2

Bees in Agriculture

2.1 In evidence before the committee, Mr Lindsay Bourke, President of the Tasmanian Crop Pollination Association told the committee, 'in Australia and throughout the world the honey bee is the most important animal on the planet. You can do without any of the others, but you cannot do without the bees'.[1]

2.2 The essential role of the European honey bee (*Apis mellifera*) in Australian agriculture is crop pollination. In its submission the Victorian Apiarists' Association pointed out that 'Australian horticulture and agriculture depends substantially on exotic crops and pastures. Many of these crops require the European Honeybee, *Apis mellifera*, to pollinate crop flora and thus effect fertilization'.[2]

2.3 In its submission, CSIRO detailed the important role of the honey bee in terms of both quantity and quality of production of crops and pasture, covering three-quarters of crop species and over one-third of food production:

> Many crop plants require pollination if they are to produce seeds, fruits or nuts. For some plants pollination happens automatically within the flower, some require wind to move pollen (especially cereals such as wheat and rice) but many require flowers to be visited by insects. The degree to which crop production worldwide depends on insect pollination was the subject of a recent scientific study (Klein *et al.* 2007). This extensive review of the available data concluded that 76% of the major crop species worldwide benefit (in

1 Mr Lindsay Bourke, *Transcript of Evidence*, 3 September 2007, p. 21.

2 Victorian Apiarists' Association, Submission no. 71, p. 21.

crop quantity or quality) from insect pollination. However, because many of the very high volume crops (e.g. cereal crops) do not benefit from insect pollination, the proportion of global crop production (in volume) that benefits from insect pollination is approximately 35%. In other words, loss of insect pollinators would dramatically affect the viability of diverse plant industries, and by extension the diversity of the human diet, but would have a lesser effect on the production of staple food products. Further, this study confirms that honey bees are the most frequently identified pollinating insect for most of these crops.

It is also important to understand that benefits of pollination are felt not only in terms of volume of production. Efficient pollination can also have a strong influence on product quality, because many fruits grow larger and more symmetrically when well pollinated. Further, efficient pollination can shorten the time between flowering and harvest, creating savings in agricultural inputs. One key input is water: shorter flowering resulting from efficient pollination can see a significant reduction in the need for irrigation. In these ways efficient pollination can be part of an overall management system that increases profits and improves market access.

Pollination can also have significant impact on the animal production sector because of the importance of insect pollinated crops as fodder. Legumes, such as clovers, are important as a source of protein for livestock, and many legumes benefit from insect pollination. Bee pollination can influence the persistence of clover in pasture, therefore affecting grazing quality. A study of agricultural industries in the south island of New Zealand found that the economic benefits of bee pollination were even greater in the pastoral industry than in horticulture (Simpson 2003).[3]

2.4 Clearly, the European honey bee is vital to the future of Australian agriculture.

2.5 In 2003, RIRDC published a report, *Valuing honeybee pollination*, which estimated the value of honey bee pollination services on the basis of the economic impact if those services were unavailable, such as in the case of a sudden and catastrophic outbreak of pests or disease (i.e. *Varroa destructor*). The estimate provided is based on the study of 35 crops for which data is available. In addition to the 35 crops for which data was available, a wide range of pastures, including lucerne and clover, are

3 CSIRO, Submission no. 33, p. 7.

pollinated by honey bees; hence, this estimate understates the potential value of the pollination services.

2.6 The value of honey bee pollination services was estimated to be $1.7 billion for 1999–2000 production, based on the direct cost of a loss of pollination services. The direct costs fall roughly equally on Australian consumers ($839m due to higher prices and unavailability of certain products) and the producers of honey bee dependent crops ($877m). 9500 jobs would be directly affected.

2.7 In addition to the direct effect upon the economy, flow-on effects *could* result in an *additional* $2 billion loss in industry output and 11,000 jobs following the loss of *all* honey bee pollination services. These latter losses would not persist over time as unutilised resources will move to other industries in the longer term. They do however have significant implications for regions with high shares of honey bee dependent crops in the years immediately following a sharp drop in the honey bee population.

2.8 The large estimates of value come from the fact that the loss of a critical ingredient—the honey bee pollination service—renders all the other inputs valueless in the case of 100% honey bee dependent crops (such as almonds) and by a proportional amount for the less dependent crops. While these costs would adjust downwards over time, such a loss would see a major restructuring of agriculture in Australia.

