Chapter 2

Support for the commercial use of bumblebees

2.1 This chapter outlines the arguments provided to the committee supporting the commercial use of bumblebees in Tasmania. The arguments centered on increased productivity in greenhouses and thus economic benefits to producers and the state of Tasmania, and the use of bumblebee pollination should honey bee populations be affected by the varroa mite.

Potential productivity and economic benefits

2.2 The committee received evidence on the potential productivity benefits of the successful commercialisation of the Tasmanian bumblebee population. Submitters commented that productivity benefits arise as bumblebees are efficient pollinators. This efficiency has been utilised in many overseas countries particularly in greenhouses. CSIRO commented:

> In agriculture, *Bombus terrestris* is used in many countries around the world as a pollinator, especially for greenhouse crops. There are some crops (e.g. greenhouse tomatoes) for which this species is a more effective pollinator than the widely available managed pollinator, the European honeybee, *Apis mellifera*.[1]

2.3 Bumblebees pollinate flowers through 'buzz pollination', that is, a rapid vibrating motion which releases large amounts of pollen onto the bee. The Tasmanian Government explained that:

> In most situations, "buzz pollination" will allow a bumblebee to pollinate a flower in a single visit. A honey bee typically needs to visit a flower between 7–10 times before it is fully pollinated.
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> Bumblebees are fast workers, visiting twice as many flowers per minute as honey bees. Because of their size, they can carry relatively heavy loads, which enables them to make long foraging trips. They also often achieve better contact with stamens and pistils than smaller insects.[2]

2.4 The buzz pollination of bumblebees makes them very effective pollinators in comparison to other pollinating insects such as honey bees and are preferred in glasshouse crops due to their superior performance in enclosed environments.[3] In a

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1 CSIRO, *Submission 7,* p. 6.

2 Tasmanian Government, *Submission 20*, p. 3.

3 Tasmanian Institute of Agriculture and University of Tasmania, *Submission 6*, p. 2; Department of Agriculture and Water Resources, *Submission 19*, p. 3.

glasshouse tomato crop, for example, a single bee has the ability to pollinate 450 flowers per hour.[4]

2.5 Submitters also noted that other attributes of bumblebees may provide potential productivity benefits for pollination services. These attributes include that bumblebees are attracted to flowers with long narrow tubes, such as blueberries and tomatoes, while honey bees are not. Bumblebees are also more efficient pollinators than honey bees as they mainly forage for pollen rather than nectar, and transfer more pollen to the pistils of flowers with each visit.[5]

2.6 A further advantage provided by bumblebees for pollination is that bumblebees are less affected by adverse and cooler weather conditions than honey bees.[6] Honey bees become active at temperatures of 15ºC to 18ºC while bumblebees are active at temperatures around 5ºC. Bumblebees are also active on cloudy, foggy and rainy days and can fly in windy weather.[7] Raspberries & Blackberries Australia stated that:

> In Tasmania, it has been observed that wild bumble bees also act as pollinators of berry crops. It has long been known that bumble bees are more reliable than honey bees as pollinators as they will forage during inclement weather and are less hesitant to forage in crops grown under plastic.[8]

2.7 Other advantages of bumblebees include that they are not tied to a specific area of a crop and will change trees more often and more easily than honey bees. This provides benefits for cross-pollination which is often required for fruit crops.[9]

Increased crop yields and reduction of costs

2.8 The committee received evidence regarding crop yields associated with pollination by honey bees, bumblebees and wand pollination. Wand pollination uses handheld vibrating wands which mimic buzz pollination. Wand pollination is commonly used for tomatoes grown in glasshouses rather than honey bee pollination.[10]

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4 Costa Group, *Submission 12*, p. 3.

5 Tasmanian Government, *Submission 20*, p. 3.

6 Fruit Growers Tasmania, *Submission 1*, p. 2; Raspberries & Blackberries Australia Inc, *Submission 5*, p. 1;

7 Tasmanian Government, *Submission 20*, p. 3.

8 Raspberries & Blackberries Australia Inc, *Submission 5*, p. 1.

9 Tasmanian Government, *Submission 20*, p. 4.

10 Department of Agriculture and Water Resources, *Submission 19*, p. 2.

2.9 Submitters pointed to increases in both yield and fruit quality—size, weight and shape—in plants such as blueberries, tomatoes, capsicum, eggplant and kiwi fruit from buzz pollination services especially in glasshouses. Protected Cropping Australia emphasised the benefits of bumblebees and stated that they are:

