



Honey Bee Health Survey 2019

Improving national biosecurity outcomes through partnerships



Plant Health Australia (PHA) is the national coordinator of the government-industry partnership for plant biosecurity in Australia. As a not-for-profit company, PHA services the needs of members and independently advocates on behalf of the national plant biosecurity system.

PHA's efforts help minimise plant pest impacts, enhance Australia's plant health status, assist trade, safeguard the livelihood of producers, support the sustainability and profitability of plant industries and the communities that rely upon them, and preserve environmental health and amenity.

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The Australian Honey Bee Industry Council (AHBIC) is the peak honey bee industry body that represents the interests of its member state beekeeping organisations and apiarists from around Australia

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Executive summary

The Honey Bee Health Survey 2019 examined the health of Australian honey bees, focusing on issues such as pests and diseases, pollination services and the level of biosecurity awareness amongst Australian beekeepers. The survey had 2549 participants representing ~ 8.5 % of Australian beekeepers¹. Of these participants ~7.6% were defined being commercial beekeepers (50 or more hives) with ~91% being hobby beekeepers (less than 50 hives)².

Key findings include:

- During the 2018–19 financial year hobby beekeepers estimated 23% of hives were lost due to factors such as pests and diseases, starvation, overwintering, queen loss and extreme weather events. Similarly, commercial beekeepers estimated 19% of hives were lost during the same period. In both cases pests and diseases were a major factor causing hive loss.
- Most commercial beekeepers surveyed had a below average (~66%) or average (~25%) honey crop during the 2018–19 financial year. Only 6% had an above average honey crop during this period.
- Over half (~51%) of commercial beekeepers provided paid pollination services during the 2018–19 financial year, with a further 7% providing unpaid pollination services.
- Most beekeepers (89%) have heard about the Australian Honey Bee Industry Biosecurity Code of Practice (Code of Practice).
- Approximately 82% of commercial beekeepers and 62% of hobby beekeepers completed pest and disease training (of any kind) in the last three years, though fewer beekeepers (63% of commercial and 11% of hobby beekeepers) have completed training approved under the Code of Practice.
- Almost all beekeepers (99%) inspected their hives for established pests and diseases (eg. American foulbrood, European foulbrood, chalkbrood, sacbrood, nosema, small hive beetle, wax moth) in the last 12 months, though fewer beekeepers (33%) are inspecting hives for exotic pests such as Varroa and Tropilaelaps mites.

¹ <https://beeaware.org.au/industry/>

² These definitions are in accordance with those outlined in the Australian Honey Bee Industry Biosecurity Code of Practice.

Introduction

Background and objectives

The Honey Bee Health Survey 2019 was designed to provide a snapshot of bee health in the Australian honey bee industry, focusing on issues such as pests and diseases and pollination. The survey also examined the level of knowledge of pest and disease symptoms and the Australian Honey Bee Industry Biosecurity Code of Practice, amongst Australian beekeepers. The survey follows on from the 2018 Honey Bee Health Survey and the ABARES Australian Honey Bee Industry Survey 2014–15³, and it is intended to be a mechanism to monitor bee health and the level of biosecurity awareness amongst Australian beekeepers over multiple years.

The results obtained from this survey will assist in determining which biosecurity areas should be the focus for education and awareness activities by industry and government. The survey was supported by funding from AgriFutures Australia as part of the AgriFutures™ Honey Bee and Pollination Program as part of the project (PRJ-010226): “Improving Biosecurity Resources and Better Understanding Bee Health in Australia” and delivered by Plant Health Australia.

Survey design

The online survey consisted of 34 questions (see Appendix 1). Thirty-two of these questions were multiple choice, though an ‘other’ option enabled participants to specify additional responses. The online survey was designed using the web-based platform Survey Monkey, and was based on the Honey Bee Health 2018 survey. The survey was distributed electronically via a number of mechanisms including: the BeeAware website and newsletter; industry newsletters; Bee Biosecurity Officers; email; and social media platforms. The survey was open for eight weeks between 4 November and 31 December 2019.

Survey analysis

The Honey Bee Health Survey 2019 had 2952 participants. Partially completed surveys, defined as having more than five unanswered questions (excluding Q33 and Q34 which were considered non-essential responses), were removed prior to analysis, to ensure integrity of the dataset. A total of 2549 survey results were analysed following the removal of partially completed responses. Commercial beekeepers were defined as having 50 or more hives, with hobby beekeepers defined as having less than 50 hives, as per the definitions outlined in the Australian Honey Bee Industry Biosecurity Code of Practice.

The results from this survey are presented below. Where possible, comparisons with the results obtained from the Honey Bee Health 2018 survey⁴ and the ABARES Australian Honey Bee Industry Survey 2014–15³ have been made. The 2014–15 ABARES survey examined key issues relating to the honey bee industry amongst beekeepers who operated 50 or more hives including financial performance, provision of pollination services and the impact of pests and diseases.

³ Australian Bureau of Agriculture and Resource Economics and Sciences. Australian honey bee industry: 2014–15 survey results. Accessed online 10 October 2019 <https://data.gov.au/dataset/ds-dga-e41d9562-9f5a-4932-b1cb-82e5c3461f30/details?q=>

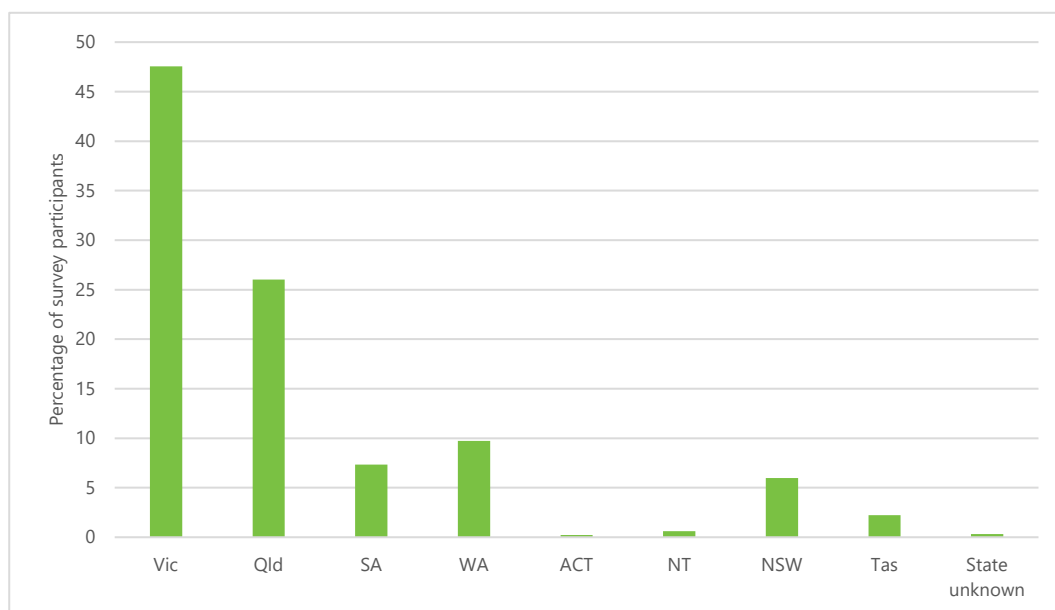
⁴ <https://beeaware.org.au/wp-content/uploads/2019/12/2018-Bee-Health-Survey-Report.pdf>

Survey Results

Jurisdiction

The majority of survey participants were based in Victoria (48%), followed by Queensland (26%), Western Australia (10%), South Australia (7.5%) and New South Wales (6%). Lower levels of participants were based in Tasmania (2%), Australian Capital Territory (0.2%) and the Northern Territory (0.6%) reflecting the lower numbers of beekeepers present within these jurisdictions (**Figure 1**). There was a small number of participants (0.3%) who did not indicate which jurisdiction they were based in.

Figure 1: Percentage of survey participants based in each state/territory



Hobby vs Commercial

Of the 2549 survey participants, 193 (7.6%) were commercial beekeepers (defined as having 50 or more hives) with 2309 (91%) participants being hobby beekeepers (less than 50 hives). A small number of survey participants did not indicate hive number (1.8%). A breakdown of survey participants (hobby vs commercial beekeepers) is presented for each jurisdiction in **Figure 2**. For each jurisdiction, hobby beekeepers comprised the majority of survey participants. Due to the small sample sizes for the Northern Territory and Australian Capital Territory results presented for these jurisdictions throughout the survey should be interpreted with caution. No commercial beekeepers from the ACT participated in this survey. Furthermore, as only one commercial beekeeper from the Northern Territory participated in this survey, where there is a comparison made between hobby vs commercial beekeepers within each of the jurisdictions these results have not been presented, though are included in the totals.

The definition used for commercial vs hobby beekeepers throughout this survey is based upon that outlined in the Australian Honey Bee Industry Biosecurity Code of Practice, with commercial beekeepers defined as having 50 or more hives, and hobby beekeepers defined as having less than 50 hives. Survey participants were asked whether they consider themselves hobby beekeepers or a commercial beekeeper (primary source of income) (**Figure 3**). Interestingly, there was a significant proportion of beekeepers under 100 hives who still consider themselves hobby beekeepers. Based upon this result, the definition of commercial vs hobby beekeepers in the Code of Practice should be re-examined.

Figure 2: Percentage of commercial and hobby beekeepers based in each state/territory

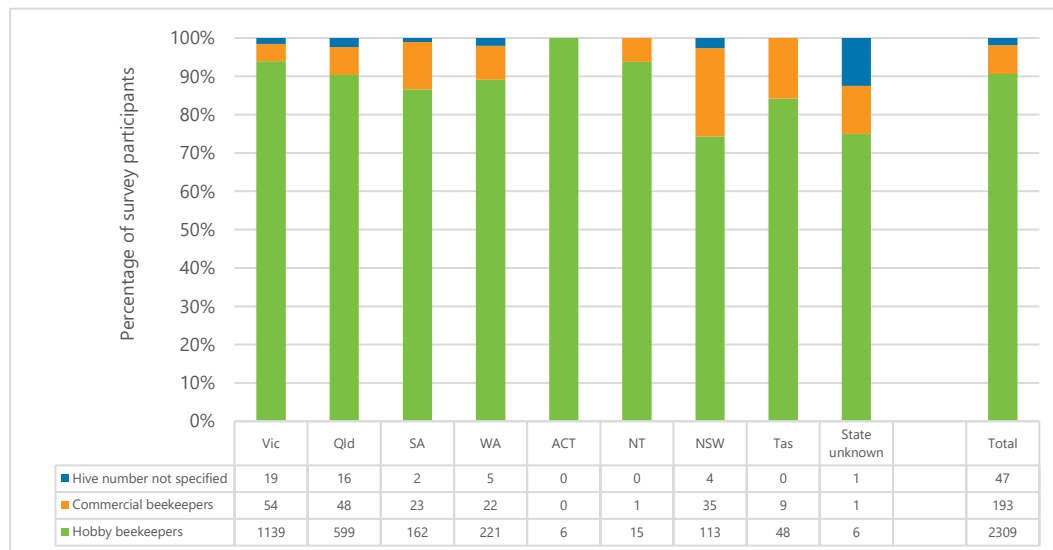
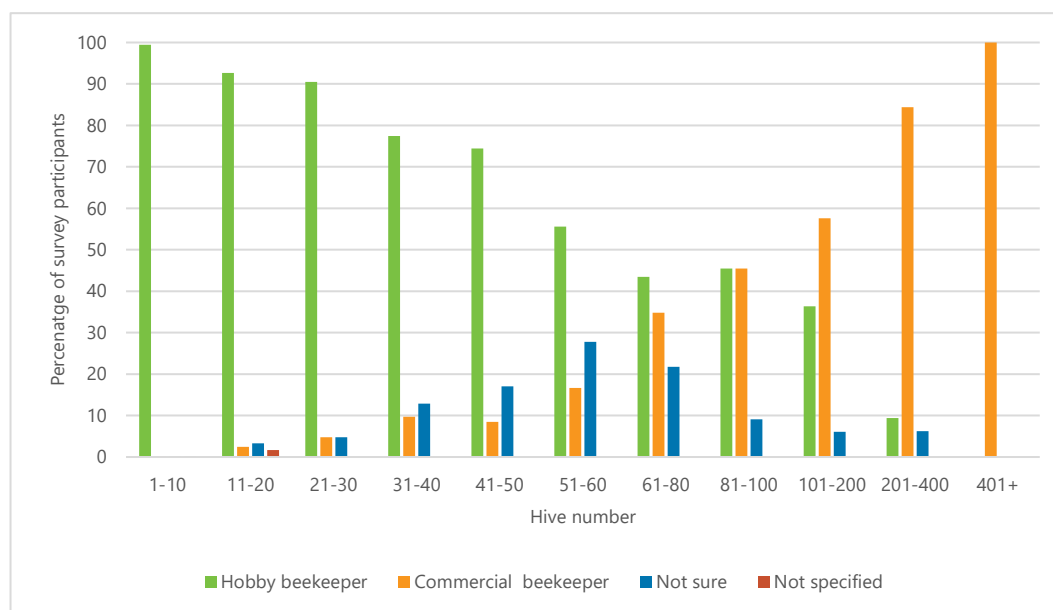


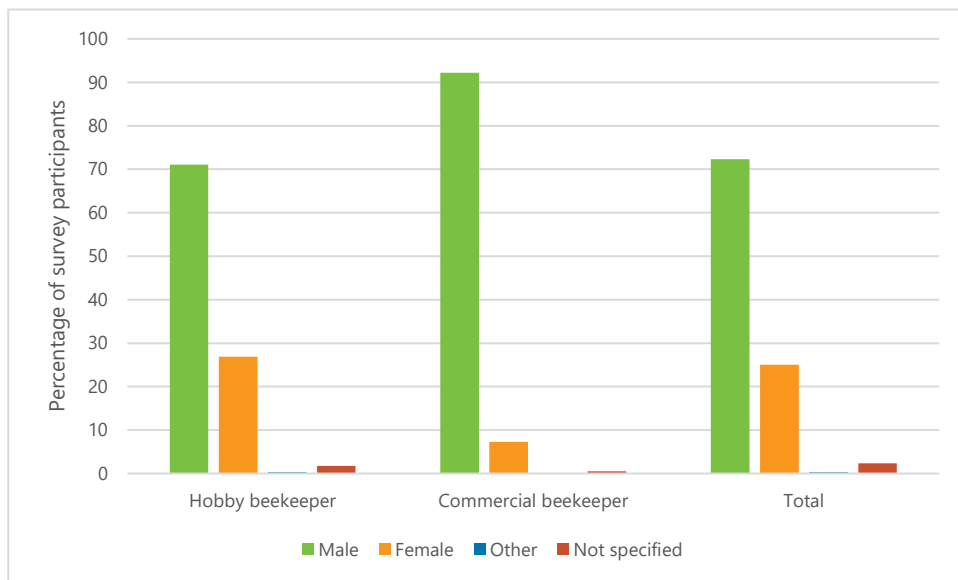
Figure 3: Hobby vs commercial (primary source of income) beekeepers based upon hive number



Participant gender

Participants were predominately male (72%) with lower numbers of female participants (25%). A small number of participants either identified as other (0.3%) or did not provide an answer (2.4%). A slightly higher proportion of commercial beekeepers were male (~92%) comparatively to hobby beekeepers (~71%) (**Figure 4**). These results are consistent with those reported in the 2018 Honey Bee Health Survey.

Figure 4: Gender of hobby vs commercial beekeepers

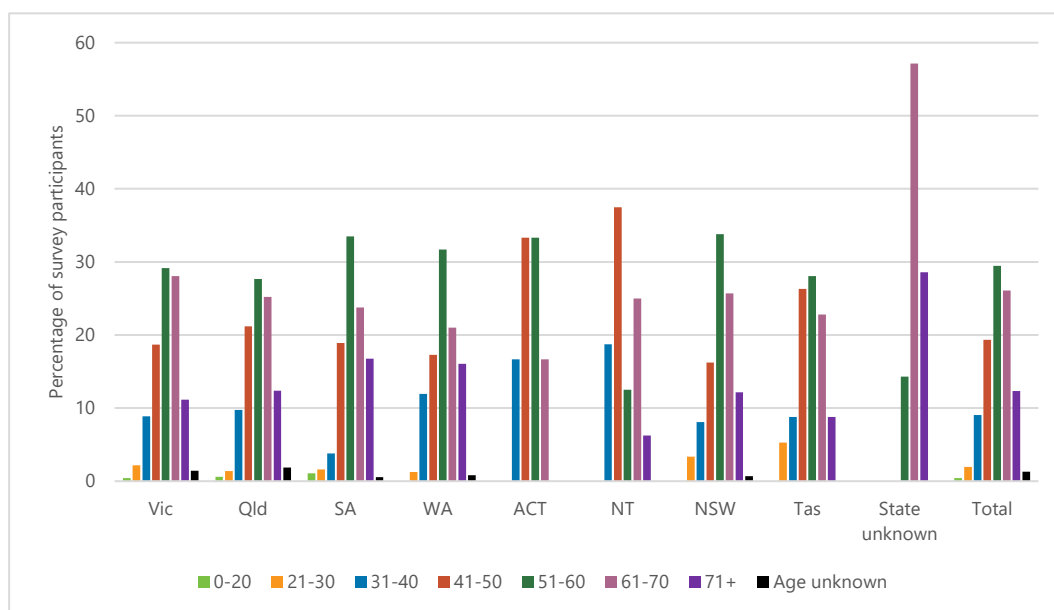


Participant age

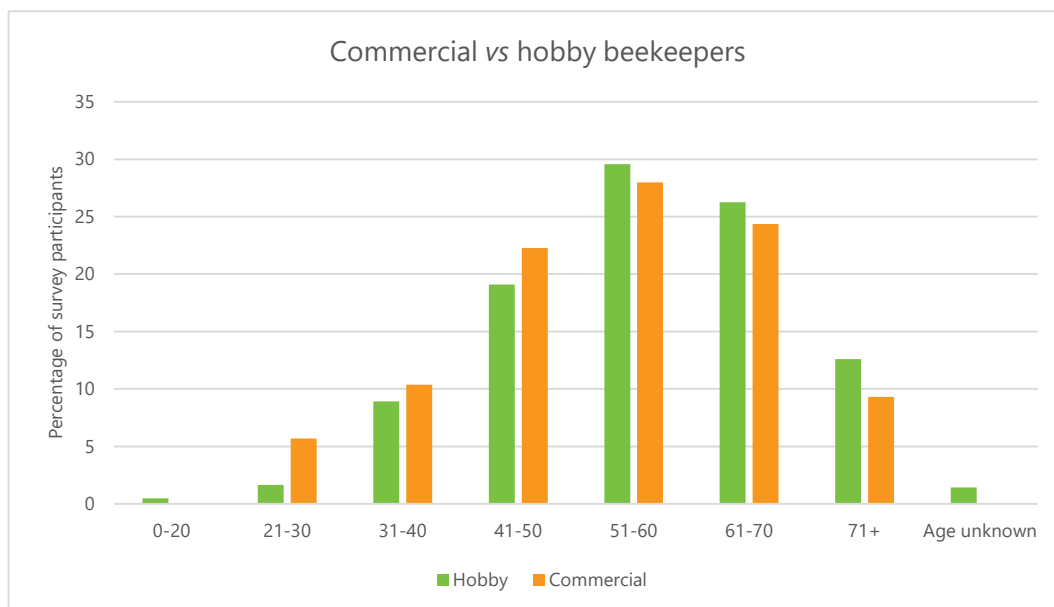
The majority of survey participants were aged over 51 years old (~68%), with most of these participants falling within the 51-60 (~29%) or the 61-70 (~26%) age groups. Only ~12% of participants were aged over 71 years old. Approximately 2.5% of survey participants were under 30 years old, with 28% of survey participants aged between 31-50. A small number of participants did not indicate their age (1.3%) (**Figure 5A**). Similar age distributions were observed between commercial and hobby beekeepers (**Figure 5B**). These results are consistent with those reported in the 2018 Honey Bee Health Survey.