2.9 However, the report notes that, in practice, even a problem such as *Varroa destructor* would not wipe out all honey bees immediately across Australia, so farmers will have time to adjust. So too will honey bee producers. It is likely that a market for pollination services would develop rapidly in heavily honey bee dependent industries, lowering the impact of exotic incursions largely to losses incurred while honey bee producers expanded their capacity to meet the demand for pollination services. The final outcome would depend on the costs to the honey bee producers of expanding production. These costs include the additional costs of disease control, access to areas to rebuild the health of hives, and the market for honey.[4]

2.10 The ability of the honey bee industry to meet the pollination workload is affected by a number of factors, including the viability of honey production and access to floral resources. In evidence before the committee, Mr Linton Briggs, one of the industry's foremost authorities,

4 Jenny Gordon & Lee Davis, *Valuing honeybee pollination*, RIRDC Publication no. 03/077, June 2003, pp. v–vi.

explained the link between honey production and the provision of paid pollination services:

> The key dynamic of the Australian honey bee industry is the honey production sector. I say that because all the other sectors—queen rearing; honey processing, particularly for the Australian produced product, crop pollination and packaged bee exports—derive their impetus from honey production. They all depend on the central core of the honey production sector of the Australian industry. The sector itself, as you would have observed in the submission, faces significant challenges in sustainability and long-term pressure on disposable incomes. If that sort of pressure continues and the industry is unable to grow, it will lessen its ability to perform the very important role of pollinator of agricultural and horticultural crops throughout Australia.[5]

2.11 He continued:

> The only place honey bee populations can be sourced from—the only place—is the honey production sector. I have heard it said, 'We might forget about honey production and just become a pollination industry.' That sounds fine but, in practice, it is no go because most of our crop pollination requirements are met very early in the season. These people, Robert and Ken, are very good examples of large commercial migratory operators who will be moving in the next couple of weeks to the almond pollination districts in the Murray Riverland. How do they keep their bees going all year round? They have to be honey producers. That is the only way in Australia to economically and feasibly maintain large, prosperous honey bee populations—by following the flow, whether it be 1,000 kilometres from your home base today, tomorrow, or 500 kilometres in the opposite direction.
>
> Honey production will always have to be an important part of the industry to maintain the population, not only through each season but very importantly to provide sufficient stores of eucalypt honey to take the colonies over the winter to the next spring.[6]

2.12 In his submission, Mr Trevor Monson, a pollination contractor, identified the expansion in capacity required in the industry if it was to meet the growing demand for paid pollination services:

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5 Mr Linton Briggs, *Transcript of Evidence*, 25 July 2007, pp. 1–2.

6 Mr Linton Briggs, *Transcript of Evidence*, 25 July 2007, p. 10.

> As Australia's largest pollination contractor, I will be sub-contracting 120 beekeepers to supply 45,000 strong healthy hives of bees this year. By 2015 this figure will increase to 300 beekeepers supplying 180,000 hives. Double these figures and you will get an idea of the increasing pressure on the industry to keep up with numbers of healthy strong bees and to improve and plan their whole year's beekeeping around pollination.[7]

2.13 In his submission, Mr Peter Barnes, a Queensland beekeeper, observed that the industry was already having difficulties meeting demand:

> Over the last few years in the months of August and September, the supply of beehives for pollination has fallen **well short** of demand. There are large areas of new plantings of orchards and crops that will require pollination in the August, September period within the next ten years. The demand of hives for pollination will continue to out strip number the number of hives available at that time of year. Under current Queensland State Government legislation on the future of managed hives in Native Forest Areas, there is no incentive for apiarists to increase hive numbers to meet the demands of the pollination **short fall.** This current legislation also discourages new investment in the industry.[8]

2.14 The Tasmanian Beekeepers' Association also highlighted the problems facing the industry in meeting demands for pollination services:

> A key economic issue facing Tasmania's agriculture and horticultural growth prospects is the predicted shortfall of some 4500 hives in Southern Tasmania to cover the minimum stocking rate per hectare for various crops. This shortfall is largely due to the diminishing access to the prime resource base of Leatherwood trees from current logging practices and increasing access restrictions in other areas.[9]

2.15 In their submission, Marie and Colin Murley, Victorian beekeepers, noted that 'the increase in hive numbers required for almond pollination with the prediction of 160,000 hives by the year 2012 in North West Victoria will be unachievable if more access to forests is denied'.[10]

2.16 In his submission, Mr Don Keith, a former chairman of Capilano Honey Ltd, argued that:

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7 Mr Trevor Monson, Submission no. 6, p. 3.