> …far more effective at pollination, than human efforts, resulting in a substantial yield increase and quality, on greenhouse crops, stone fruit and berries. This can happen at a much lower cost than manual pollination (currently the practice in greenhouse crops).[11]

2.10 The University of Tasmania and Tasmanian Institute of Agriculture (TIA), for example, noted the increased yield for some glasshouse crops overseas due to the use of bumblebees rather than honey bees for pollination:

> Increases in agricultural productivity derived from bumblebee pollination services in glasshouses are well documented. Investigations of the magnitude of these yield increases when compared to honey bee (*Apis mellifera*) pollination have demonstrated significant increased returns to growers; tomato (19%); capsicum (6%); eggplant (25%); cucumber (22%); raspberry (8%) and strawberry (13%) to name but a few.[12]

2.11 The Department of the Environment and Energy (the department) also noted reports that yields and fruit size have improved by about 20 to 30 per cent in fruit pollinated by bumblebees compared to fruit pollinated by vibrating wand.[13]

2.12 In relation to greenhouse tomatoes, the Department of Agriculture and Water Resources noted that European honey bees are not well suited for pollination. Wand pollination is preferred over honey bees. However, compared to wand pollination, bumblebee pollination gives increased yields according to some studies. Bumblebee pollination also increases quality such as individual tomato weight and more seeds per tomato.[14] Other submitters noted that bumblebees are less aggressive than honey bees and are therefore more suitable for use in greenhouses.

Reduction of costs

2.13 There are costs associated with both honey bee and wand pollination. Apiarists provide hives for a fee. Fruit Growers Tasmania commented that pollination prices have risen as much as seven times in the last season for some crops.[15] The factors contributing to the increased cost of hives are examined later in this chapter.

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11 Protected Cropping Australia, *Submission 10*, p. 1

12 University of Tasmania and Tasmanian Institute of Agriculture, *Submission 6*, p. 2. See also Tasmanian Government, *Submission 20*, p. 3.

13 Department of the Environment, *Submission 20*, p. 5.

14 Department of Agriculture and Water Resources, *Submission 19*, p. 1.

15 Fruit Growers Tasmania, *Submission 1*, p. 4.

2.14 Wand pollination is labour intensive requiring 40 to 60 hours of labour per hectare per week during the flowering period. This imposes significant costs on producers. The University of Tasmania and TIA stated that:

> …the labour cost of having to physically vibrate each flowering stem within the crop is significantly higher when compared to the cost of a bumblebee hive/s which may provide daily pollination services for up to 8 weeks.[16]

2.15 Similarly, the Geelong Beekeepers Club commented that:

> To grow large, round tomatoes, the tomato flower must be well pollinated. Outdoor tomato crops are pollinated by wind currents, but inside a greenhouse flower trusses must be individually vibrated. In Australia this is currently done with an electric wand—a labour intensive process. Consequently growers are keen to utilize an alternative, far less costly process.[17]

2.16 Estimates of the reduction in pollination costs gained through the use of bumblebees were provided by the Tasmanian Government which cited a study by the Australian Hydroponic and Greenhouse Association in 2006. That study estimated that the manual pollination of one hectare of tomatoes costs Australian growers $25,000, against $7,000 for bumblebee pollination, a saving of $18,000 per hectare. The Tasmanian Government noted that this is a 72 per cent saving or in excess of $8 million annually industry-wide. It went on to comment that it is highly likely that manual pollination costs have increased significantly in the decade since that estimate was made, but bumblebee pollination costs (in other jurisdictions) have since come down.[18]

2.17 The Tasmanian Government also noted that Mr Brandsema, Protected Cropping Australia, has indicated that the use of bumblebees would cut pollination costs to 25 per cent of manual pollination.[19] Costa Group provided detailed evidence on cost savings and commented that the cost for hand pollination of a 10 hectare greenhouse is approximately $475,000 per year. If bumblebees were used exclusively to pollinate the crop, Costa expects this would result in a production cost saving of $315,000 per annum for the 10 hectare crop.[20]

16 University of Tasmania and Tasmanian Institute of Agriculture, *Submission 6*, pp. 5–6. See also Tasmanian Government, *Submission 20*, p. 4.

17 Geelong Beekeepers Club, *Submission 18*, p. 1.

18 Tasmanian Government, *Submission 20*, p. 7.

19 Tasmanian Government, *Submission 20*, p. 7.

20 Costa Group, *Submission 16*, p. 3.

Economic benefits

2.18 A major consideration for those supporting the use of bumblebees for commercial purposes in Tasmania is the potential economic benefits. With increased yields and quality and lower production costs, submitters argued that Tasmanian growers would reap a comparative advantage and therefore enable them to expand their markets on the mainland and overseas. In turn, this could fund expansion, particularly of greenhouse crops, and provide more employment opportunities.