Figure 5: Age of survey participants in each jurisdiction (A) and age of commercial vs hobby beekeepers (B)

A.



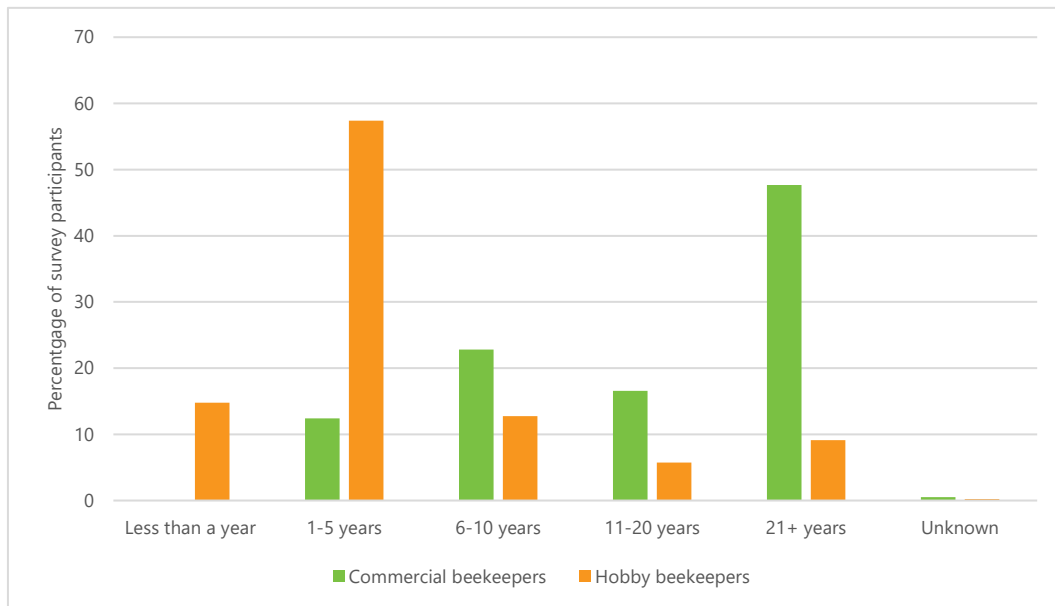
B.



Length of time being a beekeeper

Most of the hobby beekeepers surveyed (~57%) indicated they had been beekeepers for between 1-5 years. In contrast, ~48% of commercial beekeepers had been beekeepers for over 21 years (**Figure 6**).

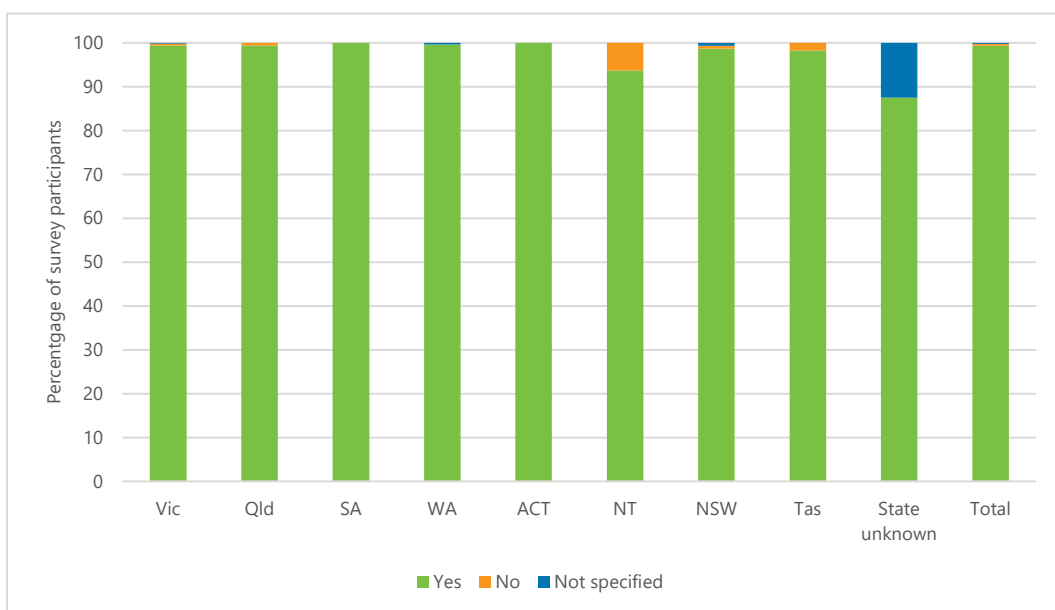
Figure 6: Length of time being a beekeeper (hobby vs commercial)



Awareness of registration requirements

Almost all beekeepers surveyed (~99.3%) indicated that they were aware of their state/territory registration requirements (**Figure 7**).

Figure 7: Awareness of registration requirements

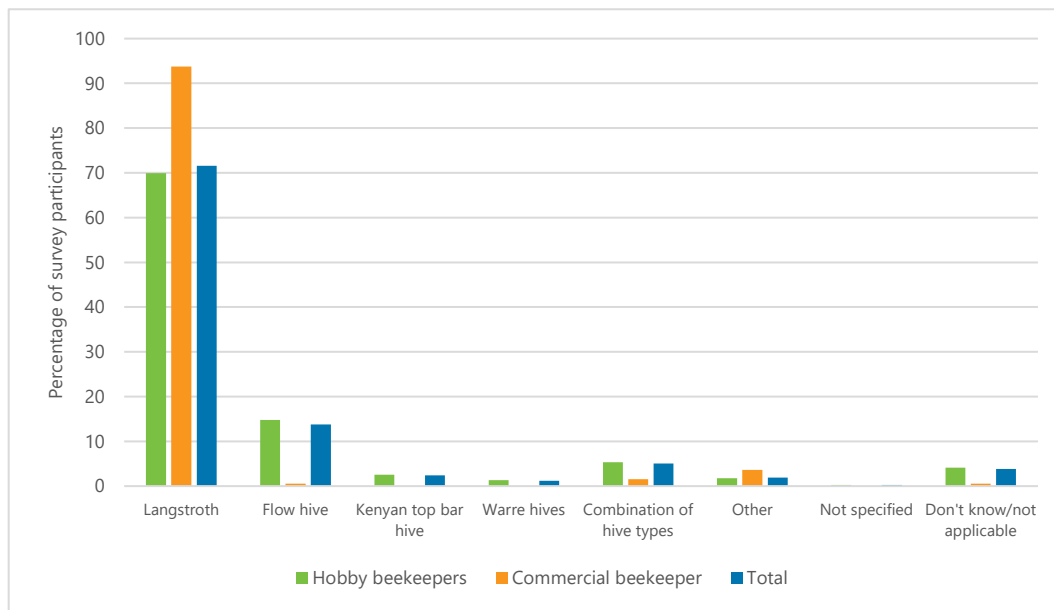


Type of hive used by participants

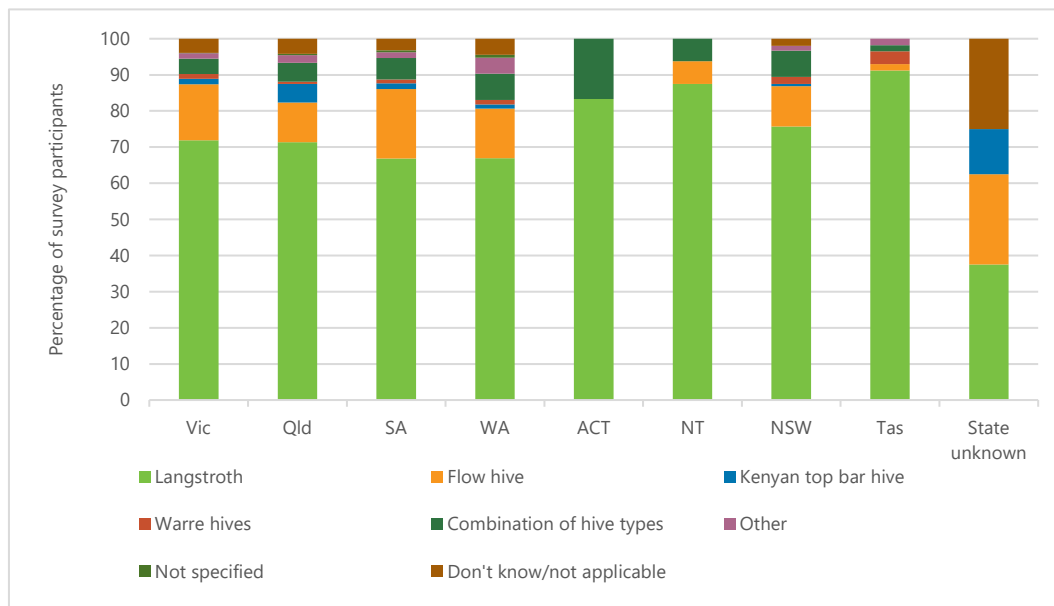
Approximately 72% of survey participants use Langstroth hives, with a smaller number of participants using flow hives (14%), Warré hives (1.2%) and Kenyan top bar hives (2.4%) (**Figure 8A**). A small proportion of survey participants did not specify (0.2%), used a combination of hive types (5%), used other types of hives that were not listed (1.9%), didn't know or indicated the question was not applicable (4%). Similar trends were reflected across the jurisdictions with Langstroth the main type of hive used in all jurisdictions (**Figure 8B**). The majority of commercial beekeepers (~94%) indicated that they used Langstroth hives comparatively to hobby beekeepers (~70%) (**Figure 8A**). These results are consistent with the 2018 Honey Bee Health Survey.

Figure 8: Main hive type used by survey participants (A) and survey participants in each jurisdiction (B)

A.



B.



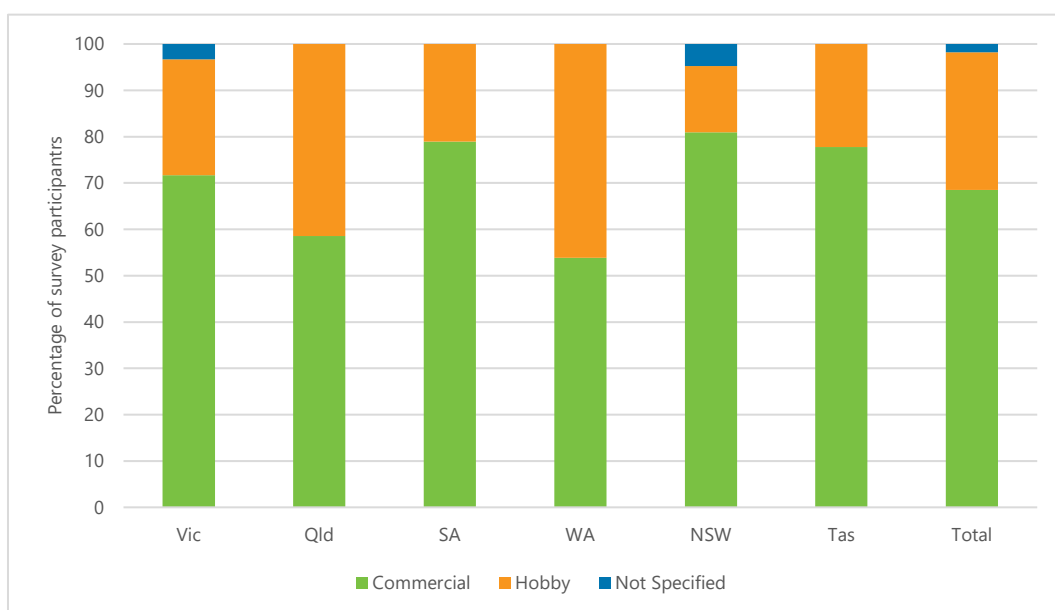
Pollination services

Honey bees are important pollinators of agricultural crops in Australia, with 35 industries including almonds, avocados, apples, pears and cherries, reliant upon pollination by honey bees for majority of production⁵. Six percent of survey participants provided pollination services during the 2018–19 financial year (**Figure 9**), with the majority of these being commercial beekeepers (68%) (**Figure 10**).⁶

Figure 9: Percentage of participants providing pollination services across the jurisdictions.



Figure 10: Breakdown of participants (hobby vs commercial) who provided pollination services across the jurisdictions



⁵ RIRDC Pub. no. 13/115. Pollination Factsheet: The real value of pollination

⁶ Note that as only a small number of beekeepers from the ACT and the NT indicated that they provided pollination services these results have not been presented, but have been included in the total.

Crops pollinated

A breakdown of the major crops beekeepers in each jurisdiction provided pollination services for is presented in **Figure 11**⁷. Almonds were the major crop pollinated by Victorian, New South Wales and South Australian beekeepers, whereas avocados and macadamias were the major crop pollinated by Queensland beekeepers. In Western Australia, avocados were the major crop, with apples and cherries the major crops pollinated by Tasmanian beekeepers. Other crops pollinated by survey participants include: beans, fava beans, carrots, cabbage, clover, zucchini, lychees, passionfruit, pumpkin, citrus, tea tree, gum blossoms, fingerlimes, bananas, onions, chicory, kiwi fruits, brassica, vetch, rock melons, cucumbers, and mangoes. These results are consistent with those reported in the 2018 Honey Bee Health Survey.

Figure 11: Major crops pollinated by beekeepers in each jurisdiction. Note berries represents blueberries, strawberries and raspberries with stone fruit representing apricots, peaches, nectarines and plums.



⁷ Beekeepers often travel large distances to provide pollination services – often crossing into other jurisdictions to do so

Paid pollination services

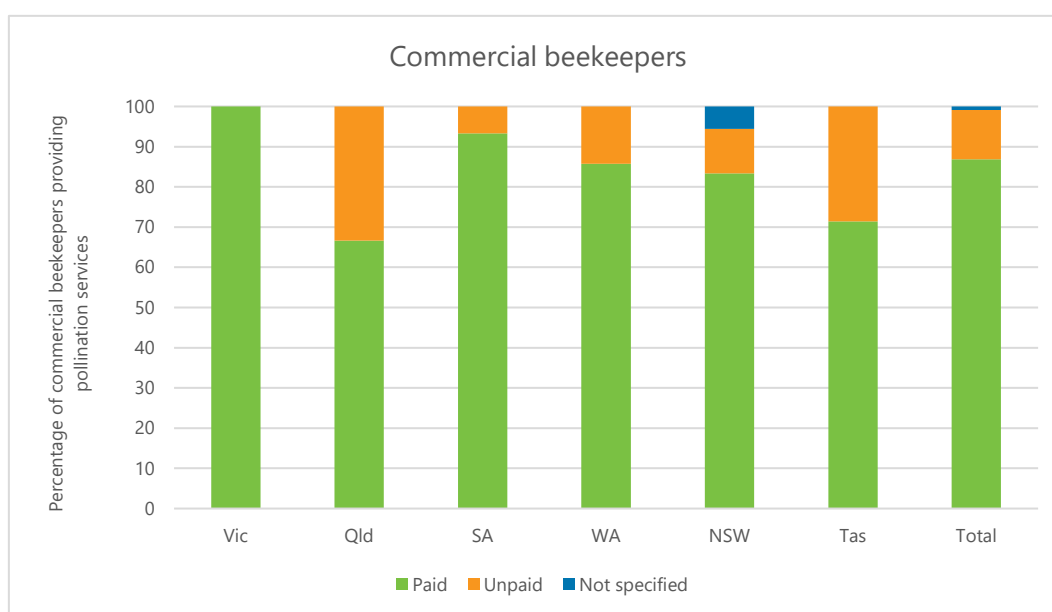
For those commercial beekeepers providing pollination services, the majority were paid for these services (~87%) (**Figure 12A**). This trend was reflected across the jurisdictions, except for Queensland and Tasmania where only ~66% and 71% respectively of commercial beekeepers were paid for the pollination services they provided. The majority of hobby beekeepers providing pollination services were not paid for these services (~70%) (**Figure 12B**).

In total 51% of all commercial beekeepers provided paid pollination services during the 2018–19 financial year, with 7% providing unpaid pollination services. This is consistent with the 2018 Honey Bee Health Survey where 46% of all commercial beekeepers provided paid pollination services, with 9% providing unpaid pollination services. This is also consistent with results obtained from the ABARES Australian Honey Bee Industry Survey 2014–15³ where 44% of beekeepers with more than 50 hives provided paid pollination services and 12% provided unpaid (in kind) pollination services in the 2014–15 financial year.