8 Mr Peter Barnes, Submission no. 5, p. 1.

9 Tasmanian Beekeepers' Association, Submission no. 63, p. 5.

10 Marie and Colin Murley, Submission no. 15, p. 1.

> The anticipated giant leap in honey bee pollination requirements while honey production viability comes under pressure indicate a need for cross stakeholder planning, underpinned by significant Government support, in view of the community benefits derived.[11]

2.17 Despite the importance of pollination, the Linkages Workshop identified a number of issues with the provision of paid pollination services. In its submission, RIRDC noted:

> Firstly, there is a poor understanding on the role of honeybees in the pollination of crops. The honeybee industry and agricultural industry representatives need to educate growers on the benefits honeybee pollination can provide.
>
> The workshop also recognised that there is a need for more professionalism in the provision of pollination services by beekeepers. This is because some pollinators provide poor quality services to growers, which reduces the reputation of the industry. It was suggested that the pollination industry should adopt pollination industry standards and quality control measures.
>
> It was also agreed that paid pollination needs to become more of a cooperative venture between apiarists and growers. Beekeepers have a responsibility to provide the right hives when required, and growers have a responsibility to making their crops 'bee friendly' by protecting the hives, reducing the risk from insecticide use, and managing pollen sources.
>
> There also needs to be more education within the honeybee industry, and particularly in the pollination industry. Beekeepers need to understand the intricacies of pollination and be more consistent in their business operations, especially in pricing their services. Growers need to be able to recognise paid pollination services that are managed well, and the additional benefits paid pollination can provide over feral bee pollination.[12]

Agricultural chemicals

2.18 One of the major problems inhibiting paid pollination is the impact of agricultural chemicals on managed hives. In its submission, the Queensland Beekeepers' Association observed:

11 Mr Don Keith, Submission no. 26, p. 3.

12 RIRDC, Submission no. 54, p. 17.

> Agricultural chemicals also impact heavily on honey bees. Some chemicals have a high residual effect and over time render a bee hive toxic. This is an increasing problem with the use of specialized seed treatments and other systemic chemicals. On a more positive note there are honeybee friendly products used by more discerning farmers who are aware of the increased yields provided by sufficient pollination.[13]

2.19 In its submission, the Tasmanian Department of Primary Industries and Water also highlighted the potential impact of agricultural chemicals:

> Agricultural chemicals, particularly wetting agents are generally lethal to bees. Commercial apiarists report significant losses by such chemicals being applied to crops near their apiary sites without their knowledge. Obviously there is an education component to the solution of this problem but warnings need to be made clearer on chemical containers. The labels on the containers of many agricultural chemicals do not mention toxicity to bees but experience by local apiarists suggests such chemicals are lethal to bees. Toxicity of agricultural chemicals to bees perhaps needs to be more comprehensively addressed through the registration process. Agronomists recommending the use of agricultural chemicals need to be more bee focused and responsible when making recommendations.[14]

2.20 Two persons closely associated with crop pollination made extensive submissions on the problem of agricultural chemicals. In his submission, Mr Warren Jones, President of the Crop Pollination Association, noted that changes had occurred over time in the types of chemicals being used in agriculture and that research upon the effects of chemicals was often behind the times:

> During the 1980s came the move to remove many chemicals found to be toxic to humans and the environment. Most of these were contact poisons with a very long half life in the environment as well as being retained in human and animal fat layers.
>
> So departed the so-called bad chemicals, to be replaced with a group of chemicals that are neurotoxic in their action on insect pests and found to be not so bad on humans (how this testing of the effect on the human brain could be assumed I cannot understand). The bee industries world-wide have questioned the

13 Queensland Beekeepers' Association, Submission no. 67, p. 5.

14 Tasmanian Department of Primary Industries and Water, Submission no. 72, p. 5.

use of this group of chemicals referred to as neonicotinoids for a number of years.[15]

2.21 On the use of neonicotinoids in particular he noted that:

> There has been a wide use of neonicotinoids to treat a large range of pasture seed and other seed prior to planting which includes most of our horticulture and vegetable production. Consequently our bees are continually in contact with neonicotinoids from the agricultural environment. We are finding it very difficult to maintain our hives at pollination strength, requiring an increase in use of young queens and replacement nucleus hives to maintain our hives.
>
> Our domestic food supplies, both vegetable and animal, would all have some residual resulting from the use of neonicotinoids in agriculture. This brings me to bring to your concern [about] the overuse of neonicotinoids in agriculture. Any move to protect the community will also result in the protection of honey bees.[16]

2.22 Mr Jones cited research which indicated that:

> …neonicotinoids where mixed with a fungicide increases the nicotoid toxicity up to 1000%. If this can occur this type of chemical should not be in agriculture as thousands of combinations are possible. As agriculture mixes chemicals that are so called compatible. If this research is correct then the practice should cease immediately.[17]

2.23 Mr Trevor Monson also expressed strong concerns about the potential impacts of agricultural chemicals:

> Insects are often the prime target for chemicals. Before registering chemicals used for agriculture and the environment, their effect on honey bees and beneficial insects needs to be rigorously tested. Some chemicals need to be reviewed, and some never used. Chemical users, farmers and beekeepers, have to know what they are doing. Some chemicals require special training. And some simply can't be applied together. Are there other ways of control without using chemicals? Do we really know what these chemicals are doing?

