

6. Using stingless bees as an educational tool in Australian schools

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Abstract

This chapter discusses one Australian teacher's need to find an alternative enterprise to the European honey bee, *Apis mellifera* L., due to many students within the school having anaphylactic allergic reactions to bee stings. The alternative was the Australian stingless bee, *Tetragonula carbonaria* Smith. After discovering this bee, and being fascinated by it, this teacher went on to develop an education program about stingless bees. The education program was used to teach a Year 9 class and its success is detailed in the text. Stingless bees could be utilised as an educational tool in a number of teaching areas, to improve student learning. Developments within the stingless bee industry would aid the conservation efforts and improve the economic value of the bees and their products. Personal experiences of an Australian native stingless bee keeper are shared as well as future directions that he has to further improve his business with stingless bees.

Key words:

Australia, education, pollination, propagation, school, *Tetragonula carbonaria*.

Introduction

As a high school teacher on the North Coast of NSW in Australia. I specialize in teaching agriculture, science and senior biology. About four years ago I attended a European honey bee (*Apis mellifera* L.) keeping course, as it was my intention to keep hives at the school as a learning tool for students. One of the other attendees mentioned that he was a native bee keeping hobbyist and had a number of Australian stingless bee hives at his home. This was the first I had heard of such a bee and upon returning home, I commenced my research into Australian stingless bees. Although extremely interested in stingless bees, I still wanted to keep European honey bees on the school farm for honey production and sale and to further educate my students on the importance of bees. I approached the school principal and asked if I could purchase some European honey bee hives for the school. He told me that there were more than 30 students at our school who suffered anaphylaxis when stung by bees (Anaphylaxis Australia, 2010). There was no way on earth that I would not be allowed to increase the danger of these students being

stung by keeping European honey bees on the property. Dejected at first, I then remembered the stingless bees that the person at the course had mentioned. The perfect alternative! A bee that lives in a social hierarchy, is suitable for the local environment and is very similar to the European honey bee;. A bee that collects honey and pollen and best of all doesn't sting! I believed that more people needed to know about stingless bees and what better way than to teach students in schools.

6.1 Educational program

In the following months, I did as much research as possible in an effort to find out more about these bees; advantages, disadvantages, pollination efficiency, most suitable crops and honey production (Heard, 1988; 1994; Klumpp, 2007) to name just a few areas of interest. I discovered that the main species of stingless bee found in my local area was *Trigona carbonaria* Smith (Dollin et al., 1997). The more I learnt about these bees the more excited and interested I became. It occurred to me, that if I had gone all this time without ever having heard of these

remarkable bees, then millions of other Australians would not have heard of them either. I wanted all Australians to know about these wonderful native insects, and their potential usefulness in so many areas. So, I decided to create an education program which could be used in schools to teach students about stingless bees. Using the bees as a tool, I incorporated various activities, such as comprehension exercises, questions, experimental design and crosswords puzzles, to enhance the students' learning experience. Aspects such as pollination services, colony propagation and hive products were included in the program. The program included numerous colour photographs so that students could visualise relevant features of the nest structures and the bees themselves (Maginnity, 2011).

It took over twelve months to complete the education program, as I consulted with researchers, bee enthusiasts and stingless bee keepers throughout Australia. I needed to get a better idea of the emerging Australian stingless bee industry. The whole process was a major learning experience for me, with mixed information coming from people I consulted.

Finally, after editing and graphic design enhancement, the program's booklet went to print. The finished product looks great and the task now is to market it to as many schools as possible, thus building community awareness of stingless bees. A second edition is currently under production, to further enhance the overall program.

6.2 Stingless bees in education in New South Wales

The relevance of stingless bees within a number of curricula is a major advantage. There are several subjects that would benefit from knowledge of stingless bees. For example, student learning outcomes could be improved in science subjects as they learn about the bees' role as pollination vectors (Heard, 1994), and their importance in helping to maintain genetic diversity of floral species. Agriculture students could learn about honey production the necessary marketing requirements. Mathematics students could monitor entrance activity, recording the number of bees exiting a hive at different times of day, and use this data to construct illustrative graphs. Home economics students could make delicious cuisine using honey from stingless bees and industrial arts students could design and manufacture bee hives.

Colony propagation and multiplication is a valuable skill (Heard, 1988; Klumpp, 2007). Propagation

techniques can be successfully taught in schools, and such exercises promote student engagement and improve learning outcomes. Knowledge of colony propagation techniques is important for students and teachers, particularly as natural bee populations are under threat due to habitat loss through land clearing. Improved understanding of these agriculturally important pollinating insects will benefit teachers, students and the community alike. It is crucial that students understand the many important interactions between organisms and that without native bees, pollination of many plants, including agricultural crops, would decrease.

From a cultural perspective, students can learn how important stingless bees have been in indigenous Australian culture. For centuries, they have been using cerumen (a mixture of stingless bee wax and collected plant resins) for making tools and the nest content, "sugarbag", was used as a food source (Yunkaporta, 2009).

"The students that we teach today are the future. These students are being given the responsibility to pass on current knowledge and enhance teaching and learning about stingless bees for their sustainable future." Steve Maginnity.