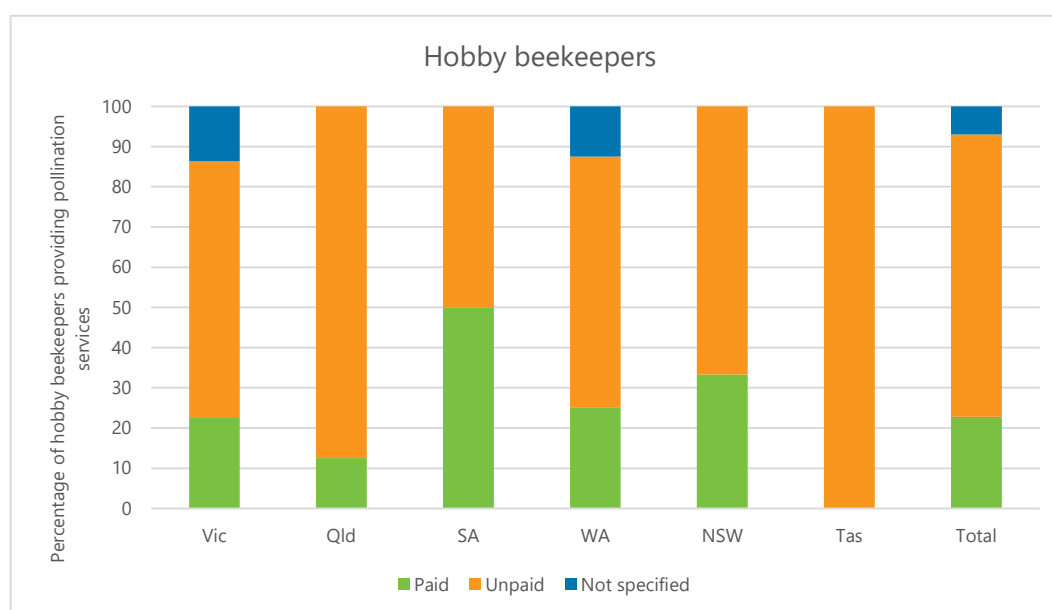
In total less than 1% of all hobby beekeepers provided paid pollination services with 1.7% providing unpaid pollination services. Again, this is consistent with the 2018 Honey Bee Health Survey where less than 1% of all hobby beekeepers provided paid pollination services, with 1.6% providing unpaid pollination services.

Figure 12: Percentage of commercial (A) and hobby (B) beekeepers who were paid for the pollination services they provided

A.



B.

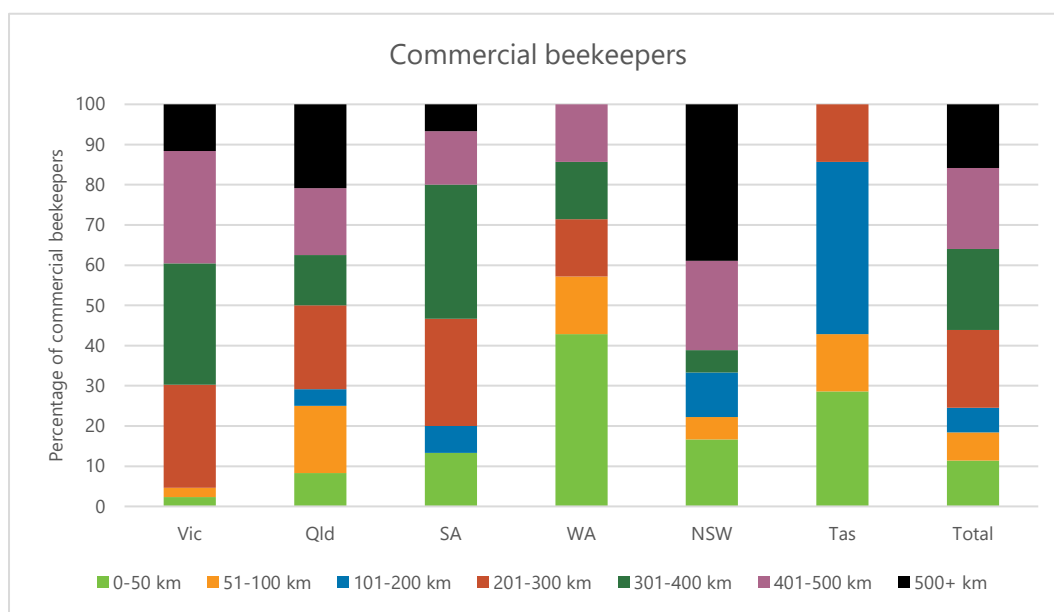


Distance travelled to provide pollination services

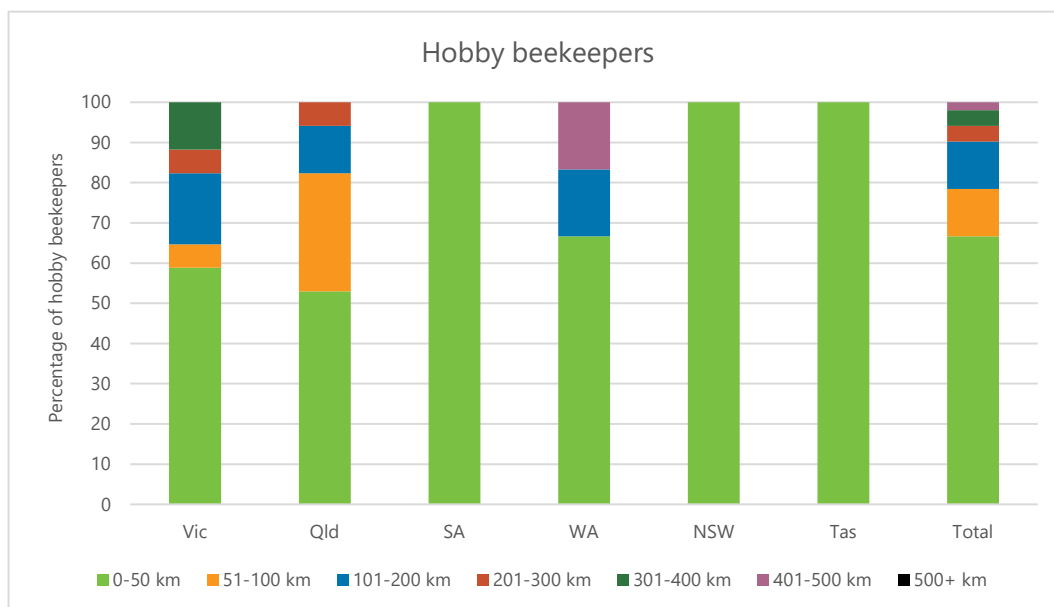
Most hobby beekeepers (~67%) travelled under 50 km to provide pollination services (paid and unpaid), this trend is reflected across the jurisdictions (**Figure 13A**). Commercial beekeepers generally travelled further distances to provide pollination services (paid and unpaid) with the majority (81%) of commercial beekeepers travelling over 101km (**Figure 13B**). These results are consistent with those reported in the 2018 Honey Bee Health Survey.

Figure 13: Distance travelled by commercial (A) and hobby (B) beekeepers to provide pollination services

A.



B.



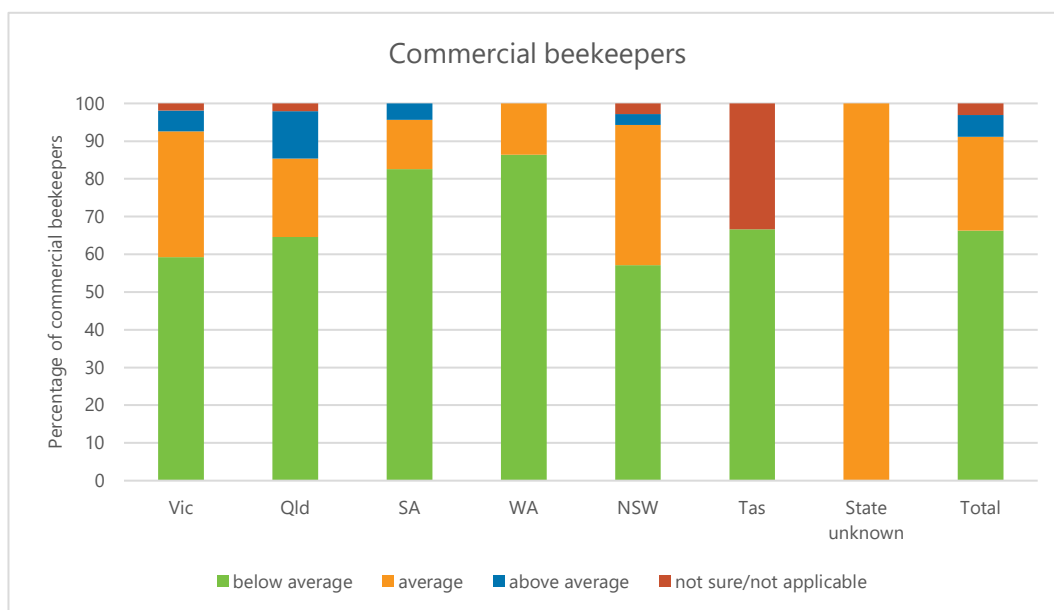
Honey crop

Approximately 66% of commercial beekeepers had a below average honey crop during the 2018–19 financial year, with 25% indicating their crop was average (**Figure 14A**). Only 6% had an above average honey crop, with a small percentage of commercial beekeepers (3%) indicating they were not sure or that the question was not applicable.

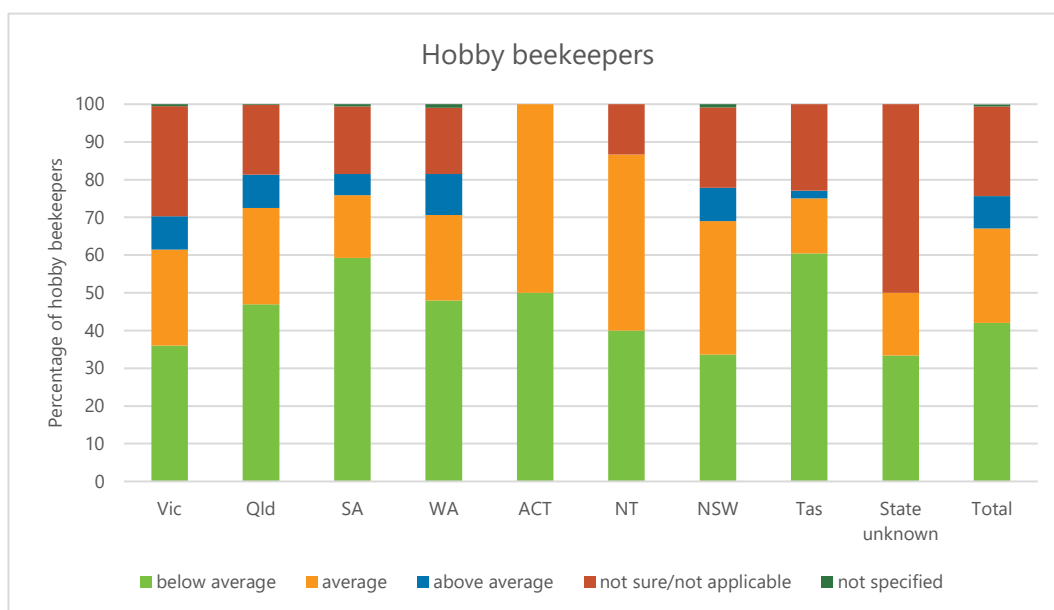
A smaller percentage of hobby beekeepers (42%) had a below average honey crop during the 2018–19 financial year, with 25% having an average crop. Only 9% of hobby beekeepers had an above average honey crop, with a large proportion of hobby beekeepers (24%) indicating they were not sure or that the question was not applicable (**Figure 14B**).

Figure 14: Honey crop during the 2018-19 financial year for commercial beekeepers (A) and hobby beekeepers (B)

A.



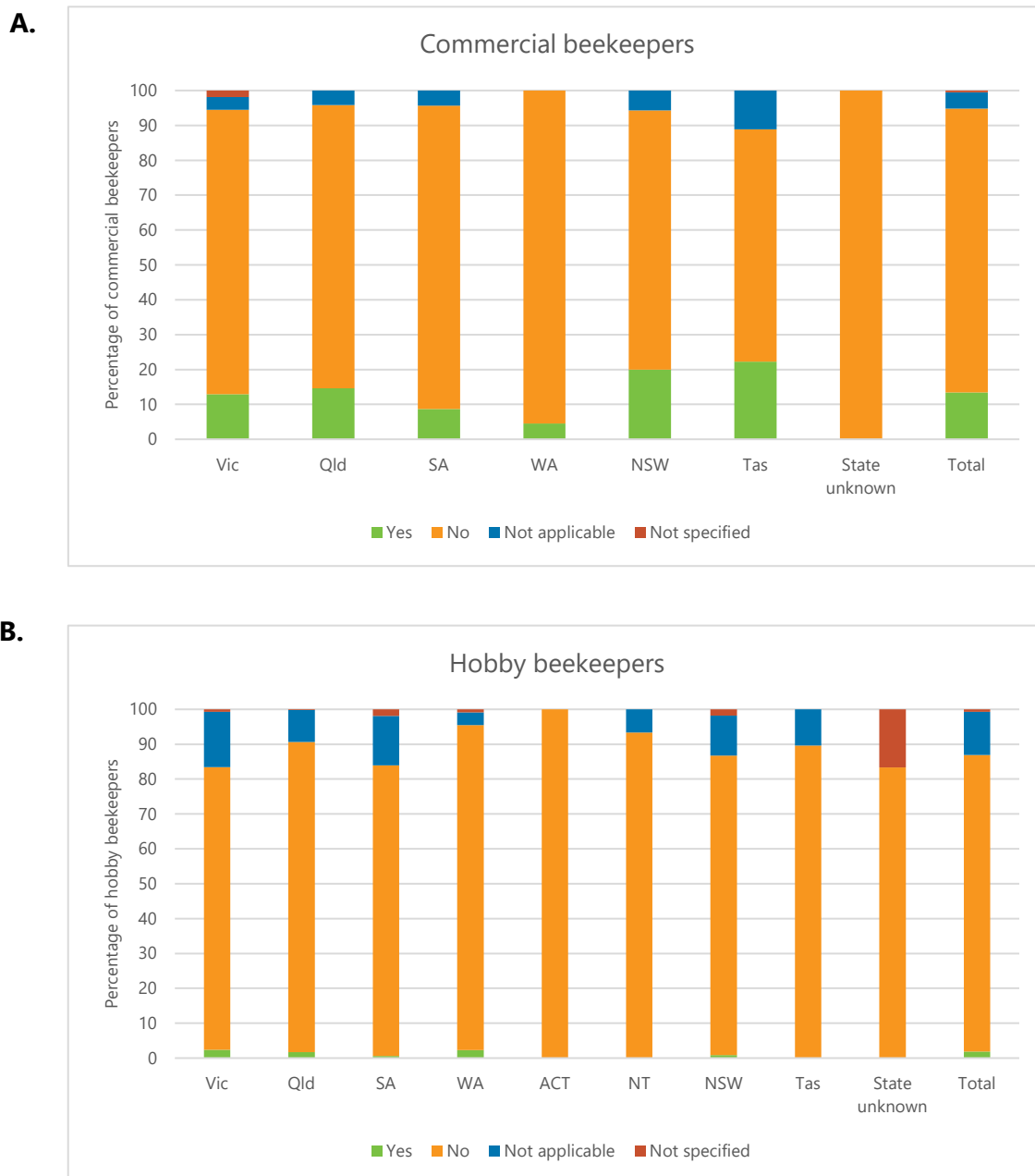
B.



Testing for chemical residues (eg. pesticides, fungicides, herbicides)

Approximately 2% of hobby beekeepers and 14% of commercial beekeepers surveyed indicated they had their honey tested for chemical residues (e.g. pesticides, fungicides, herbicides) during the 2018–19 financial year (**Figure 15**). It should be noted that honey packers regularly test honey for chemical residues, and that the results of this survey likely reflect beekeepers being unaware that honey testing is being performed, as beekeepers are only advised if there is a positive result.

Figure 15: Honey testing for chemical residues for commercial (A) and hobby (B) beekeepers

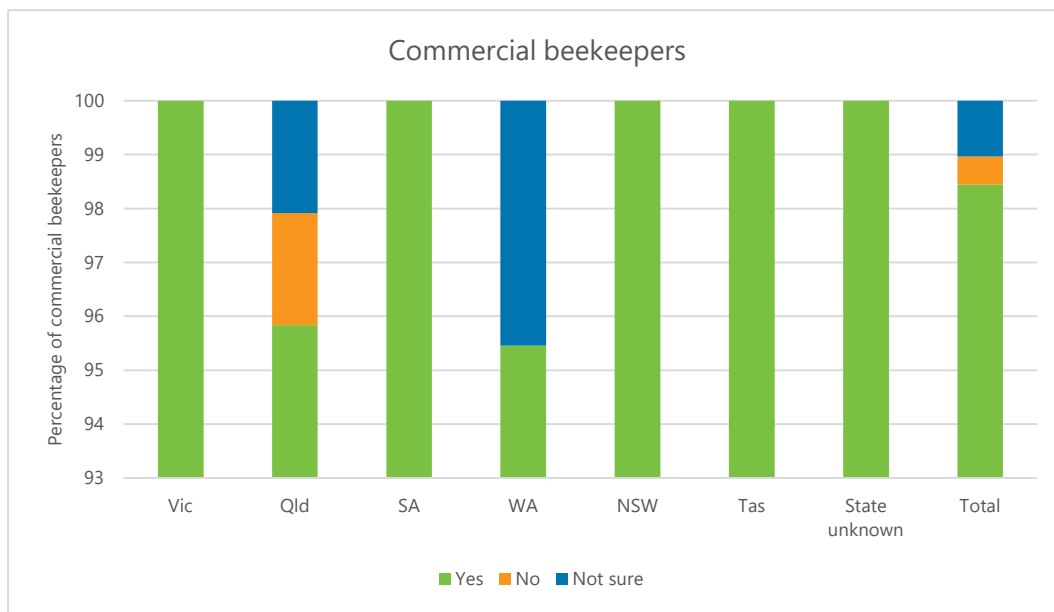


Australian Honey Bee Industry Biosecurity Code of Practice

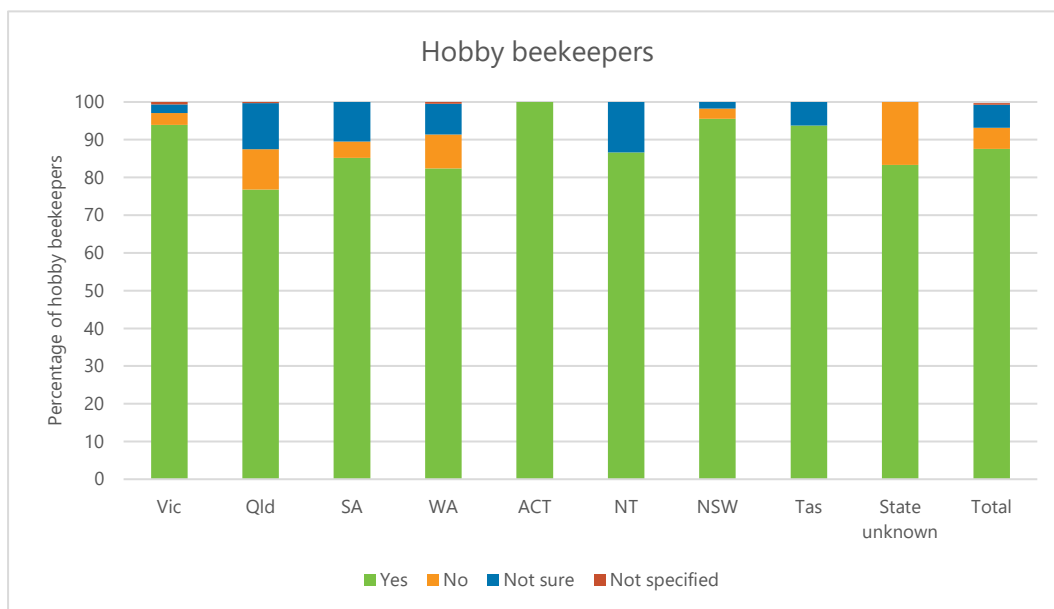
Overall, 89% of the beekeepers surveyed had heard about the Australian Honey Bee Industry Biosecurity Code of Practice (the Code). A slightly higher percentage commercial beekeepers (98%) (Figure 16A) indicated that they had heard about the Code when compared to hobby beekeepers (88%) (Figure 16B). These results are similar to the 2018 Honey Bee Health survey where 97% of commercial beekeepers and 84% of hobby beekeepers indicated that they had heard about the Code.