15 Mr Warren Jones, Submission no. 52, p. 3.
16 Mr Warren Jones, Submission no. 52, p. 4.
17 Mr Warren Jones, Submission no. 52, p. 5.

> Since the recent Colony Collapse Disorder in the USA, a warning has been issued to farmers to know their pesticides and fumigants and how to use them. "Growers…must maintain a delicate balance between protecting their crops from pests and pathogens, and protecting the insects that are necessary to pollinate their crops." "Chemical contamination is one of the possible contributing factors that is being investigated" for CCD. Beekeepers may be using chemicals within the hive as well as farmers using chemicals on the crops the bees are visiting. The warning talked of the increased toxicity that certain chemicals have, when two or more chemicals were being used at the one time. An example was given of the common practice of combining certain insecticides and fungicides. It was found that some combinations could increase the toxicity of a component 1,000 fold. Some farm chemicals have a systemic effect, making the treated plants toxic to insects that collect their pollen and nectar. Foraging honey bees transfer these chemicals to the hive bees and queen, causing memory, navigation, orientation and feeding behaviour problems, even death.[18]

2.24 On the other hand, Mr Robin Thompson, of the Tasmanian Department of Primary Industries and Water, argued that there was little research to link agricultural chemicals to long term health issues:

> We also heard a bit about the influence of agricultural chemicals on bees and their toxicity. There is a need to take a twofold approach to this.
>
> The first issue is the labelling of agricultural chemical containers. That is currently not as expansive or descriptive as it could be—usually because the active ingredient is not actually toxic to bees but the solvent and some of the other additives probably are. Surfactants are a classic example of that. They stop bees breathing. So there is a labelling issue and a need to look at the whole composition of the chemical rather than just the active component. There is an extension program, which it is obviously important to keep going. Our minister gave a commitment to doing that when he met with members of the TBA [Tasmanian Beekeepers' Association] a few weeks ago. There will be an education program which will be ongoing.
>
> We hear a lot of claims about cause and effect with agricultural chemicals and some of the subclinical effects that we can see—for example, if a pre-emergent herbicide or insecticide is applied then

18 Mr Trevor Monson, Submission no. 6, pp. 4–5.

> it gets translocated through the plant and can have a sub toxic effect on bees. A lot of that is conjecture. There is no good scientific evidence to say what is happening one way or the other. Often in these issues it is very easy to blame these things; they become whipping boys. We have to be a bit careful that we do not do that and that we keep the whole thing in perspective. So there is a need for better science to underpin the use of agricultural chemicals.[19]

2.25 Several beekeepers gave the committee first hand evidence of their experience with chemical spraying. In evidence before the committee, Mr Roy Barnes, a Queensland beekeeper, stated:

> We did avocados last year, and Peter might have mentioned that we do macadamias heavily. Unfortunately, in the instance of the avocados last year we were doing the same property on two orchards and one of his neighbours was spraying other small crops, so we got very heavily sprayed, so much so that we will not do pollination work on that orchard again because it just cost us too much recovering those hives.[20]

2.26 In his submission, Mr Gavin Jamieson, a Victorian beekeeper, told the committee that:

> I used to produce bees for pollination services. I have not been involved recently due to the seemingly impossible task of avoiding pesticide damage and kills to hives. This issue is very poorly understood from a legal or residue perspective. I doubt if organic honey exists. If it's really deadly the hives are dead and will not produce honey. There are other situations that are not as clear cut as total mortality of all bees.[21]

2.27 In evidence before the committee, Mr Rodney Whitehead, a Victorian beekeeper, noted that 'there are some crops that we have done in the past that we will not do these days because of chemical problems and the time of year they come in—you need to allow the bees time to recover'.[22]

2.28 In its submission, AHBIC argued for better labelling of chemicals and grower education:

> Although paid pollination services represents a large opportunity for the honeybee industry, there are many risks that could inhibit

19 Mr Robin Thompson, Tasmanian Department of Primary Industries and Water, *Transcript of Evidence*, 3 September 2007, pp. 38–9.