2.19 Mr Michael Toby, from the Costa Group (one of Australia's largest horticultural companies and a major grower, packer and distributor of fresh fruit and vegetables), commented that should the proposed trial be successful, Tasmania would have a competitive advantage over every other Australian state and the potential economic benefits would be significant.[21]

2.20 This view was supported by the Tasmanian Government. The Tasmanian Government noted that a report prepared by an independent agricultural economist commissioned by the then Department of Economic Development had found that the use of bumblebees as pollinators would create a major competitive advantage for Tasmanian producers by significantly reducing production costs.[22] It went on to comment that bumblebee pollination 'would also enable Tasmania's CEA [controlled environment agriculture] sector to compete more effectively with countries such as New Zealand and Chile, which already receive a productivity advantage from access to bumblebees'.[23]

2.21 The Costa Group provided an indication of the comparative advantage to be gained through the reduction of current greenhouse tomato pollination costs. It noted that the price of New Zealand tomatoes is much lower than the price of those produced in Australia as pollination costs in New Zealand have been reduced through bumblebee pollination. The Costa Group stated:

> New Zealand (where bumble bees are present and legal) exports about 4000 tonnes of tomatoes p.a. to Australia (worth about $A4.26m), the Pacific Islands and Japan.
>
> In recent years, New Zealand grown glasshouse tomatoes have sold at cheaper prices in Australian supermarkets compared to the Australian grown equivalent.
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> This price difference is in large part attributable to the significant labour cost savings provided by the use of bumble bees in New Zealand horticulture.[24]

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21 Mr Michael Toby, Costa Group, *Committee Hansard*, 21 February 2017, p. 2.

22 Tasmanian Government, *Submission 20*, p. 8.

23 Tasmanian Government, *Submission 20*, p. 8.

24 Costa Group, *Submission 12*, p. 8.

2.22 Should the trial of bumblebee pollination be successful, it was argued that greenhouse production could expand. The Tasmanian Government noted that 'the economic benefits of bumblebees have been a key driver behind the growth of large scale greenhouse horticulture in many countries throughout Europe and Asia'.[25] The Department of the Environment also commented that there has been a very rapid uptake of bumblebee services by growers where they are available.[26] Both the Tasmanian Government and the department cited to a report produced by the horticultural industry in 2008 in which it was estimated that the economic benefit of bumblebee pollination across Australia could be $40 million per year.[27]

2.23 Mr Marcus Brandsema, Protected Cropping Australia, also commented on potential growth of greenhouse production and associated economic benefits. He stated:

> Why can't a 20-hectare struggling potato farm convert to a 20-hectare high-tech greenhouse employing 300 to 400 people, having this pollination advantage? Why can't Tasmania be the head and not the tail in this industry sector? I am looking much further than our current Tassie footprint. I am looking at our potential.[28]

2.24 The Tasmanian Government suggested that the economic benefits could include significant expansion of the state's CEA sector in which commercial agricultural crops are grown in fully enclosed secure greenhouses. However, while other crops are grown in protective poly-tunnels, there are very few crops apart from tomatoes, capsicums and cut-flowers where fully enclosed greenhouses are employed in Tasmania.[29]

2.25 Total Tasmanian production of tomatoes for fresh markets is small—about 0.42 per cent of the total volume of Australian production with 1.1 per cent of total undercover tomato production. However, the Tasmanian Government submitted that the comparative advantaged gained through bumblebee pollination could lead to an expansion of the production area through investment. It stated that Tasmania could become a future hub for CEA.[30]

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25 Tasmanian Government, *Submission 20*, p. 4. See also University of Tasmania and Tasmanian Institute of Agriculture, *Submission 6*, p. 3.