Figure 16: Percentage of commercial (A) and hobby (B) beekeepers who have heard about the Australian Honey Bee Industry Biosecurity Code of Practice in each of the state/territory jurisdictions.

A.



B.

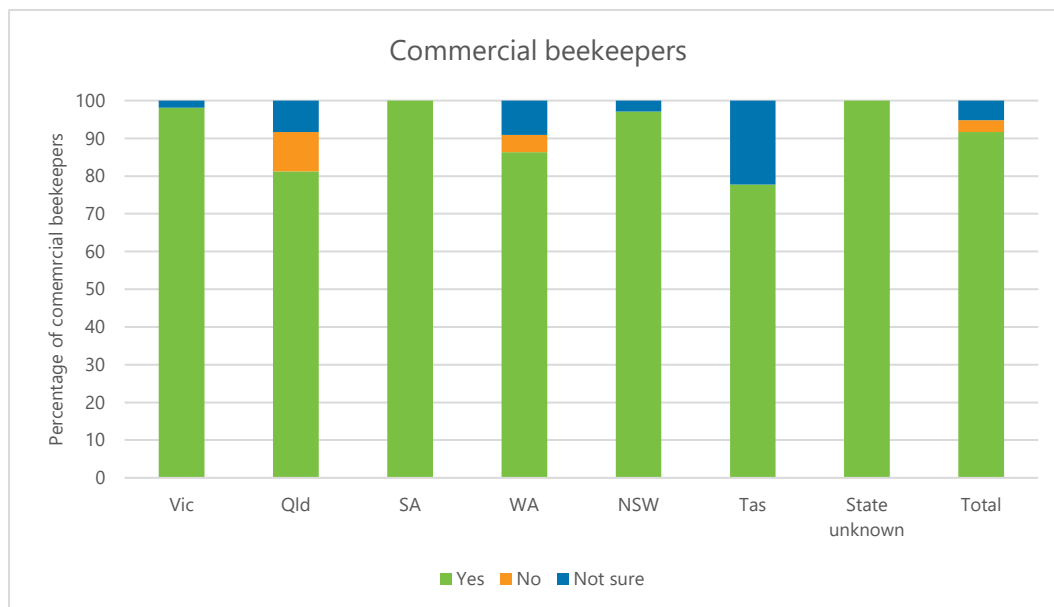


National Bee Biosecurity Program

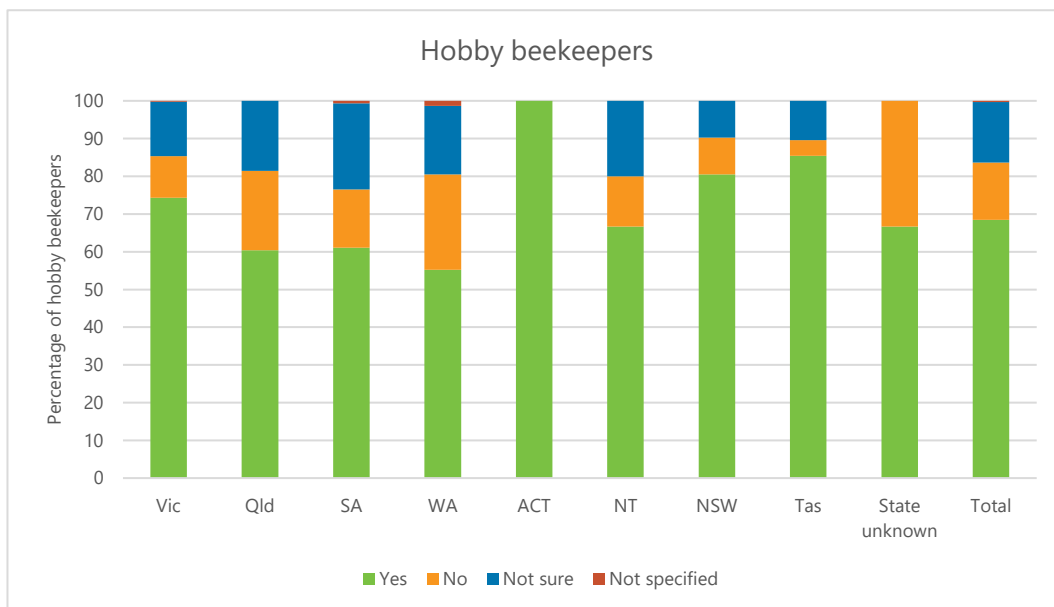
Approximately 92% of the commercial beekeepers surveyed have heard about the National Bee Biosecurity Program (**Figure 17A**). In contrast, a slightly lower percentage of hobby beekeepers (68%) (**Figure 17B**) indicated that they had heard about the Program.

Figure 17: Percentage of commercial (A) and hobby (B) beekeepers who have heard about the National Bee Biosecurity Program

A.



B.



Pest and disease training completed in the last three years

Under the Australian Honey Bee Industry Biosecurity Code of Practice, beekeepers with 50 or more hives are required to complete approved pest and disease training within three years of implementation of the Code of Practice (2016) and then every three years thereafter. The *Biosecurity for Beekeepers* online BOLT course, Pests and diseases of honey bees (AHCBEK306⁸) and Certificate III in Beekeeping⁹ and are all approved pest and disease training under the Code of Practice.

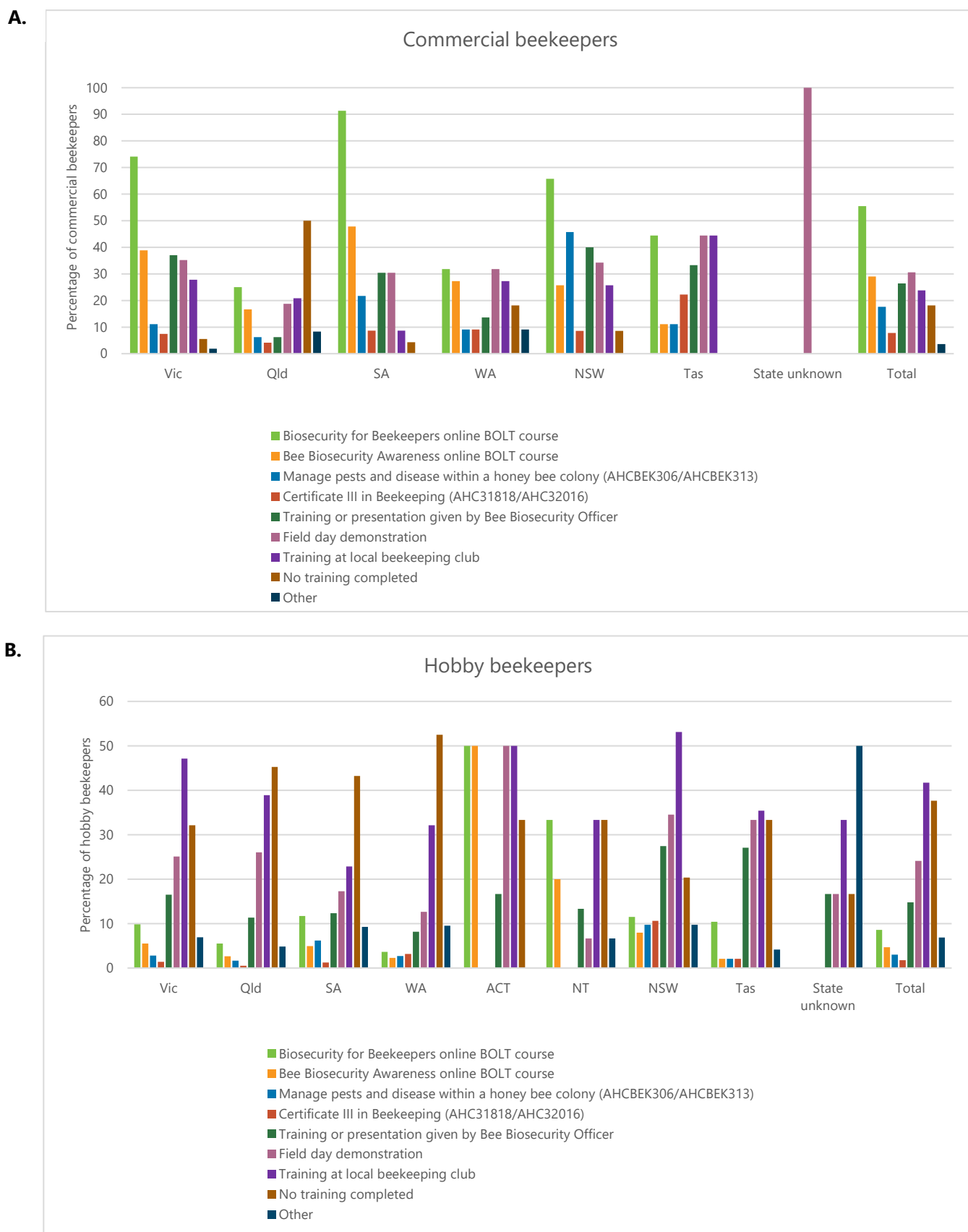
Approximately 82% of commercial beekeepers and 62% of hobby beekeepers completed pest and disease training (either formal or informal) in the last three years. Approximately 63% of commercial beekeepers indicated that they had completed approved training in the last three years (note: approved means *Biosecurity for Beekeepers* online BOLT course; Certificate III in Beekeeping; or Pests and Diseases of Honey Bees (AHCBEK306)) (**Figure 18A**). This is a sharp increase from the results of the 2018 Honey Bee Health Survey where only 32% of commercial beekeepers indicated that they had completed approved pests and disease training in the last three years. Other types of informal pest and disease training were also completed by commercial beekeepers in the last three years; Bee Biosecurity Awareness online BOLT course (29%); training or presentation given by Bee Biosecurity Officer (27%); field day demonstration (31%); training at local beekeeping club (24%); and other training (including books, online research and mentoring; 4%).

Hobby beekeepers with less than 50 hives are not required to complete approved pest and disease training every three years under the Code of Practice. As such, lower numbers of hobby beekeepers (11%) completed approved training in the last three years (*Biosecurity for Beekeepers* online BOLT course; Certificate III in Beekeeping; or Pests and Diseases of Honey Bees (AHCBEK306)) (**Figure 18B**). Which was a slight increase from 7% recorded in the 2018 Honey Bee Health Survey. Informal pest and disease training was also completed by hobby beekeepers in the last three years including; Bee Biosecurity Awareness online BOLT course (5%); training or presentation given by Bee Biosecurity Officer (15%); field day demonstration (24%); training at local beekeeping club (42%); and other training (including books, online research and mentoring; 7%).

⁸ Note that AHCBEK306 (Manage pests and disease within a honey bee colony) was superseded by AHCBEK313 in 2018

⁹ Note that AHC32016 (Certificate III in Beekeeping) was superseded by AHC31818 in 2018

Figure 18: Pest and disease training completed in the last three years by commercial (A) and hobby (B) beekeepers.



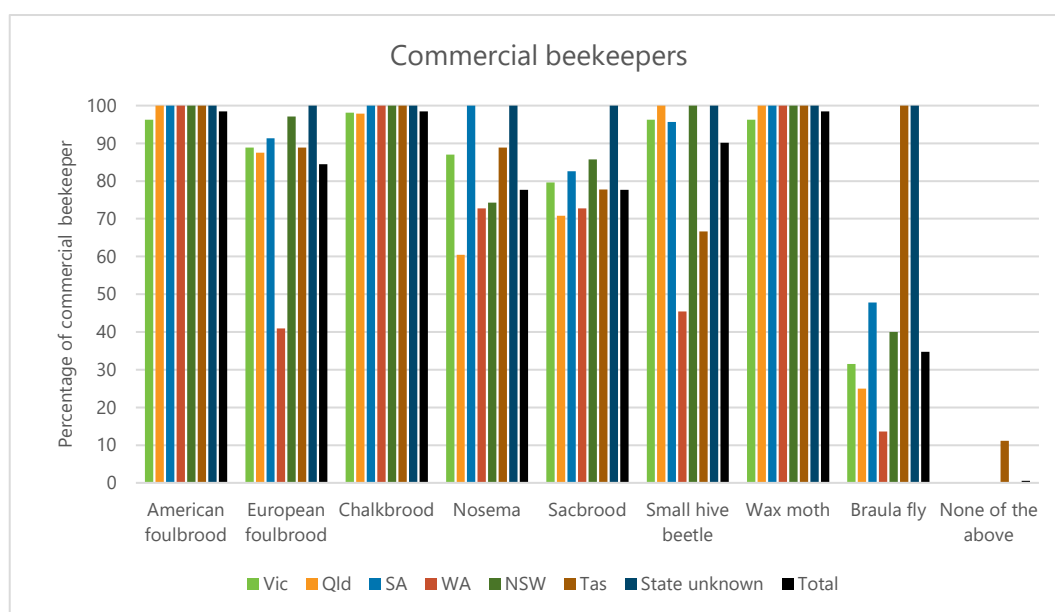
Identification of established pests and diseases

Over 98% of commercial beekeepers said that they could identify American foulbrood, chalkbrood, and wax moth. A high percentage of commercial beekeepers also could identify small hive beetle (90%), European foulbrood (84%), nosema (78%) and sacbrood (78%). A much lower percentage of beekeepers could identify braula fly (35%), with the exception of Tasmania where 100% of commercial beekeepers could identify this pest which is established in Tasmania. A small percentage (0.5%) of commercial beekeepers claimed that they could not identify any of these established pests. (**Figure 19A**)

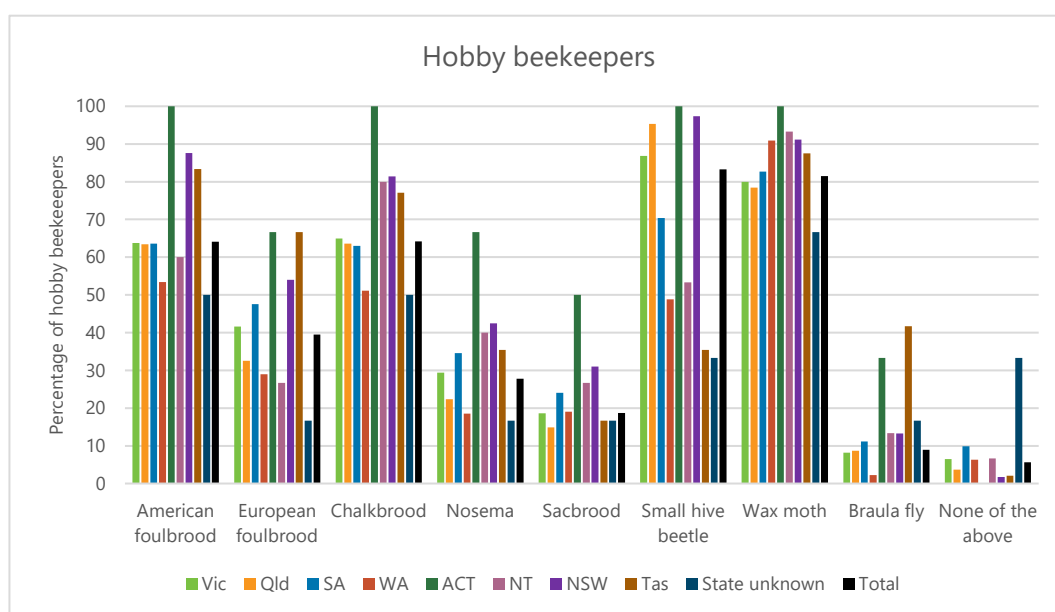
Lower percentages of hobby beekeepers could identify American foulbrood (64%), chalkbrood (64%), wax moth (81%), small hive beetle (83%), European foulbrood (39%), nosema (28%) or sacbrood (19%), braula fly (9%). A small percentage (6%) of hobby beekeepers claimed that they could not identify any of these established pests (**Figure 19B**). These results are similar to those obtained in the 2018 Honey Bee Health Survey.

Figure 19: Percentage of commercial (A) and hobby (B) beekeepers who can identify established pests

A.



B.