20 Mr Roy Barnes, *Transcript of Evidence*, 10 August 2007, p. 66.

21 Mr Gavin Jamieson, Submission no. 10, p. 2.

22 Mr Rodney Whitehead, *Transcript of Evidence*, 25 July 2007, p. 75.

> the development of this market. Chemical spraying is one such risk. Those who apply chemicals to crops need to be educated on the risk spraying can impose on bee colonies. Better labelling on chemical products would reduce the potential collateral damage from spraying.[23]

2.29 In her submission, Mrs Elwyne Papworth, a Victorian beekeeper, made the following recommendations with regard to the use of agricultural chemicals:

> All Chemical companies should be required to include extension research, before release of any new product, and to include "in use" products on growing plants, to determine if nectar and or pollen is being affected by residue of in ground or surface residual chemicals, weather applied by water delivery, aerial or conventional spray methods.
>
> Better labelling of all types of chemical containers, to include a tested, proven statement if it is or is not harmful to bees, what the with-holding period, (if appropriate) is before bee visitation can be under taken for pollination services.
>
> Education of Agronomists, Agricultural and Horticultural advisors to the grower sectors of the benefit and value adding by the informed use of chemicals to protect bees, managed or feral, educate Agronomists to recognize the use of bees.[24]

2.30 She also noted that research was 'required into the effect chemicals have on live plants intake/transfer to nectar and or pollen from soils previously used where chemicals are known to be used including pollen absorption [by] Honey Bees'.[25]

2.31 In his submission, Mr Neville Bradford, a Queensland beekeeper, also argued for research into the impact of agricultural chemicals on bees and apiary products, including 'the short and long term effects of agricultural chemicals on beehives, from overspray and systemic poisoning'.[26]

2.32 In his submission, Mr Don Keith highlighted the need for research in this area, stating:

> The Honey Bee Industry in Australia has had a constant focus on minimising the use of chemicals to manage diseases and pests.

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23 AHBIC, Submission no. 56, p. 22.

24 Mrs Elwyne Papworth, Submission no. 74, p. 5.

25 Mrs Elwyne Papworth, Submission no. 74, p. 6.

26 Mr Neville Bradford, Submission no. 43, p. 3.

> This provides the industry with genuine, clean, green credentials for promoting its products. There will be an ongoing need for *development of non-chemical controls for diseases and pests* if this clean, green status is to be maintained.[27]

2.33 Closely related to the issue of chemical use is the need to educate growers on the needs of bees and the benefits of pollination. In his submission, Trevor Monson identified a need to educate farmers and other land managers on the needs of bees and the potential impacts of chemicals:

> Farmers, especially, need to know the basics of beekeeping, so that their farming schedule can be adjusted to allow for the presence of pollinating insects. In other words they need to plan where bees are going to be placed during pollination, provide suitable access to sites, have all spraying and farm work finished, know what chemicals are safe to use and what chemicals they can eliminate. Farmers need to know about bees even if they do not use them for pollination, because in all probability their neighbours will.
>
> Farm and land managers need a greater understanding of honey bees. And this doesn't just mean farmers of bee-dependent crops such as almonds, cherries, apples, stone fruits and vegetables, etc. For example, a rice farmer may grow canola, faba beans or safflowers as rotation crops to enrich the soil. Public Land Managers and most workers in agriculture come across swarms and incidents that involve honey bees. They need to understand the habits and basic needs of honey bees, such as water, and know how to handle them.[28]

2.34 In a similar vein, Mr Neville Bradford, a Queensland beekeeper, stated in evidence before the committee:

> I think there needs to be more education in relation to those people who are getting the pollination services and how they fit together and what their benefits are, because a lot of them do not understand. They do not understand how much increase in yield they will get and what sort of dollars that will mean to them. With chemical use, a load of beehives is worth nothing compared to their chemical bill. If the bees go, it is a case of saying, 'Oh well, we'll just get another beekeeper next year,' so there is a bit of an attitude there where they do not really see the true value being their increasing yield. If they keep doing that, they will get no bees

27 Mr Don Keith, Submission no. 26, p. 4.

28 Mr Trevor Monson, Submission no. 6, p. 4.

> eventually because people will wise up to the fact that they do not care. I feel there has to be a lot of education, because there are too many people getting bees sprayed and they cannot do anything about it.[29]

2.35 Mr Rodney Whitehead, a Victorian beekeeper, told the committee:

> Then there are other farms where we have promoted the pollination aspect, the farmers are not prepared to do it—it is a lot of money—and quite often we have taken bees to the farm and said, 'We're not going to charge you this year. You come back and tell us whether it was worth while.' We have found that those farmers have said, 'Gee, we didn't realise we would get a fruit set like that. Can we pay you?'[30]