6.3 My teaching experiences

I recently used my own education program to teach one of my high school classes. As an additional teaching resource I had five hives of *T. carbonaria* on site were used. Alstonville High School (28.85° S, 153.46°E, 140 m) has a sub-tropical climate with wet summers and dry periods during late winter and spring. Average temperatures range from 10 to 27°C, with an annual average daily maximum of 23°C (BOM, 2012). The food sources for the bees come from a small pocket of remnant vegetation in one area of the school, a riparian zone which contains species of eucalypts, the schools orchard which contains citrus, macadamias, mangoes, avocados and blueberries. The school is situated in a residential area hence the bees can also forage in nearby gardens for alternative sources of food (ExploreOz, 2012). The topic was taught to a class of 20 Year 9 students over a six week period.

I have found that, as a teacher, you will know how successful you have been in preparing meaningful, engaging work that is suitable for various levels of academic ability in no time at all. The students are never shy in telling you if work is boring, too hard or easy, or if the topic you have chosen for them is too ordinary.

With this in mind, I was nervous but excited about delivering my unit on native bees. Throughout the topic the students were as excited, if not more excited, as me. It was fantastic! Every lesson the students entered the classroom with a thousand different questions about all the different aspects of keeping and caring for stingless bees. At times these questions made me consider how much more there is to learn about native bees. The questions also helped me to develop even more educational activities for the next time I teach the topic.

One of the most rewarding activities was when students made their own hives and we split existing colonies to provision their boxes. It was very satisfying to observe the students' expressions, as well as the obvious sense of achievement and ownership of the project. Even though it was a group project, individuals would talk about 'their' bees because they had done the brood transfer.

As an extension exercise each student had to design an experiment that they could conduct using stingless bees. Within the class there is a huge range of abilities and it was so interesting to see all of the different experiments created and implemented by these students. From concepts as simple as counting the number of pupal casings being removed from the hive entrance over a set period of time, to more complex tasks such as designing hive heating systems. Again, the students filled my head with concepts and ideas that I had not tried and alternative ways of completing tasks which I had never thought of.

At the end of the six weeks, I asked all of the students to provide feedback by completing an evaluation form. Many of the students commented that they enjoyed the subject a lot because they could see how much I enjoyed teaching it. It was pleasing to hear that my enthusiasm gave the students added interest in this topic. The practical nature of the lesson content was also another positive expressed by the students. It was extraordinary to read that only one out of the 20 students had heard of native stingless bees prior to commencement of the program.

Since teaching this class I have adjusted my schedule so that I can teach the topic to more groups each year. Being passionate about the subject continues to impress the students and enhance their learning experience.

6.4 A bright future for stingless bees in education

When talking to a family friend one day in 2008 he informed me that he had a wild hive of stingless bees in a stump on his farm and if I was prepared to get

them I could put the bees in an artificial hive and take them away. My first hive! I was over the moon. I could now observe the bee activity, take notes and learn first hand about various aspects of life in the hive.

I began asking more people I knew from rural areas if they knew of hives on their property and if I could box them. Over the next 3 years I had managed to purchase, salvage and split 90 *Trigona carbonaria* hives.

In 2010 I launched my website (Figure 1) www.stevesnativebees.com.au in order to advertise the education program and the sale of related products. It also showcases additional services I provide. The site also has a forum where people can ask questions about native bees. I intend to continue to update the site and make improvements wherever possible.

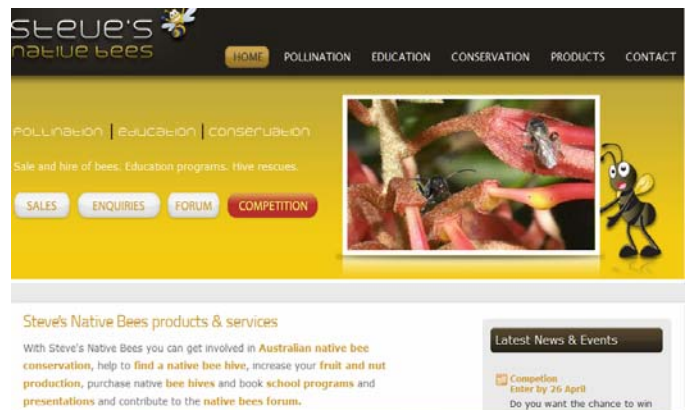


Figure 1. Steve's native bee website www.stevesnativebees.com.au

6.5 Future endeavours

I am passionate about education and stingless bees, so I want to further develop this relationship. I plan to present my program to teaching staff at schools, so they too can teach their students about stingless bees and enjoy them in the same way I have.

I plan to continue to investigate new techniques and modify existing ones for the duplication of hives, through hive design, hive heating and artificial selection.

I will continue to grow and expand the number of hives I have so that I can service a greater number of producers when pollination is required. By increasing my hive numbers I will also be better equipped to supply hives to the growing number of people in Australia seeking to keep stingless bees for themselves.

When at the European bee keeping course in 2008 the course presenter stated that in his belief you needed to be keeping bees for 16 years before you could call yourself a true beekeeper. If this in fact is true I believe that this time frame would have to be extended for stingless beekeepers as knowledge of the various species of stingless bees is far less significant than information formulated over hundreds of years of people keeping *Apis mellifera*.

Keeping Australian native stingless bees is a definite passion of mine. Through education, I strive to show others the importance, intrigue and wonder of these bees. The best thing for me is that I never stop learning when studying these bees and they continue to fascinate me each and every day.

The ever increasing interest in stingless bees in Australia is a wonderful thing and I invite each person to learn more about them, what they can do for us and what we can do for them.

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