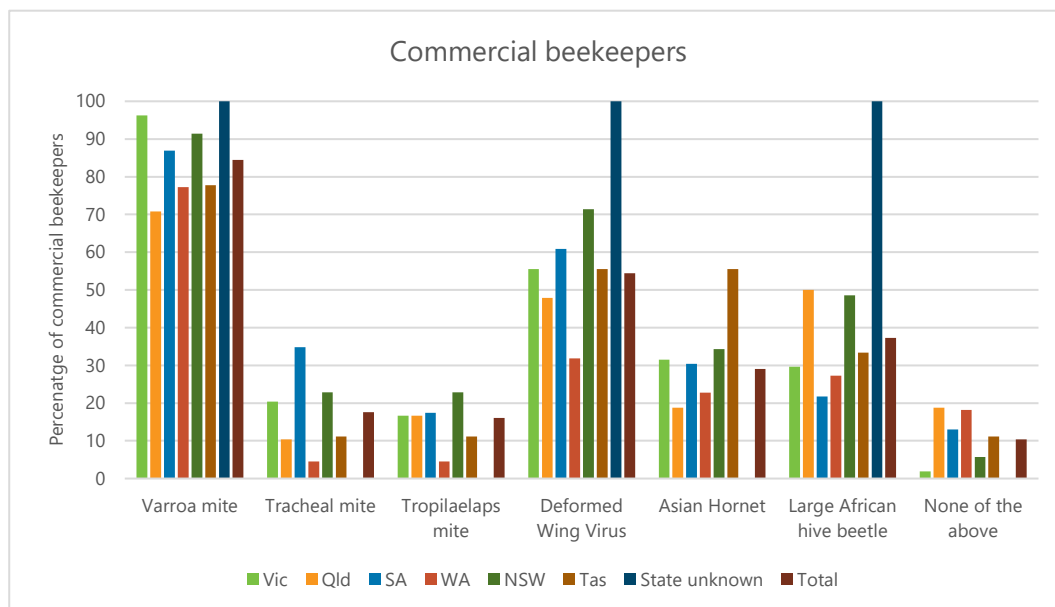


Identification of exotic pests and diseases

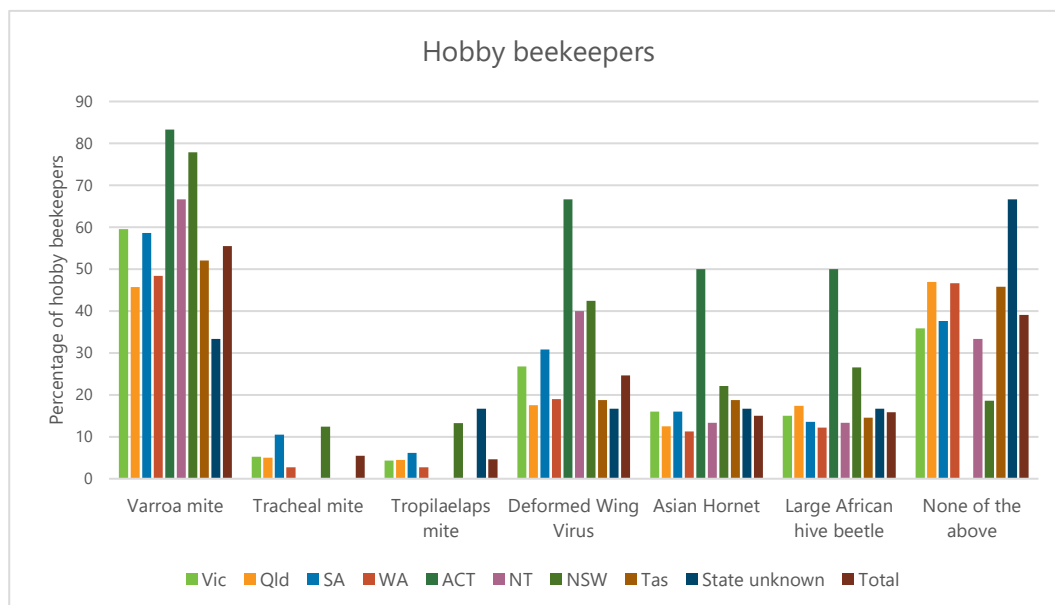
A large percentage of both hobby (~55%) and commercial (~84%) beekeepers could identify Varroa mites (**Figure 20A and Figure 20B**). Lower numbers of hobby beekeepers could identify tracheal mite (5%), tropilaelaps mite (5%), symptoms of deformed wing virus (25%), Asian hornet (15%) and large African hive beetle (16%). Similarly, lower numbers of commercial beekeepers could identify tracheal mite (18%), tropilaelaps mite (16%), deformed wing virus (54%), Asian hornet (29%), and large African hive beetle (37%). Approximately 39% of hobby beekeepers and 10% of commercial beekeepers could not identify any of these exotic pests and diseases. These results are similar to those obtained in the 2018 Honey Bee Health Survey.

Figure 20: Percentage of commercial (A) and hobby (B) beekeepers who can identify exotic pests and diseases

A.



B.

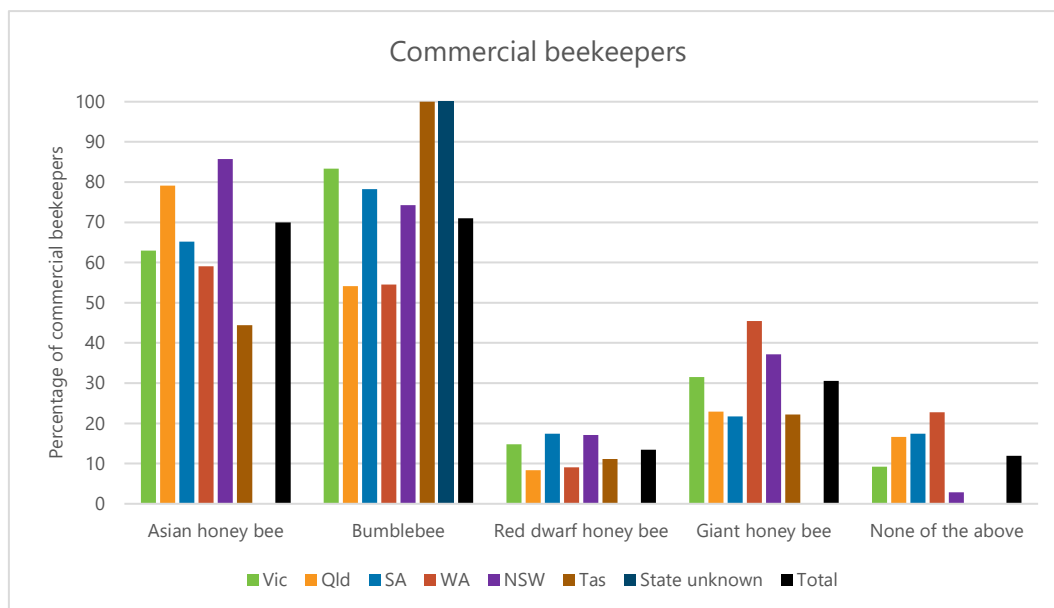


Identification of exotic bees

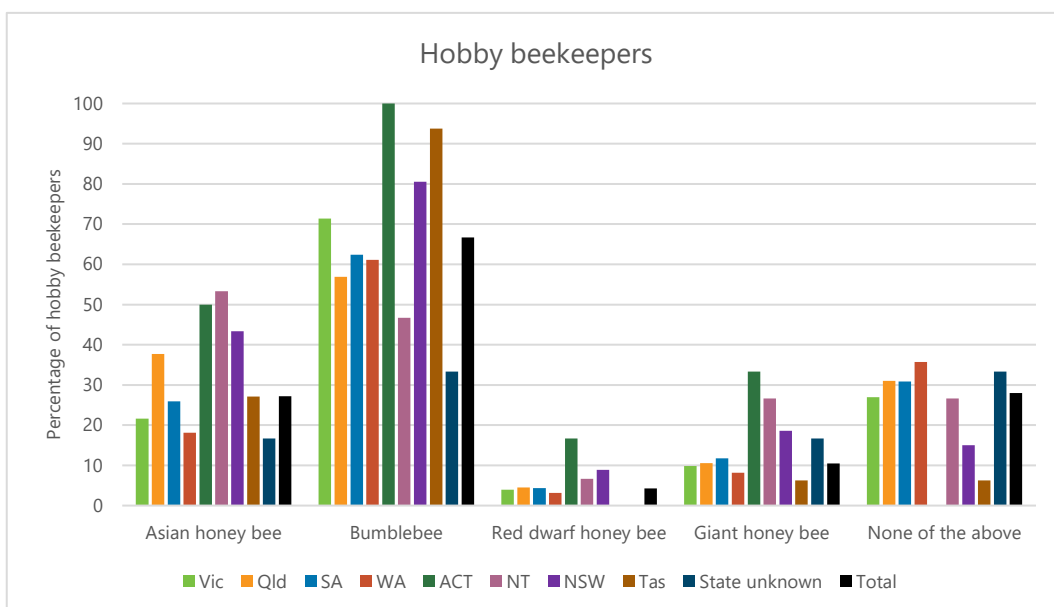
A high percentage of commercial beekeepers could identify bumblebee (71%) and Asian honey bee (70%), with a smaller number of commercial beekeepers could identify red dwarf honey bee (13%) and giant honey bee (31%). Approximately 12% of commercial beekeepers could not identify any of these exotic bees (**Figure 21A**). A high percentage of hobby beekeepers could also identify bumblebee (67%), with lower numbers of hobby beekeepers able to identify Asian honey bee (27%); red dwarf honey bee (4%) and giant honey bee (10%). Approximately 28% of hobby beekeepers said that they could not identify any of these exotic bee pests (**Figure 21B**). These results are similar to those obtained in the 2018 Honey Bee Health Survey.

Figure 21: Percentage of commercial (A) and hobby (B) beekeepers who can identify exotic bees

A.



B.

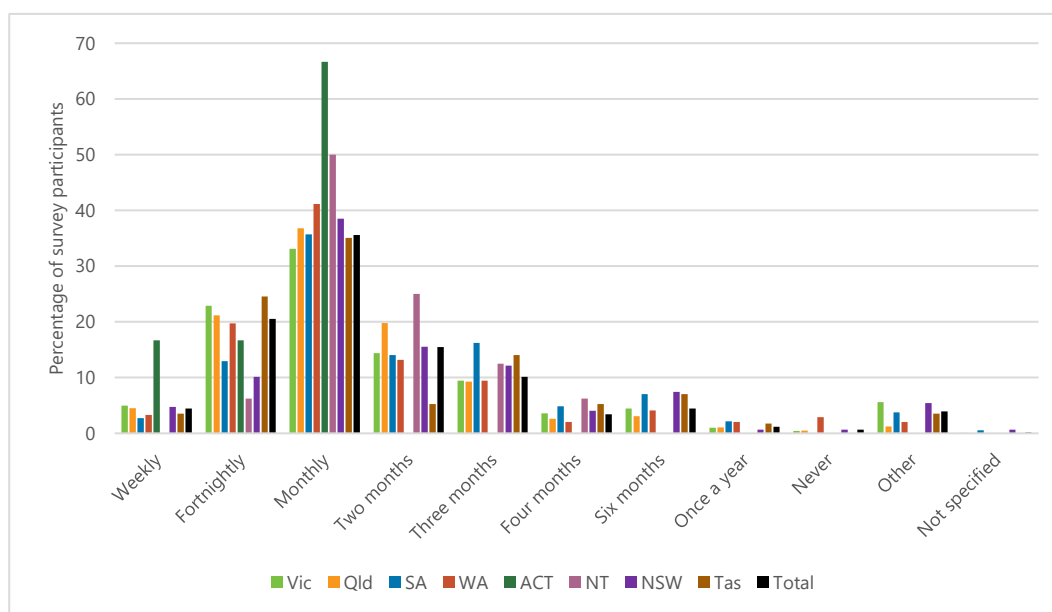


Hives inspected for established pests and diseases in the last twelve months

Approximately 99% of all beekeepers inspected their hives for established pests and diseases (eg. American foulbrood, European foulbrood, chalkbrood, sacbrood, nosema, small hive beetle, wax moth) in the last 12 months (Figure 22).

Most beekeepers inspect their hives for pests and diseases on a fortnightly (21%), monthly (36%) or two-monthly basis (16%) (**Figure 22**). These results are in accordance with the Australian Honey Bee Industry Biosecurity Code of Practice (Section 3.1) which requires beekeepers to visually inspect hives for pests and diseases at least twice each year, at a minimum of four consecutive calendar months apart. These results are similar to those obtained in the 2018 Honey Bee Health Survey.

Figure 22: Frequency that beekeepers inspect hives for pests and diseases within each jurisdiction



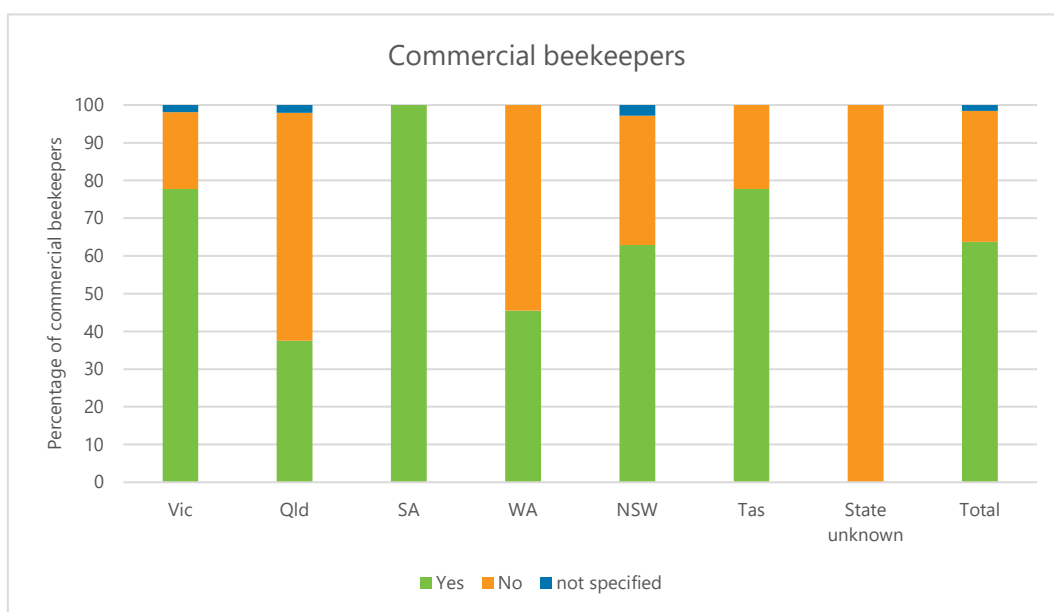
Honey tested for American foulbrood in the last 12 months

American foulbrood (AFB) is a bacterial disease of honey bee brood caused by the spore forming bacterium *Paenibacillus larvae*. AFB is present throughout Australia; however, it has not been reported or confirmed in the NT. The Australian Honey Bee Industry Biosecurity Code of Practice requires beekeepers with 50 or more hives to test their honey annually for American foulbrood (AFB).

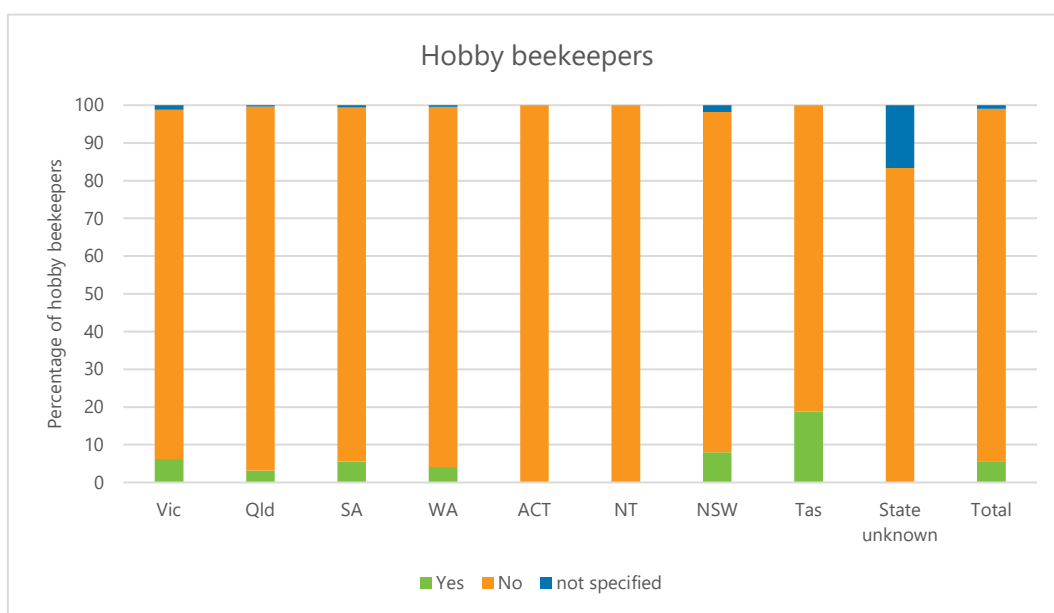
Sixty four percent of commercial beekeepers had their honey tested for AFB in the last 12 months. This is a substantial increase from 40 percent of commercial beekeepers described in the 2018 Honey Bee Health Survey (**Figure 23A**). Results varied between the jurisdictions. In South Australia, 100% of commercial beekeepers performed honey testing for AFB in the last 12 months. Lower numbers of commercial beekeepers in Queensland (~37%) and Western Australia (~45%) tested their honey for AFB compared to other jurisdictions (Victoria 78%; New South Wales 63%; Tasmania 78%). Only six percent of hobby beekeepers had their honey tested for AFB in the last 12 months (**Figure 23B**).

Figure 23: Percentage of commercial (A) and hobby (B) beekeepers that performed honey testing for American foulbrood in the last 12 months.

A.



B.