Alternative pollinators

2.36 Finding pollination alternatives to honey bees is another important and potentially significant area of research. In its submission, CSIRO stated:

> Honey bees are not the only effective crop pollinators. Some crops are pollinated exclusively by insects other than honey bees, and for some crops it is known that other bee species are more effective than honey bees in terms of their effect on pollination. Most insect-pollinated crops are visited by a wide range of native insects, and studies have shown that for some crops species native insects are very effective pollinators. If the feral honey bee population was to decline, it is possible that native insects would compensate to some degree by continuing to provide a free pollination service to some crops. Unfortunately there is not enough data to be confident how effective this service would be. Nevertheless, an increasing number of studies from Australia and around the world show that native pollinators can provide a significant pollination service, and that this level of service is influenced by the habitat available for nesting and feeding. Maintaining these alternative native pollinators and determining how best to use them would provide a buffer for agricultural industries if the honey bee keepers cannot provide sufficient pollination services.[31]

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29 Mr Neville Bradford, *Transcript of Evidence*, 10 August 2007, p. 52.

30 Mr Rodney Whitehead, *Transcript of Evidence*, 25 July 2007, p. 75.

31 CSIRO, Submission no. 33, p. 8.

2.37 CSIRO advocates research into the potential of native pollinators as a way of reducing the risk to agriculture of European honey bees being decimated by Varroa:

> At present the bee keeping industry is primarily focused on *A. mellifera.* In addition, there has been some interest from the lucerne industry in leafcutter bees, but this is well short of becoming a sustainable industry. To reduce reliance on *A. mellifera,* and to broaden the product base for beekeepers, native pollinators that may be directly managed for crop pollination benefits should be considered. At present our knowledge in this regard is patchy and insufficient to provide a clear picture of the potential role of native species.[32]

2.38 In her submission to the inquiry, Dr Anne Dollin of the Australian Native Bee Research Centre, highlighted the importance of research into native bees as alternative pollinators to European honey bees. She stated:

> The development of alternative pollinators, such as native bee species, should have high priority in the future research and development of the honey bee industry.[33]

2.39 Dr Dollin noted that research on the use of stingless social bees, such as *Trigona* and *Austroplebeia*, and the blue banded bee *Amegilla*, had produced positive results. She noted that:

> The main constraint on the use of these Australian native alternative pollinators is a lack of research into their husbandry and effectiveness.
>
> Given the serious threat posed by exotic pests and diseases to honey bees in Australia, it is urgent that research and development funds be allocated to the development of alternative native insect pollinators in Australia.[34]

2.40 In its submission, the Centre for Plant and Food Science at the University of Western Sydney stated:

> There is increasing interest in Australia and overseas in understanding and exploiting native bee pollinators, or even the importation of exotic species, such as bumblebees *{Bombus terrestris).* There is a significant potential for non-*Apis* bees in

32 CSIRO, Submission no. 33, p. 16.

33 Dr Anne Dollin, Australian Native Bee Research Centre, Submission no. 9, p. 1.

34 Dr Anne Dollin, Australian Native Bee Research Centre, Submission no. 9, p. 2.

> pollination, particularly in the rapidly expanding protected cropping (greenhouse production) industry.
>
> An incursion of Varroa mite into Australia is predicted to devastate feral *Apis mellifera* colonies, and thus, incidental crop pollination by them. Such a situation will increase the role for non-*Apis* species in crop pollination. Research to better understand the behaviour and ecology of native bees is therefore essential.
>
> A proportion of the pollination research will need to take place in tropical areas of Australia, particularly for field pollination by native bees, although, as discussed earlier, the rapidly expanding protected (greenhouse) cropping industry will provide further opportunities for research and training. This will become even more essential in the event of the introduction of bumblebees into mainland Australia for greenhouse pollination.[35]

2.41 In its submission, the Australian Hydroponic and Greenhouse Association (AHGA) urged the introduction of bumblebees as alternative pollinators for suitable crops, in particular greenhouse tomatoes. The submission noted:

> …bumblebees are used in every developed country in the world except Australia to improve the pollination of a wide range of crops, both in the greenhouse (tomatoes, capsicums, eggplant, strawberries, berry fruit) and in the field (almonds, apples, stone fruit, avocados). They do not replace honeybees, but operate in concert with them or in situations where honeybees are not able to adequately pollinate the crop. This particularly applies to solanaceous crops such as tomatoes, which require a good buzz pollinator. Their use overseas over the last 20 years has resulted in substantial yield increases, enhanced crop quality, major labour savings and greatly reduced pesticide use. Bumblebees are managed in similar ways to honeybees, with commercially available hives. These differ from those of honeybees in that each contains a single queen and an initial 50 workers, with a hive life span of only 4–8 weeks. They are then exchanged for new ones, using them only during the pollination period, which is crop specific.[36]

2.42 AHGA argued that bumblebee would have little if any impact on the natural environment. The submission stated:

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35 Centre for Plant & Food Science, University of Western Sydney, Submission no. 90, p. 5.

