know environments and what is likely to happen at certain times of the year – external influences.

*the general public can be responsible for some of the problems beekeepers face and that we can do something about it.

*if a hive is lost the impact on honey production can be devastating for the beekeeper and in turn pollination of plants.

* to safe guard food and water supplies, as well as private properties, beekeepers need to ensure they have access to public native forests. Ultimately we are all responsible in the management of native floral resources.

Community Action –

Encouraging all to *bee* involved

We discussed how we could get our local community involved. First, we thought an awareness of the role bees play in our environments would be a good starting point. We designed a simple flyer, which we thought would catch people's eye and start them questioning and thinking. We asked the local shop owner if we could leave some fliers in her shop and she was more than happy. We also plan to put a copy on the Bundarra web page, a town newsletter and in our school newsletter.

We also plan to contact the Uralla Shire Council to see if native hive/s could be placed in a small nature reserve on the outskirts of Bundarra and the possibility of planting a few more bee attracting trees/plant in the area.

Our plan to evaluate the impact we are able to have on the community is:

- to ask people if they have read the flyer somewhere and if so give us feedback and share any ideas/information they have about improving bee habitats in our community/district.
- when our native bee hive is in place in the school grounds ask community members to come and see it.If the Uralla Shire allow us to locate a hive there also we will inform the community about these through another flyer.
- ask community members to look at our gardens throughout the year and hopefully become more aware of how year round variety of plants attracts bees.

If the responses to the above are positive and helpful, with a desire to become involved in our improvement plans we will know we have made an impact.

Bees Bees Bees

Did you know that:

bees are the only animal on our planet that can make or break our food supply?

Australia has two species of bees

- native bee
- introduced honeybee ?

Australia is the only bee disease free country in the world?



Please look after our bees. It is up to us to ensure a healthy bee habitat that can thrive forever!!!

What Can You Do?

- Plant a bee-friendly garden
- Use pesticides as directed

For more information please contact Abbey, Andrew, Dakota, Elise and Ella at Bundarra Central School.

Investigate: Bees

Project Evaluation -

*Bee*n Learning About *Bee*s

The investigate: Bees project has had a very positive impact on us.

When we first started the project we realise now how little we knew about bees. After researching and observations in a limited time we realise how in depth the understanding of bees and their role in ensuring the continuation of a food source for all of us is.

Albert Einstein is quoted as saying:

"If the bee disappeared off the face of the earth, man would only have four years left to live."

Our beekeeper Graham suggested we look this quote up. Whether this quote is true or not it is still a real awarenees wake up!! Not forgetting that not all plants rely on pollen spreading insects (eg: leafy vegetables like cabbbage do not need insects, corn is pollinated by the wind and potatoes and carrots can be grown from tubers) bees do play role in mass flowering crops and plants.

We felt we needed more time to come up with more accurate observatiions and compare data. However what we did observe was really interesting and we had valuable discussions. As a result we would like to do a year long observation moving through the four seasons.We plan to do this using a spread sheet program where entries can be made accurately and quickly(We are still working on a format for this).

As the children we surveyed appeared to know little about bees we would like to make term class visits to share any information with them.Like wise they could tell us about any sightings or bee information they have.

When everyone starts "talking bees" we feel our project will have been worth while!

We have learnt that the fate of Australian bees hangs in the balance.

It is up to us to "drive" forward in the name of *bees*. Please *bee* ready to hop on board.