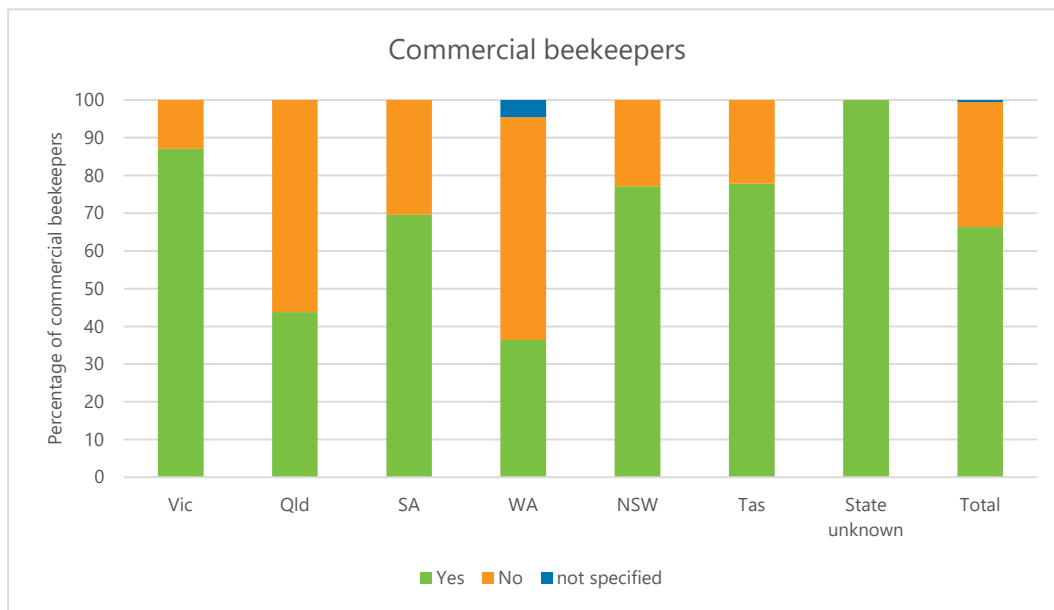


Hives inspected for exotic pests like Varroa and Tropilaelaps mites using sugar shake, alcohol wash or drone uncapping in the last twelve months

Approximately 66% of commercial beekeepers (**Figure 24A**) and 30% of hobby beekeepers (**Figure 24B**), inspected their hives for the exotic pests Varroa and Tropilaelaps mites using sugar shake, alcohol wash or drone uncapping in the last 12 months. This is a sharp increase from the 36% of commercial beekeepers and 20% of hobby beekeepers who reported inspecting their hives for exotic pests for Varroa and Tropilaelaps mites in the 2018 Honey Bee Health Survey. Most beekeepers indicated that they used sugar shake, rather than drone uncapping or alcohol wash to inspect for Varroa and Tropilaelaps mites (**Figure 25A** and **Figure 25B**).

Figure 24: Percentage of commercial (A) and hobby (B) beekeepers that have inspected hives for the exotic pests Varroa and Tropilaelaps mites using sugar shake, alcohol wash or drone uncapping in the last 12 months

A.



B.

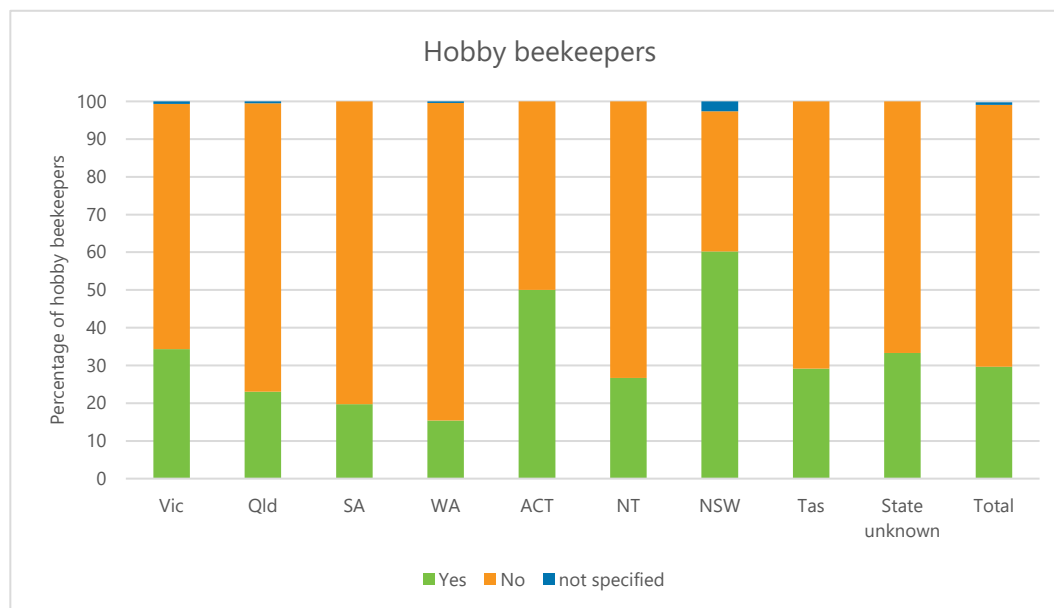
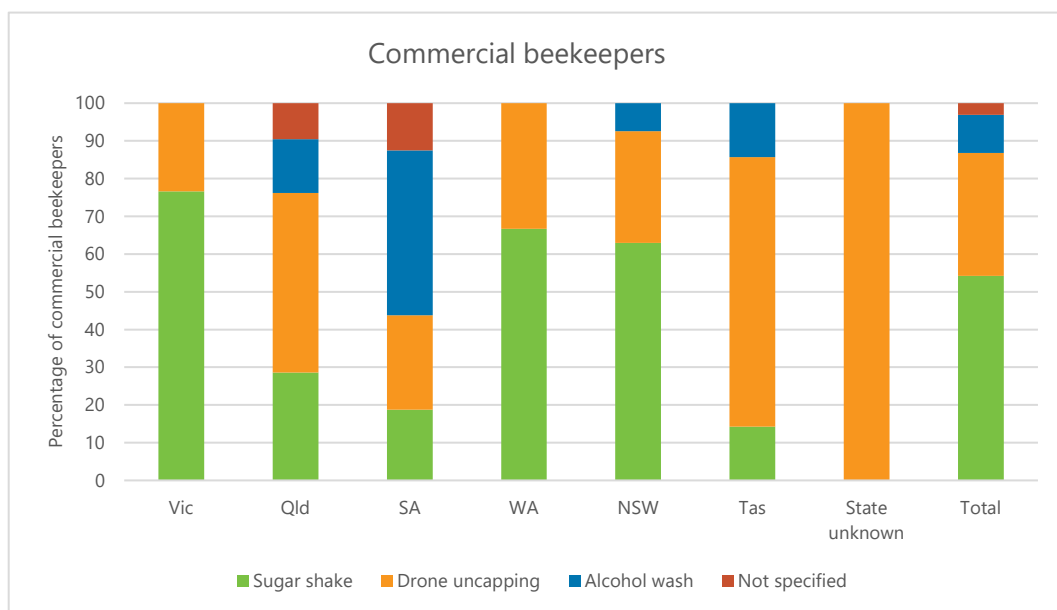
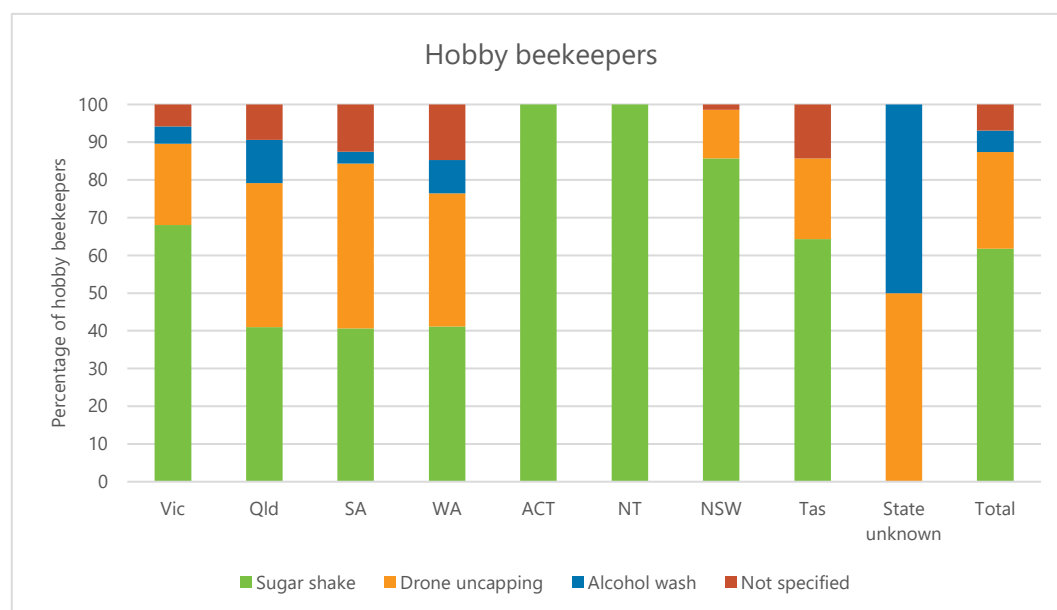


Figure 25: Percentage of commercial (A) and hobby (B) beekeepers using sugar shake, drone uncapping and alcohol wash to inspect for exotic pests like Varroa and Tropilaelaps mites

A.



B.



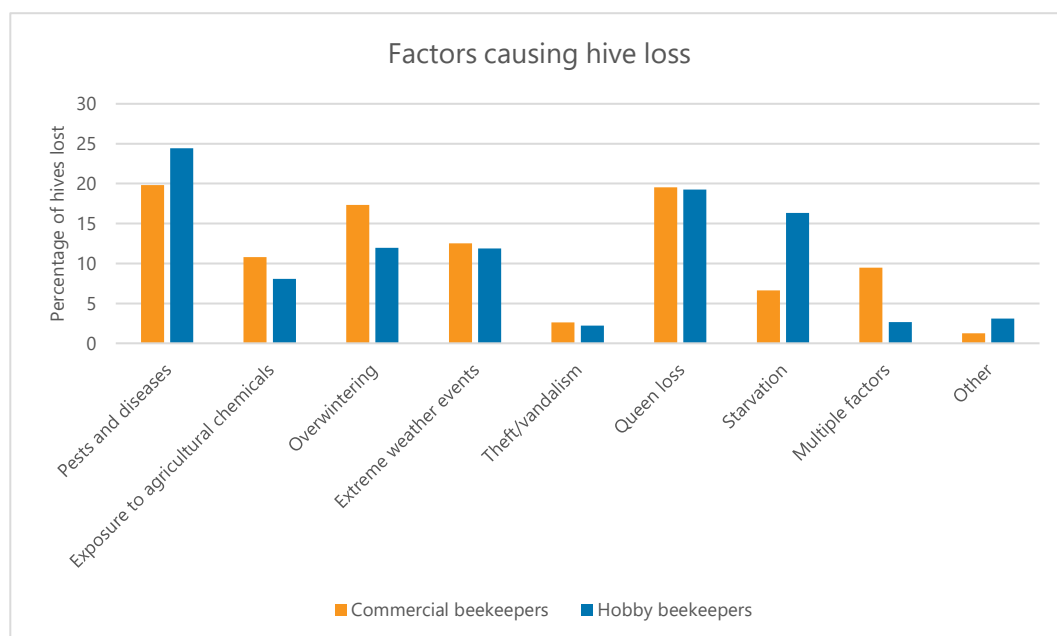
Factors causing hive losses

Overall hobby beekeepers estimated approximately 23% of hives were lost during the 2018–19 financial year. Similarly, commercial beekeepers estimated approximately 19% of hives were lost during this period. This is a slight increase from that reported in the 2018 Honey Bee Health Survey where hobby beekeepers reported 17%, and commercial beekeepers reported 12% of hives lost during the 2017-18 financial year.

Of the 23% of hives lost by hobby beekeepers in this survey, a quarter were lost due to pests and diseases (~24%), with queen loss (19%), starvation (16%), overwintering (12%) and extreme weather events (12%) the other major contributing factors. Pests and diseases were also reported as a major factor in hive loss by hobby beekeepers in the 2018 Honey Bee Health Survey, with queen loss and overwintering also reported as major factors (**Figure 26**).

Similarly, of the 19% of hives lost by commercial beekeepers just under a quarter were lost to pests and diseases (20%), followed by overwintering (17%) and queen loss (19%), with smaller numbers of hives lost to agricultural chemicals (11%), extreme weather (13%) and theft/vandalism (3%) (**Figure 26**). These results are similar to the 2018 Honey Bee Health Survey where pests and diseases, overwintering and queen loss were reported as the major factors causing hive loss amongst commercial beekeepers.

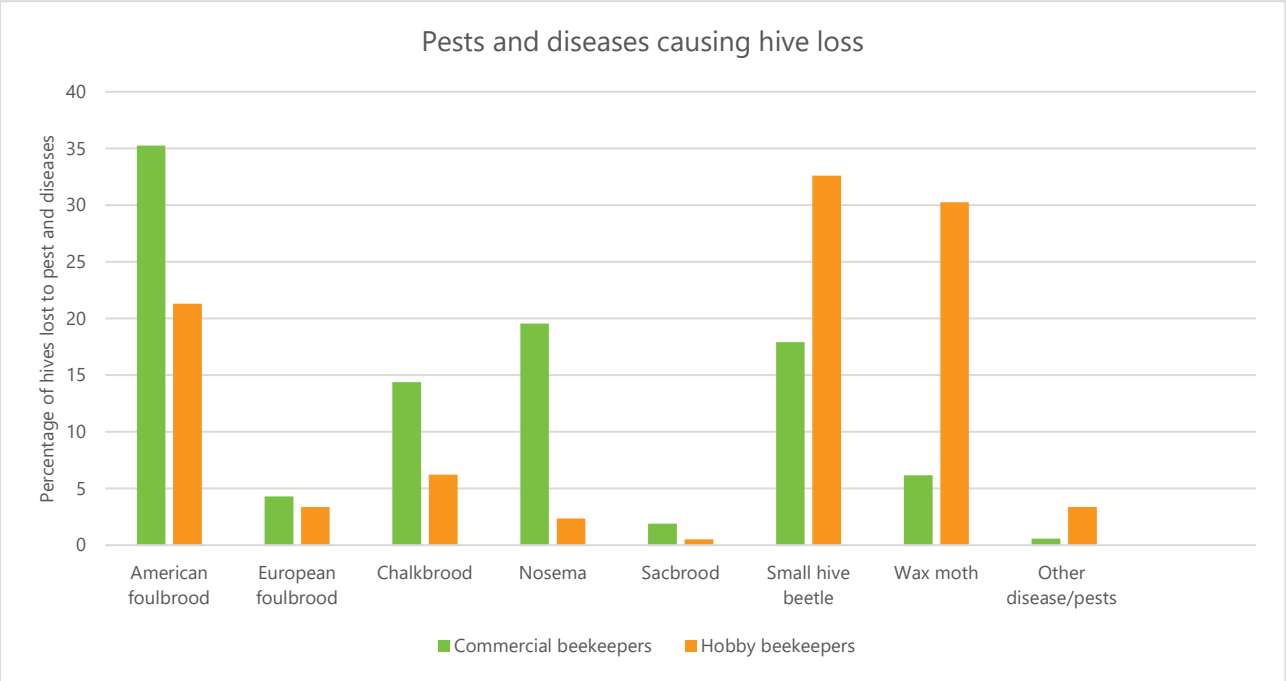
Figure 26: Factors causing hive loss amongst commercial and hobby beekeepers.



For commercial beekeepers the major pests and diseases causing hive loss during the 2018–19 financial year included American foulbrood (35%), small hive beetle (18%), chalkbrood (14%) and nosema (20%) (**Figure 27**), which is broadly similar to the results of the 2018 Honey Bee Health Survey. The ABARES Australian Honey Bee Industry Survey 2014–15³ also identified small hive beetle, American foulbrood and chalkbrood as the pests and diseases causing the highest levels of financial loss amongst commercial beekeepers nationally, supporting the results of the current study.

For hobby beekeepers the major pests and diseases causing hive loss during the 2018–19 financial year included small hive beetle (33%), wax moth (30%) and American foulbrood (21%) (**Figure 27**). However, these results should be interpreted with caution, as limited capacity appears to exist, particularly amongst hobby beekeepers, to identity established pests and diseases (see **Figure 19** page 21).