36 Australian Hydroponic and Greenhouse Association, Submission no. 57, p. 2.

> In the same way that environmentalists applied the so-called 'precautionary principle' to restrict honeybee access in State and public parks, they have actively and successfully lobbied the public and State governments to have bumblebees refused entry onto mainland Australia under any circumstances. An assumption of serious negative environmental impact has been made on even flimsier 'evidence' than exists for honeybees. A concerted scaremongering campaign over many years has labelled the innocuous bumblebee a flying cane toad, another European wasp, the next rabbit, a threat to one's children and a carrier of Varroa, which it most certainly is not.[37]

2.43 According to AHGA, bumblebees had a limited capacity to survive in the natural environment:

> In Israel, bumblebees are used in irrigated crops where they do not naturally occur and could not and do not survive once the commercial hives are removed. A similar system could work very well in Australia. Unlike honeybees, feral *Bombus terrestris audax* would be very limited in its ability to survive most of the climate extremes in Australia, and may not survive the predation of ants and birds even in climatically suitable areas.[38]

2.44 However, there was no support for the introduction of bumblebees within the honey bee industry. In its submission, AHBIC stated:

> Bumblebees were introduced into Tasmania in 1992 by accident and have since been contained in Tasmania. However some industries such as the tomato industry and those that are grown under similar hydroponics are calling for the introduction of the bumblebee to pollinate their crops. Currently the majority of tomato pollination is done by mechanical vibration.
>
> However there are some concerns held by the honeybee industry regarding the introduction of bumblebees to mainland Australia. Firstly it is unknown whether the bumblebee harbours pests that are dangerous to the honeybee industry (such as the Varroa mite). Nor is it known what other parasites or pathogens bumblebees might carry that are as yet unknown to the honeybee industry.
>
> In addition, the industry is concerned that the bumblebee will compete for nectar and pollen with the honeybee, and because the bumblebee can forage at lower temperatures and can start foraging

37 Australian Hydroponic and Greenhouse Association, Submission no. 57, p. 3.

38 Australian Hydroponic and Greenhouse Association, Submission no. 57, p. 4.

> earlier in the morning, they have a competitive advantage over the managed honeybee. Bumblebees would also increase competition with native species that forage earlier in the day than honeybees.
>
> The industry is also concerned that feral bumblebee colonies might be dangerous to the environment. This is because bumblebees specialise in pollinating certain types of flora, which contain many agricultural weeds. This means these weeds become more prolific, thereby invading native plants and in some cases choking rivers.
>
> It is therefore the position of the industry that bumblebees should not be introduced on the mainland of Australia.[39]

2.45 Likewise, the Tasmanian Crop Pollination Association argued against the introduction of bumblebees onto the Australian mainland.[40]

Genetically modified (GM) crops

2.46 Another issue of concern to the honey bee industry is the interaction of honey bees with GM crops. In its submission, Capilano Honey Limited noted that 'the release of GM crops and detection of GM products in honey pose a marketability and consumer confidence risk for the honey industry to overcome'.[41] According to Dr Ben McKee of Capilano Honey Ltd, the possible contamination of honey with GM pollen is a real issue for the industry:

> Before too long, we are going to wind up with a situation where there is going to be considerable inadvertent contamination of our honey across the board with GM products, and that is originating from the pollen. There will be a GM product that may result in some kind of protein, or a factor or something that is present on a plant. That may be in the nectar. Who knows? That is something that I am sure is not going to be very well thought about in the process. It is something that we as an industry are going to have to resolve—hence I am saying it is one important thing we have to be prepared for.
>
> The second thing is that the bees gather the pollen, the DNA is in the pollen, and anyone can do what is called a PCR [polymerase chain reaction] test and identify that DNA and say, 'That honey