26 Department of the Environment, *Submission 22*, p. 5.

27 Department of the Environment, *Submission 22*, p. 5.

28 Mr Marcus Brandsema, Protected Cropping Australia, *Committee Hansard*, 21 February 2017, p. 10.

29 Tasmanian Government, *Submission 20*, p. 7.

30 Tasmanian Government, *Submission 20*, p. 8.

2.26 The Tasmanian Government went on to comment that there had been interest, including from a large grower with significant investment in Tasmania, in investment in CEA in Tasmania if bumblebee pollination were to become available.[31]

2.27 Apart from tomatoes, the potential use of bumblebee pollination for other commercial agricultural crops grown in fully enclosed secure greenhouses such as capsicums, eggplant and cut flowers was outlined. Production of fresh berries was also mentioned, noting the structures used with berries are not fully enclosed.[32]

Employment opportunities

2.28 The University of Tasmania and TIA discussed potential increased employment opportunities resulting from commercial bumblebee pollination. It was noted that increased production levels may result in demand for workers for crop harvesting and subsequent cold chain logistics.[33]

2.29 It was also suggested that opportunities could exist for the development of a bumblebee hive production industry. In those countries using bumblebee pollination services, the bumblebees are commercially bred.[34] The University of Tasmania and TIA commented that a small-to-medium scale bumblebee hive production industry may develop. Their submission explained that this could be undertaken by either the state's beekeeping industry, whose extensive knowledge of crop pollination would seem best suited to this role, or by other commercial parties. The University of Tasmania and TIA concluded:

> It is envisaged that production of hives would positively impact on the State's economy due to increased employment.[35]

2.30 Mr Toby, Costa Group, was similarly of the view that a new industry for research, production, pollination services and export was likely to develop in Tasmania should the proposed trial be successful. He reported that there had already been overseas interest, including for investment, in the commercial production of bumblebees in Tasmania.[36]

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31 Tasmanian Government, *Submission 20*, p. 8.

32 Tasmanian Government, *Submission 20*, p. 7; Department of the Environment, *Submission 22*, p. 5.

33 University of Tasmania and Tasmanian Institute of Agriculture, *Submission 6*, p. 5.

34 Department of the Environment, *Submission 22*, p. 5.

35 University of Tasmania and Tasmanian Institute of Agriculture, *Submission 6*, p. 5.

36 Mr Michael Toby, Costa Group, *Committee Hansard, 21 February 2017*, p. 2. See also Tasmanian Government, *Submission 20*, p. 8.

Other possible benefits

2.31 Other potential benefits from the use of bumblebees as pollinators were highlighted in evidence. These included addressing unmet demand for pollination services at peak times and as additional pollinators should the varroa mite establish in the honey bee population.

Pollination issues

2.32 The committee received evidence that some agricultural industries in Tasmania are heavily reliant on honey bees, both feral and commercial, for pollination services. These include the fruit industry (for example, apricots, blueberries, strawberries, raspberries, cherries, apples, pears and plums), the vegetable industry (for example, brassicas, onions and fennel) and seed industry (for example, carrot seed) as well as for clover, lavender, lucerne and red clover.

2.33 Pollination services are provided by commercial honey producers as part of their overall operations with crop producers paying for hives to be placed on their properties to pollinate crops.[37] The Tasmanian Government noted that agricultural industry peak bodies have expressed concern that during critical peak demand periods there is a critical shortage of honey bee pollination hives available.[38] Mr Phil Pyke, Fruit Growers Australia, commented that a number of the larger berry farms are moving into their own bee production because they cannot access enough hives to meet demand.[39]

2.34 Factors contributing to the unmet demand for pollination services are the value of honey production and the timing of demand for pollination services. Fruit Growers Tasmania pointed to the high prices received from key Asian export markets for honey as reason for beekeepers to prioritise honey production over pollination services.[40] The University of Tasmania and TIA similarly stated:

> The lucrative returns for beekeepers for honey, and especially leatherwood honey, together with the current relative size, scale and timing of the Tasmanian agricultural sector creates significant supply issues for managed honey bee pollination services in Tasmania.[41]

37 Tasmanian Government, *Submission 20,* p. 1.

38 Tasmanian Government, *Submission 20,* p. 1.

39 Mr Phil Pyke, Fruit Growers Tasmania, *Committee Hansard*, 21 February 2017, p. 12.

40 Fruit Growers Tasmania, *Submission 1*, p. 3.

41 University of Tasmania and Tasmanian Institute of Agriculture, *Submission 6*, p. 2.

2.35 The Tasmanian Government explained the impact of the timing of peak demand for pollination services:

> Many of Tasmania's apiarists consider pollination secondary to the more lucrative honey production activity. They make their hives available for pollination outside the key honey production time. However, the key honey production time for Leatherwood coincides with the flowing of many annual horticultural crops…The pollination season extends from late-July through to early April, which overlaps with the leatherwood honey season that commences late December and finishes in early March.[42]