Figure 27 Pests and diseases causing hive loss

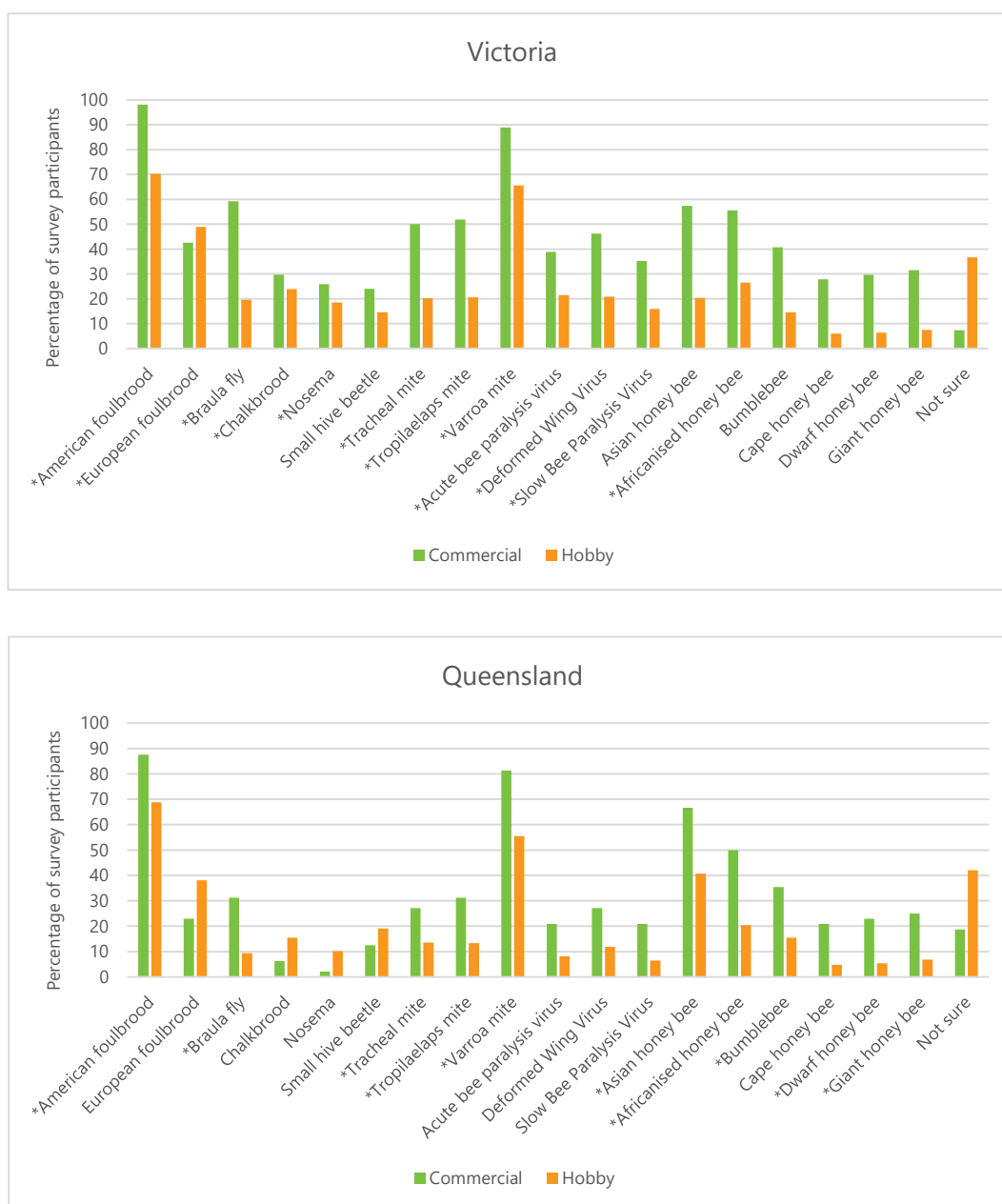


Knowledge of notifiable pests and diseases

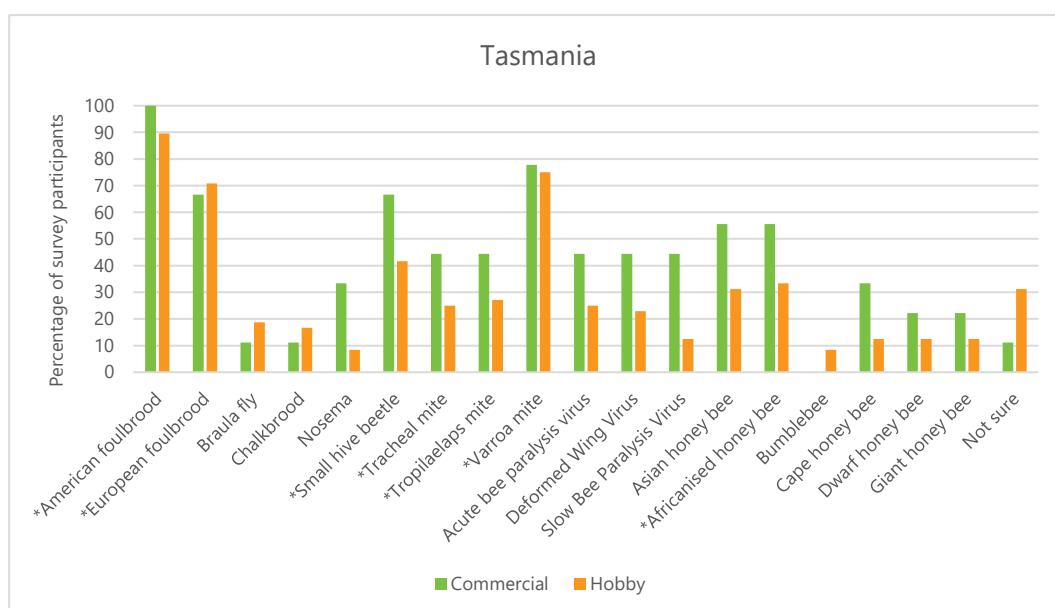
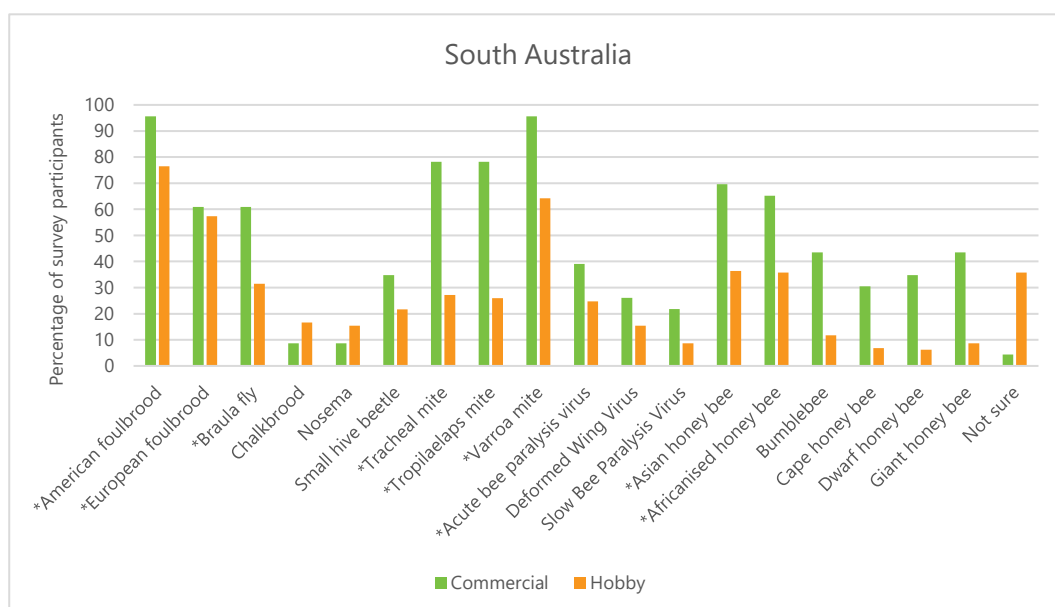
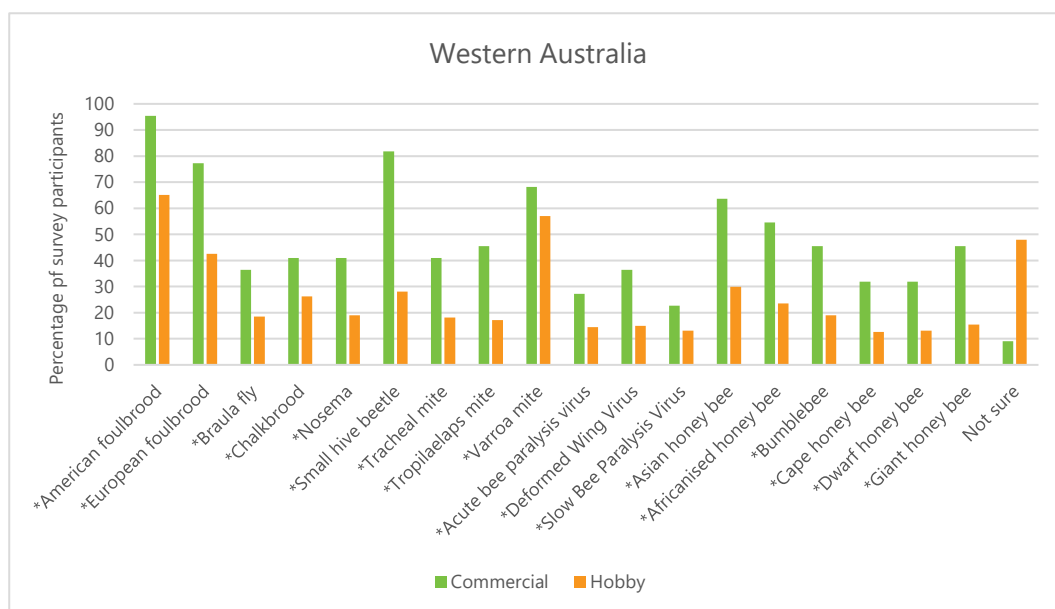
Survey participants were also asked to indicate which pests and diseases were notifiable in their jurisdiction (**Figure 28**). American foulbrood, tracheal mites, varroa mites and tropilaelaps mites are notifiable within all jurisdictions. Several other pests are also notifiable in each jurisdiction.¹⁰ Most hobby (71%) and commercial (95%) beekeepers were aware that American foulbrood was a notifiable pest. Similarly, most hobby (63%) and commercial (84%) beekeepers were aware varroa mites were notifiable. Much lower proportions of commercial (~50%) and hobby (~20%) beekeepers were aware that tracheal and tropilaelaps mites were also notifiable. Similarly, both hobby and commercial beekeepers had limited knowledge of other notifiable pests within their jurisdictions. These results are consistent with those reported in the 2018 Honey Bee Health Survey.

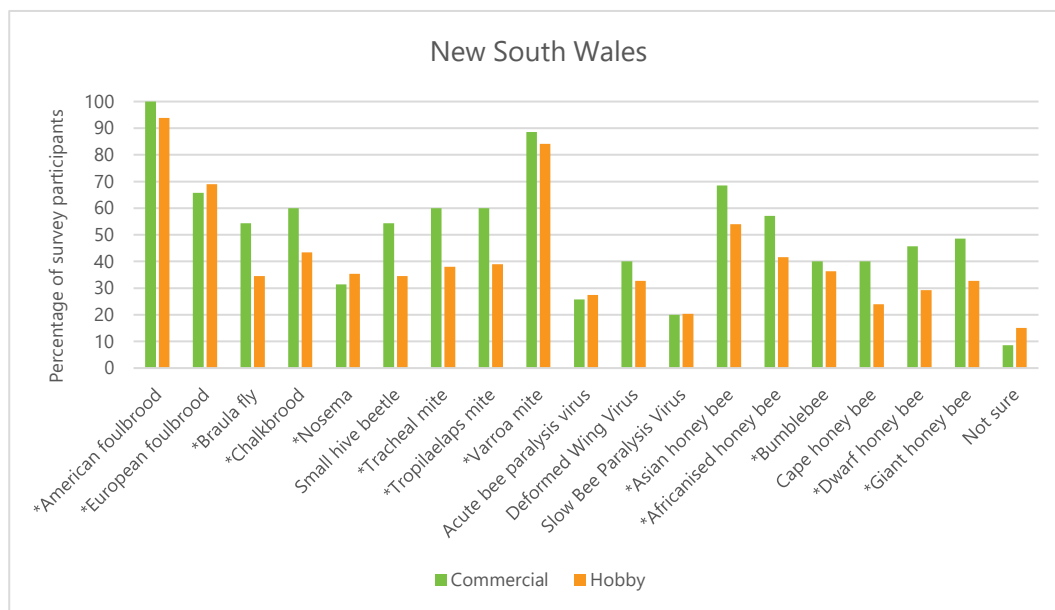
Figure 28: Percentage of survey participants which have knowledge of notifiable pests and diseases within their jurisdiction.

Notifiable pests in each jurisdiction are indicated with *



¹⁰ For a list of notifiable pests in each jurisdiction see <https://beeaware.org.au/code-of-practice/reporting-diseases/>.





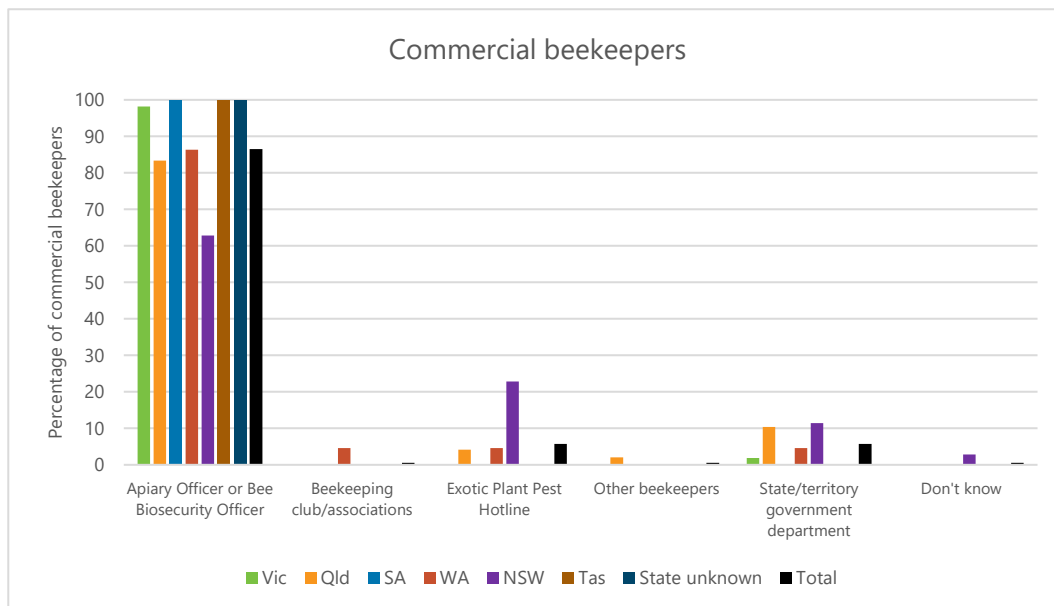
Who beekeepers would contact if they suspected a notifiable pest or disease was in their hives

Ninety two percent of commercial beekeepers would contact either their relevant state/territory government (6%) or their Apiary/Bee Biosecurity Officer (86%) if they thought they had a notifiable pest or disease. Lower numbers of commercial beekeepers would contact the Exotic Plant Pest Hotline (6%), beekeeping club/associations (0.5%), other beekeepers (0.5%), or didn't know who they would contact (0.5%) (**Figure 29A**).

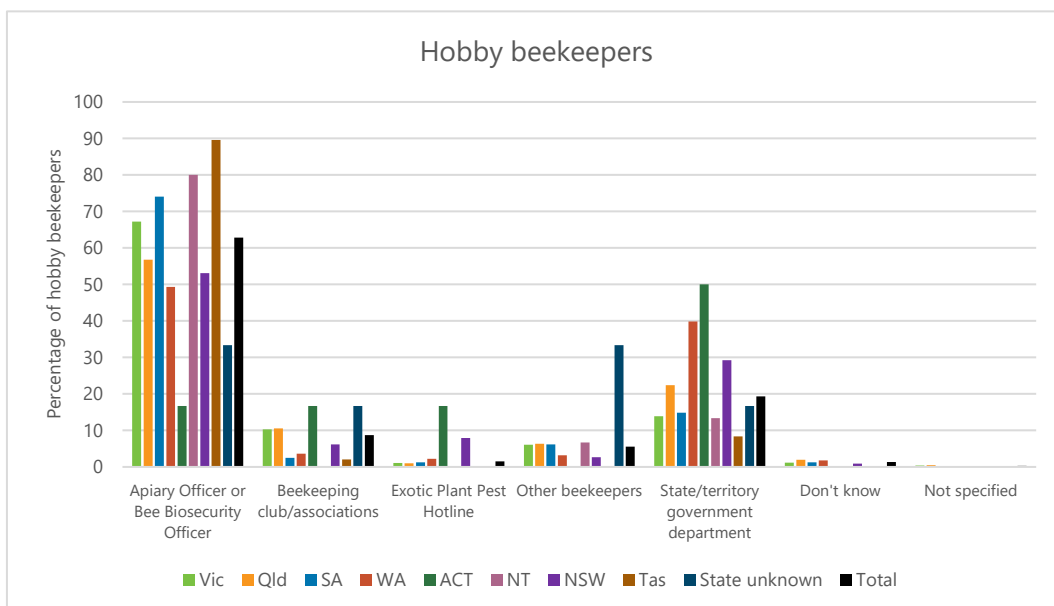
Eighty two percent of hobby beekeepers indicated they would contact either their relevant state/territory government (19%) or their Apiary/Bee Biosecurity Officer (63%) if they thought they had a notifiable pest or disease. Lower numbers of hobby beekeepers would contact the Exotic Plant Pest Hotline (1.5%), beekeeping club/associations (9%), other beekeepers (6%), didn't know (1.3%), or did not specify (0.3%) (**Figure 29B**).

Figure 29: Who commercial (A) or hobby beekeepers (B) would contact if they suspected a notifiable pest or disease

A.



B.

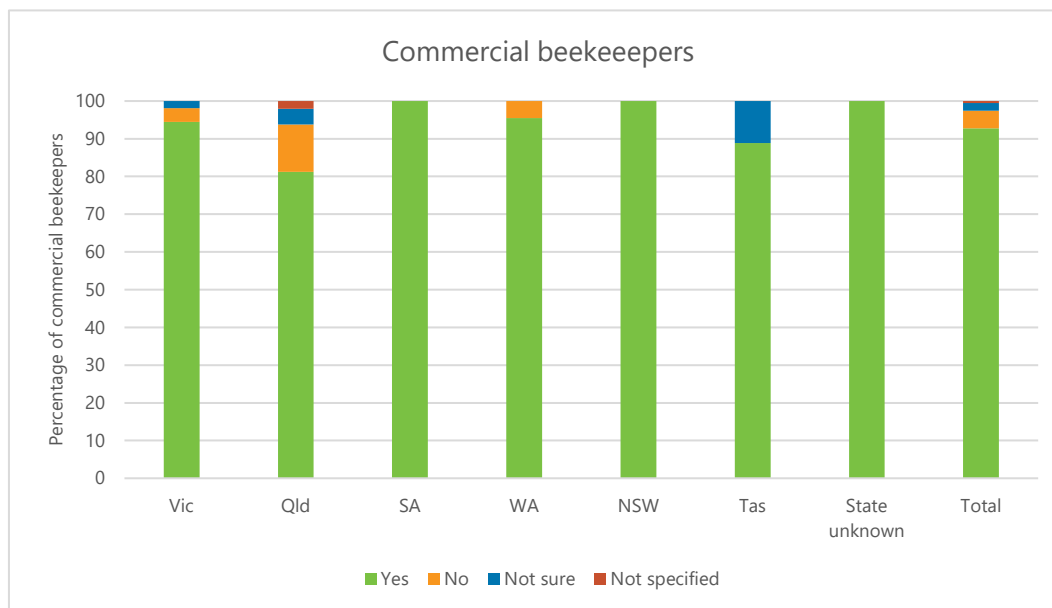


Barrier management system

Approximately 92% of commercial beekeepers (**Figure 30A**) know what a barrier management system is compared to 33% of hobby beekeepers (**Figure 30B**). This is a slight increase from 84% of commercial beekeepers and 24% of hobby beekeepers recorded in the 2018 Honey Bee Health Survey. Sixty five percent of commercial beekeepers and 40% of hobby beekeepers who knew what a barrier management system was, indicated that they used a barrier management system (**Figure 31**). This again is an increase from the results reported in the 2018 Honey Bee Health Survey where 55% of commercial beekeepers and 11% of hobby beekeepers who knew what a barrier management system was, indicated that they used a barrier management system.