39 AHBIC, Submission no. 56, pp. 38–9.

40 Tasmanian Crop Pollination Association, Submission no. 70, pp. 16–17.

41 Capilano Honey Limited, Submission no. 55, p. 6.

> there contains GMOs.' It is a DNA fragment that has been inserted into the genome of a plant that is coming through in the honey. How do we respond to that? There are a number of strategies that we as a company are looking at. Do we remove all the pollen and filter our honey to a much higher degree and, at the same time, potentially reduce some intrinsic benefits that people talk about with honey, such as enzymes and so on—because they will all go at the same time—to ensure that we do not face a marketing crisis on the shelf? I am sure that someone at some stage is going to say, 'We don't like the widespread use of these GMs. We'll use this to highlight that GMs get in everything,' and the honey industry will face that.[42]

2.47 In its submission, the Tasmanian Beekeeper's Association associated GM crops with potential loss of Australian honey's clean-green image, and cited GM crops as a possible cause of Colony Collapse Disorder:

> Tasmanian honey like other Tasmanian products currently has a clean green image. This image maybe challenged with the potential introduction of GM crops. The State Government is reviewing the prohibition of GM crops in Tasmania. Bees are very sensitive to the environment. Colony Collapse Disorder, CCD, is an epidemic sweeping the bee populations of Europe and America. It has resulted in beekeepers incurring huge losses of stock and reduced production. As yet the cause is unknown; GM crops are one of the many suspected risk factors under investigation.[43]

2.48 In his submission, Mr John Edmonds, a Victorian beekeeper, argued that 'GMO crops should be studied more before plunging into possible problems with toxic pollens killing honeybees'.[44]

2.49 In its submission, Capilano argued that 'industry needs to develop localised testing capabilities for GM products and pollen DNA in honey, to further research and to implement identification and control testing procedures'.[45]

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42 Dr Ben McKee, *Transcript of Evidence*, 10 August 2007, pp. 6–7.

43 Tasmanian Beekeepers' Association, Submission no. 63, p. 5.

44 Mr John Edmonds, Submission no. 23, p. 6.

45 Capilano Honey limited, Submission no. 55, p. 6.

Committee conclusions

2.50 The evidence presented to the committee during the course of its inquiry has highlighted the importance of the honey bee, *Apis mellifera*, to Australian agriculture. Bees are vital to the commercial production of a significant range of crops. Managed pollination is important in terms of productivity and quality of crops. Moreover, with the imminent threat of Varroa on Australia's doorstep, it is clear that managed pollination will be necessary to crop production in the future. It is essential that effective pollination management systems are put in place now.

2.51 To be successful, managed pollination requires three things:

- An understanding of the pollination requirements of individual crops;
- Professional expertise on the part of the provider of pollination services; and
- An understanding by the primary producer of the requirements of bees and the factors mitigating successful pollination, such as misuse of pesticides.

2.52 Managed pollination will therefore require investment in research on crop pollination and training for pollination providers and users. The committee notes that these needs have been identified as part of the Pollination Australia project, as discussed in chapter 1.

2.53 Furthermore, to meet the threat of Varroa, the Australian honey bee industry will need to develop the capacity to provide pollination services to a range of industries on a large scale. This, in turn, will require professional development within the industry, a higher level of coordination between industries, a sustained research effort to minimise the impacts of pests and diseases and maximise the impact of paid pollination services, and increased access to floral resources to maintain hive numbers and strength for pollination.

2.54 The committee notes the evidence received concerning the impact of agricultural chemicals, especially pesticides, on honey bees. Clearly, better labelling of chemicals is required to prevent the accidental poisoning of bees involved in pollination. It is also evident to the committee that more research into the short and long term effects of agricultural chemicals is required.

2.55 The committee supports the need for research into alternative pollinators and pollination systems such as self-pollinating plants. The use of alternative pollinators such as leaf-cutter bees or native bees will make

agriculture less reliant on honey bees, thus mitigating the potential impacts of a pest or disease incursion. On the basis of the evidence presented, however, the committee opposes the introduction of bumblebees to mainland Australia.

2.56 The committee also notes concerns over the introduction of GM crops and their potential impact on the honey sector. The potential presence of GM pollen in natural honey raises real difficulties for honey producers, especially as bees cannot differentiate between GM crops and other plants. There is real potential for GM products to inadvertently enter the food supply through honey bee pollination. This represents a real commercial risk for the industry.

Recommendation 2

2.57 **The Committee recommends that the Australian Government fund research and training in the provision of paid pollination services as part of its contribution to Pollination Australia.**

Recommendation 3

2.58 **The Committee recommends that the Australian Government fund research into alternative pollinators as part of its contribution to Pollination Australia.**

Recommendation 4

2.59 **The Committee recommends that the Australian Government alter labelling requirements for agricultural chemicals to reflect their impact on honey bees and other pollinating insects.**