2.36 A further matter impacting on demand during peak times is the limitations to honey bee pollination if the weather is not suitable for honey bee activity. As noted above, honey bees will not forage if the temperature is below 15°C or during inclement weather or rain events. The University of Tasmania and TIA commented that this can create problems with the pollination of several field crops, including apples, berries and cherries, if such conditions are experienced during their pollination window.[43]

2.37 Submitters also noted that some apiarists are unwilling to provide pollination services as they have experienced damage to hives placed on farms. For example, producers irrigating or spraying at the times bees are pollinating can lead to damage to the colony.[44] Mr Lindsay Bourke, Tasmanian Beekeepers' Association, stated:

> There is not a shortage of bees; it is just that some beekeepers choose not to pollinate, because previous fruit growers and vegetable growers have done the wrong thing in the past by spraying them at the wrong times of the day, and beekeepers do not want to do it.[45]

2.38 A further matter contributing to apiarists being less inclined to provide pollination services is their use in protected environments, for example, orchard bird netting. The University of Tasmania and TIA stated that hive health declines when deployed in these environments.[46]

2.39 With increased demand, the cost of pollination services has increased. Fruit Growers Tasmania, for example, commented that pollination prices have risen as much as seven times in the last season for some crops.[47]

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42 Tasmanian Government, *Submission 20*, p. 1.

43 University of Tasmania and Tasmanian Institute of Agriculture, *Submission 6*, p. 5.

44 Fruit Growers Tasmania, *Submission 1*, p. 3. See also Mr Phil Pyke, Fruit Growers Tasmania, *Committee Hansard*, 21 February 2017, p. 12.

45 Mr Lindsay Bourke, Tasmanian Beekeepers' Association, *Committee Hansard*, 21 February 2017, p. 15.

46 University of Tasmania and Tasmanian Institute of Agriculture, *Submission 6*, p. 6.

47 Fruit Growers Tasmania, *Submission 1*, p. 4.

2.40 The Tasmanian Government noted that there are apiarists who are dedicated to providing pollination services only. These services are increasingly in demand because of the growth across a range of sectors including cherries, berries, pasture and vegetable seed crops.[48] However, submitters argued that given forecast growth in the Tasmanian agricultural sector commercial bumblebees may help alleviate some of these supply issues.[49]

Insurance against the varroa mite

2.41 A further matter noted by submitters was the potential importance of bumblebee pollination should the varroa mite[50] enter Australia and spread to the honey bee population. Currently, honey bee populations are under threat 'globally, from pest and disease issues, such as varroa mite and colony collapse disorder'.[51] Mr Michael Toby, Costa Group, commented that:

> Varroa remains the greatest threat to pollination within Australian horticulture and honey production. The varroa mite is a well-adapted parasite of the Asian honey bee, both of which are present at the moment in northern Queensland. *Varroa jacobsoni* is currently being eradicated from Australia under an emergency response. However, the more destructive *Varroa destructor* is not yet present in Australia. It is in New Zealand, where evidence suggests it arrived on illegally imported honey bees.[52]

2.42 The University of Tasmania and TIA also provided evidence on the potential impact of varroa on pollination of crops by honey bees. It was stated that:

> If Varroa mite invades Australia then the significant pollination services of feral honey bee populations will be lost, costs of managed honey bee populations will rise and a pollinator deficit is probable in the agricultural industry.[53]

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48 Tasmanian Government, *Submission 20*, p. 1. See also Fruit Growers Tasmania, *Submission 1*, p. 4.

49 University of Tasmania and Tasmanian Institute of Agriculture, *Submission 6*, pp. 2, 5, 6.

50 External parasites of honey bees. Although they can feed and live on adult honey bees, they mainly feed and reproduce on larvae and pupae in the developing brood, causing malformation and weakening of honey bees and well as transmitting numerous viruses. See http://beeaware.org.au/archive-pest/varroa-mites/#ad-image-0 (accessed 30 September 2016). Note: The varroa mite was found in a nest of honey bees in the Port of Townsville in far north Queensland. The hive was destroyed by staff from the Department of Agriculture and Water Resources. See Matt Watson, 'Bee-killing varroa mites found in Port of Townsville nest', *ABC News*, 6 July 2016.

51 Tasmanian Government, *Submission 20*, p. 1.

52 Mr Michael Toby, Costa Group, *Committee Hansard*, 21 February 2017, p. 2.

53 University of Tasmania and Tasmanian Institute of Agriculture, *Submission 6*, p. 6.

2.43 Similarly, Mr Brandsema commented on the potential impact of varroa and stated that, based on overseas experience, 'it is expected varroa will progressively kill between 95 and 100 per cent of Australia's feral European honey bee population, greatly reducing the pollination service they provide'.[54]

2.44 Submitters commented that there is a very high risk that *Varroa destructor* will eventually enter Australia and establish in the honey bee population. However, it was noted that bumblebees, along with some native bees, are resistant to varroa.[55] As such, it was argued that bumblebees will be vital to ensure that pollination of crops can continue.[56]

2.45 Raspberries & Blackberries Australia, for example, commented that:

> In New Zealand, the Varroa mite (*Varroa destructor*) has severely reduced wild honey bee populations. Bumblebees are not a carrier or host of Varroa mite. Should Varroa mite enter Australia then we will be faced with the same challenge as in New Zealand in maintaining viable honey bee populations for pollination purposes. In New Zealand, bumblebees are commercially used as pollinators for a number of agricultural and horticultural crops. As a minimal strategy in any contingency plan, bumble bees should be considered as complementary pollinators (but not necessarily an alternative) to honey bees.[57]

Need for further research

2.46 The University of Tasmania and TIA stated that the current legislation is a major impediment to setting up a bumblebee colony for research which could include:

> …environmental research requiring manipulation of bumblebee numbers, pollination research to quantify their impact, and economic research to ascertain the viability of the limited gene pool for commercial rearing and associated rearing costs. Furthermore, bumblebees are ideal models for a joint CSIRO–University of Tasmania project currently underway developing tracking sensors for mounting on flying insects because of their larger size and social behaviour where they return to a hive regularly. None of this work can be undertaken under the current legislation.[58]

2.47 While advocating a cautious approach to the use of bumblebees as pollinators for protected cropping in Tasmania, the Tasmanian Farmers & Graziers Association also suggested that further research be undertaken:

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54 Mr Marcus Brandsema, Protected Cropping Australia, *Committee Hansard*, 21 February 2017, p. 9.

55 University of Tasmania and Tasmanian Institute of Agriculture, *Submission 6*, p. 6.

56 Fruit Growers Tasmania, *Submission 1*, p. 4; *Submission 6*, p. 6; Mr Marcus Brandsema, Protected Cropping Australia, *Committee Hansard*, 21 February 2017, p. 9.

57 Raspberries & Blackberries Australia, *Submission* 5, p. 2.

58 University of Tasmania and Tasmanian Institute of Agriculture, *Submission 6*, p. 6.

> With the limited amount of current research been undertaken there is an opportunity to undertake research on bumblebees to provide guarantees that any change to legislation is favourable for all stakeholders.[59]

2.48 Other submitters also advocated further research is required into the impacts of bumblebees on the environment.[60] Fruit Growers Tasmania, for example, stated that:

> …to allow research into the effect of its presence on native bee populations, environmental risks and other impacts including competition for floral resources, weed spread, effectiveness as a pollinator and potential for spreading of pathogens and parasites.[61]

2.49 Dr Katja Hogendoorn, Ms Elisabeth Fung, Dr Remko Leijs and Dr Richard Glatz provided a useful summary of the research conducted and outlined the areas where further research is required:

> Bumblebees have been present on Tasmania for more than 20 years and research has identified a number of potential impacts of the species: The species has been demonstrated to cause an increase in the seed set of weeds …a decrease in the nectar availability for the swift parrot…displacement of native Tasmanian bees from flowers through competition…and rob nectar without pollination...
>
> However, we do not as yet fully understand the ecological implications of the introduction of this feral pollinator, because (a) the impact of bumblebees on Tasmania has not been structurally monitored; (b) the last research done on the impact of bumblebees was 10 years ago, and (c) insufficient experimental research has been done.
>
> By now, vegetation changes due to the introduction of bumblebees should start to become visible and should be researched. Therefore, the impact of any decision to legalise breeding (and enhance the feral population) should be assessed by establishing the ecological effects of experimentally increased and decreased bumblebee densities on:
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> - Commercial honey and pollen yield for *Apis mellifera*;
> - Native bird foraging;
> - Seed set and propagation of weeds, including tree lupin, foxgloves, scotch broom and rhododendron;
> - Native bee reproduction;
> - Presence and spread of bee viruses.[62]

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59 Tasmanian Farmers & Graziers Association, *Submission 13*, p. 2.

60 Dr Anne Dollin, *Submission 15*, p. 1.

61 Fruit Growers Tasmania, *Submission 1, p. 2.*

62 Dr Katja Hogendoorn et al, *Submission 16*, p. 2.