Figure 30: Percentage of commercial (A) and hobby (B) beekeepers who know what a barrier management system is

A.



B.

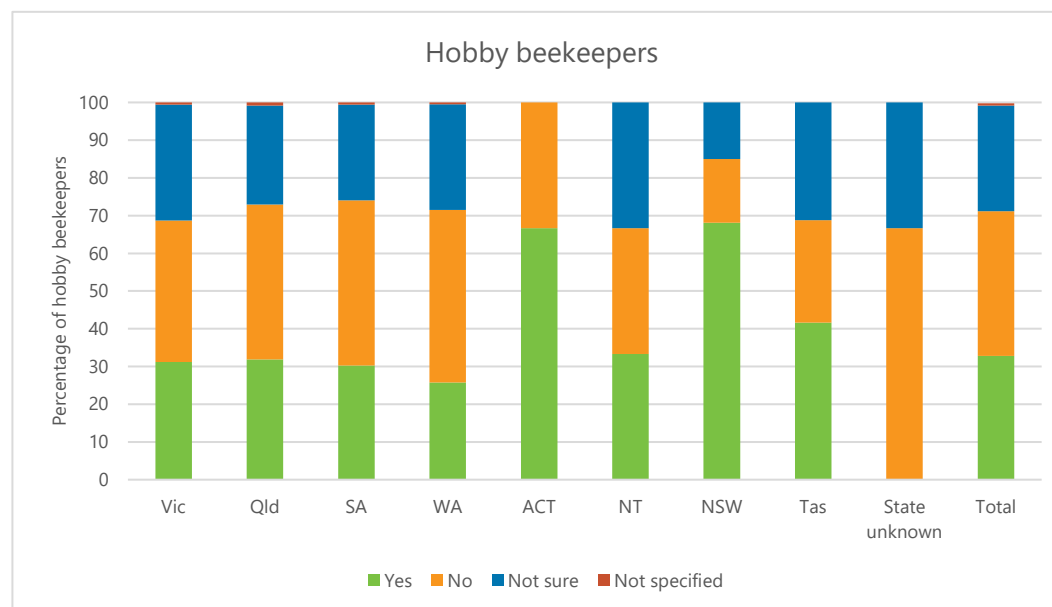
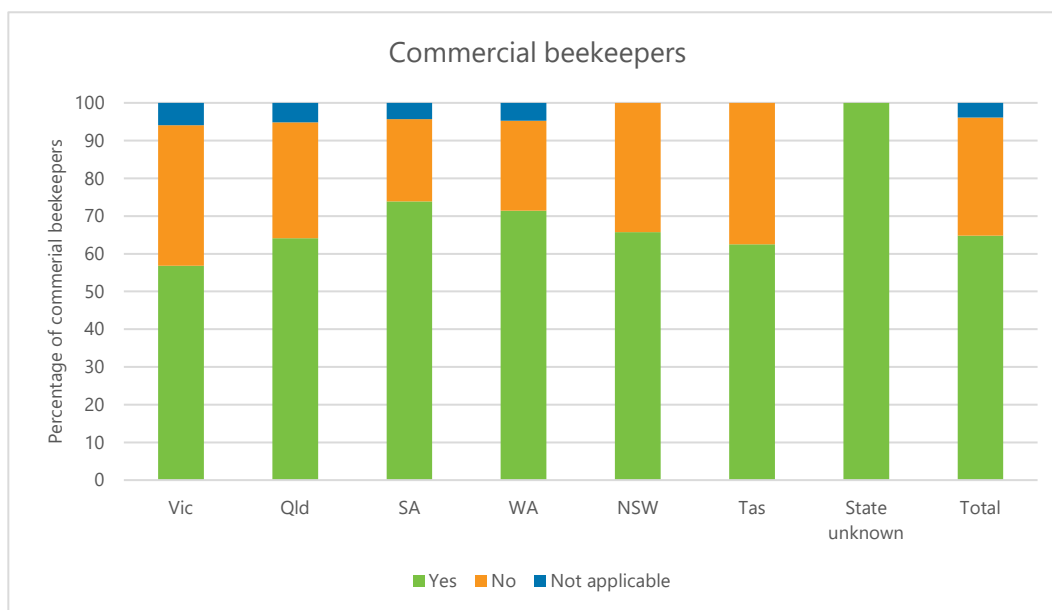
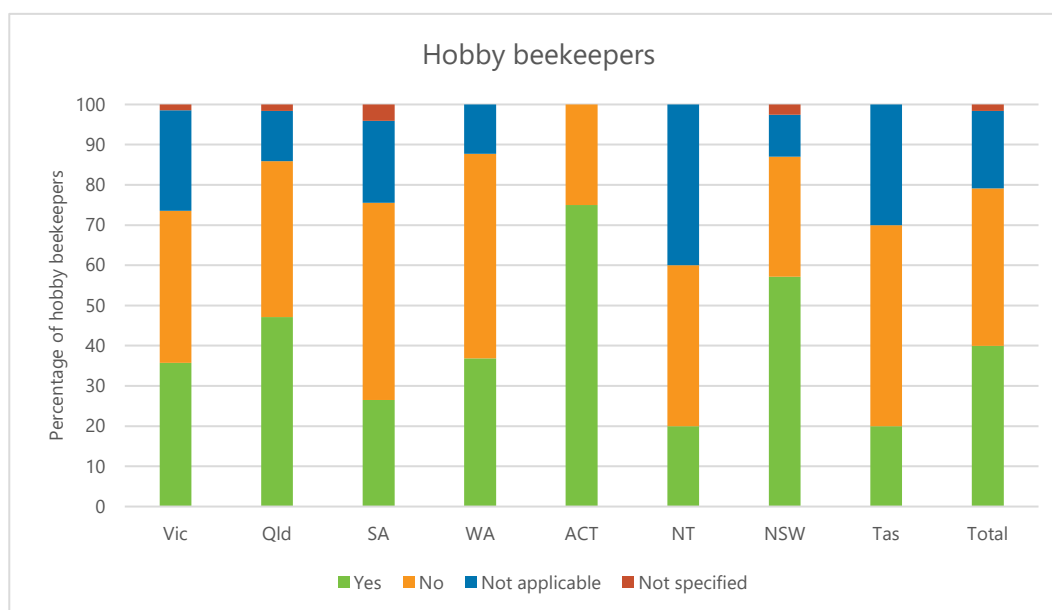


Figure 31 Percentage of beekeepers using a barrier management system

A.



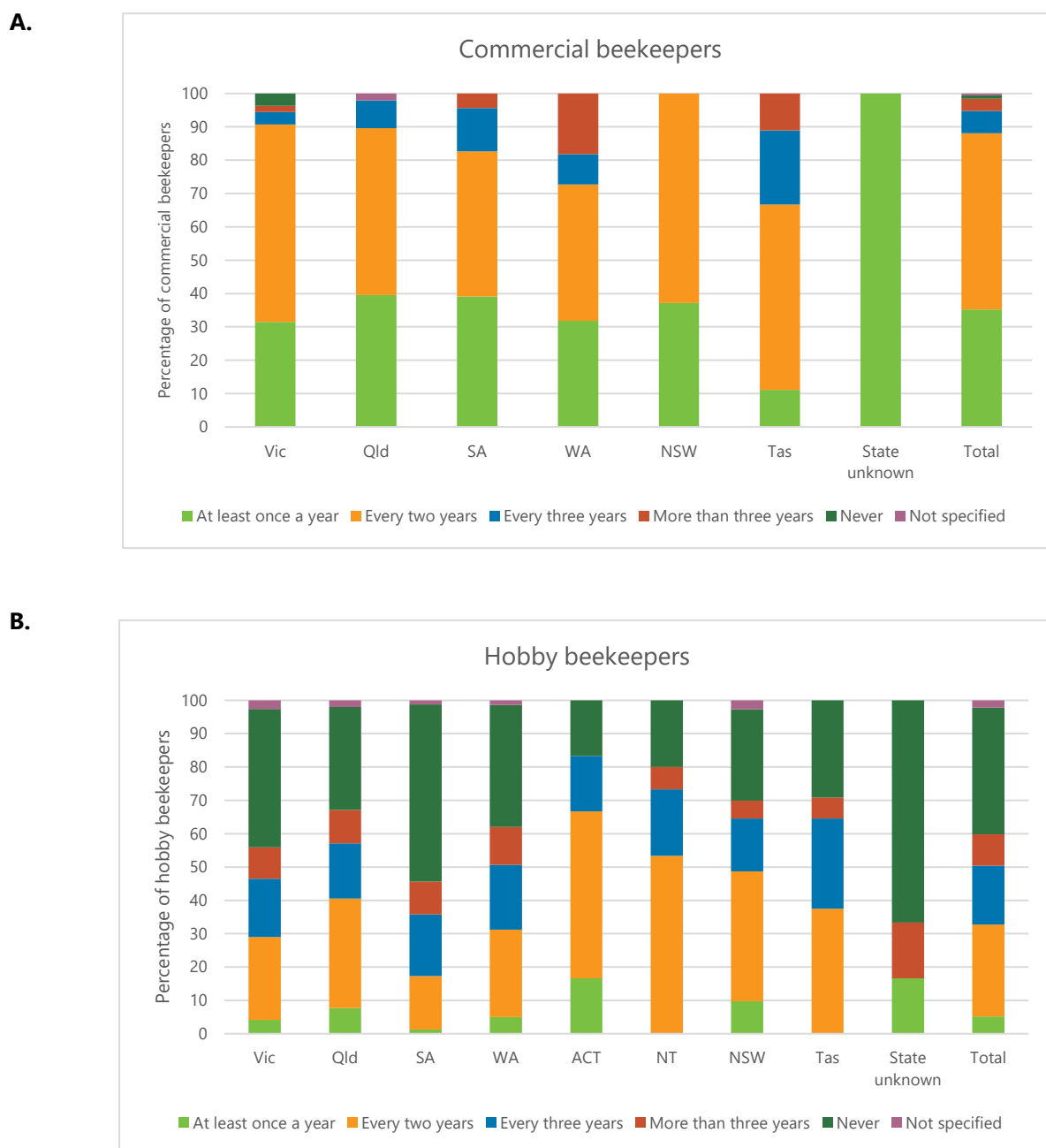
B.



Requeening

Most commercial beekeepers requeened at least annually (35%) or every two years (53%). In contrast, lower proportions of hobby beekeepers requeened at least annually (5%) or every two years (28%) with a large proportion (38%) of hobby beekeepers indicating that they never requeened their colonies (**Figure 32**). It is recommended that beekeepers requeen their colonies every two years with a young and healthy queen bee from a reputable breeder, in order to maintain strong and healthy colonies¹¹.

Figure 32: Frequency that commercial (A) and hobby (B) beekeepers requeen their colonies



¹¹ Biosecurity Manual for Beekeepers. Downloaded from <https://www.farmbiosecurity.com.au/wp-content/uploads/2019/05/Biosecurity-Manual-for-Beekeepers.pdf>

Where beekeepers get their information on pests and diseases

Survey participants obtained their information on pests and disease from a variety of sources. Seventy four percent of participants used online sources, with friends and other beekeepers the other main source of information (66%). Information was also obtained from books (58%), beekeeping associations/clubs (50%) and state/territory agriculture departments (38%). Similar trends were observed between commercial and hobby beekeepers (**Figure 33**), though higher levels of commercial beekeepers obtained information from industry magazines (70% vs 20%), Bee Biosecurity Officers (66% vs 25%) and AHBIC (42% vs 17%). Online was considered to be the most useful source of information (72%), followed by the BeeAware website (68%), Bee Biosecurity Officers (67%), beekeeping associations/clubs (64%), friends and other beekeepers (63%) (**Figure 34**).

These results are similar to those obtained in the 2018 Honey Bee Health Survey and are broadly similar to those found in the ABARES Australian Honey Bee Industry Survey 2014–15³, which identified other beekeepers, honey packers, and manufacturers as the main source of information on best management practices along with magazines, journals and publications. Books on beekeeping, field days, industry conferences and courses, and beekeeping associations and clubs were also identified as common sources of information. In contrast to the current survey, and the 2018 Honey Bee Health Survey, the 2014–15 ABARES survey indicated lower numbers of participants obtaining information from the internet (<25%) and the BeeAware website (<10%).

Figure 33: Sources of information on pests and diseases for commercial beekeepers (A) and hobby beekeepers (B)

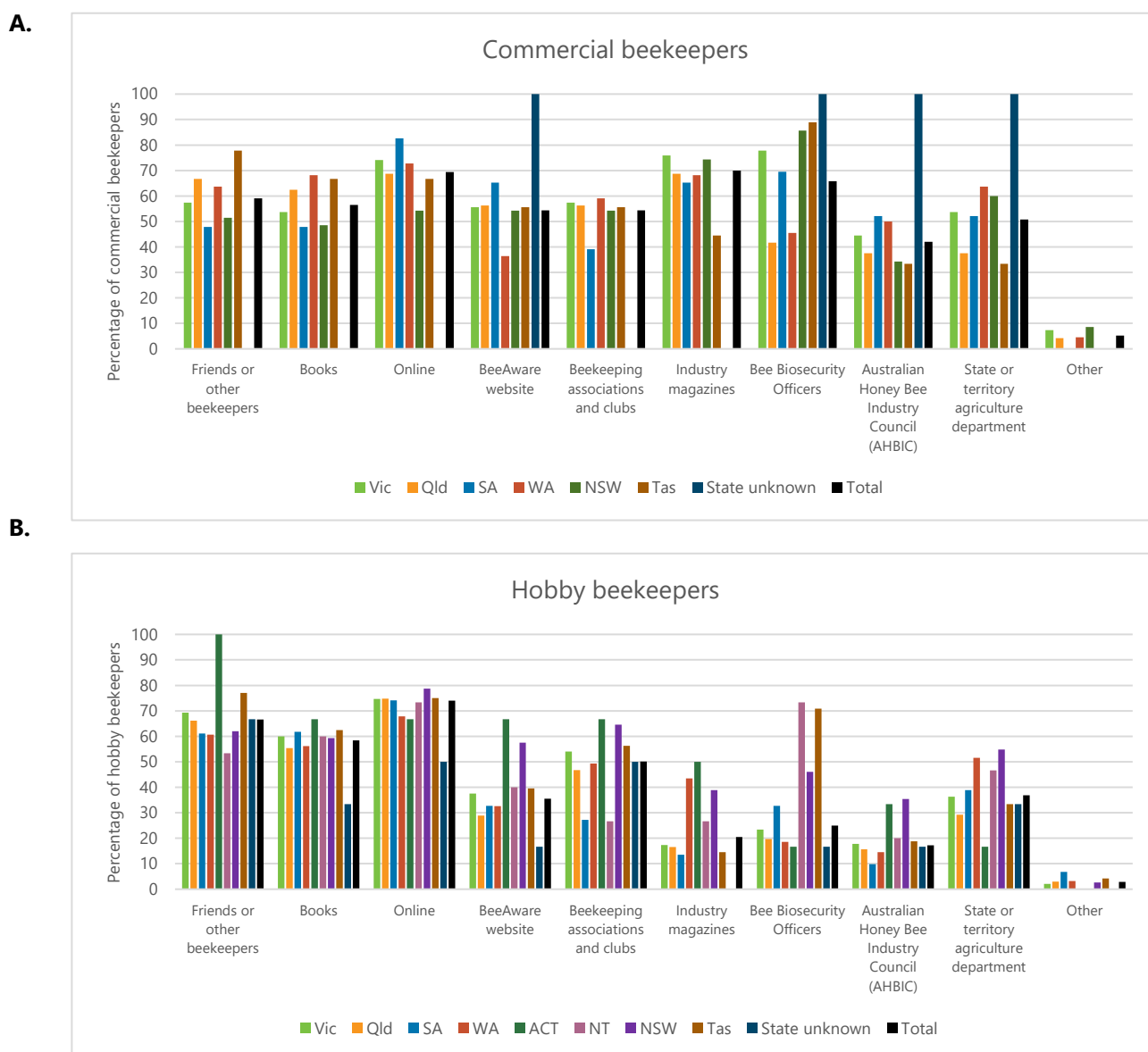
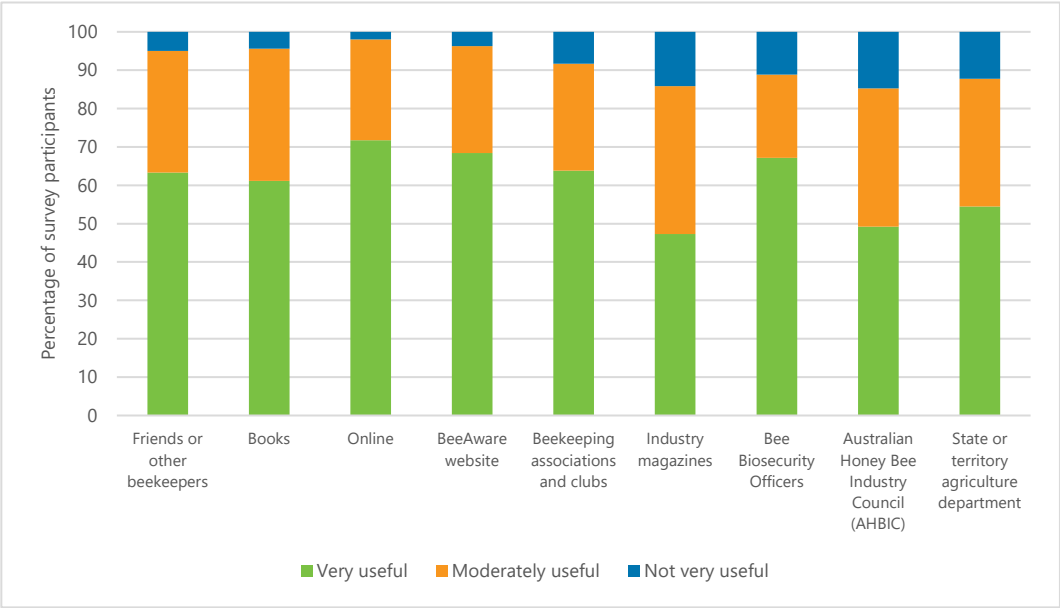


Figure 34: Usefulness of pest and disease information sources

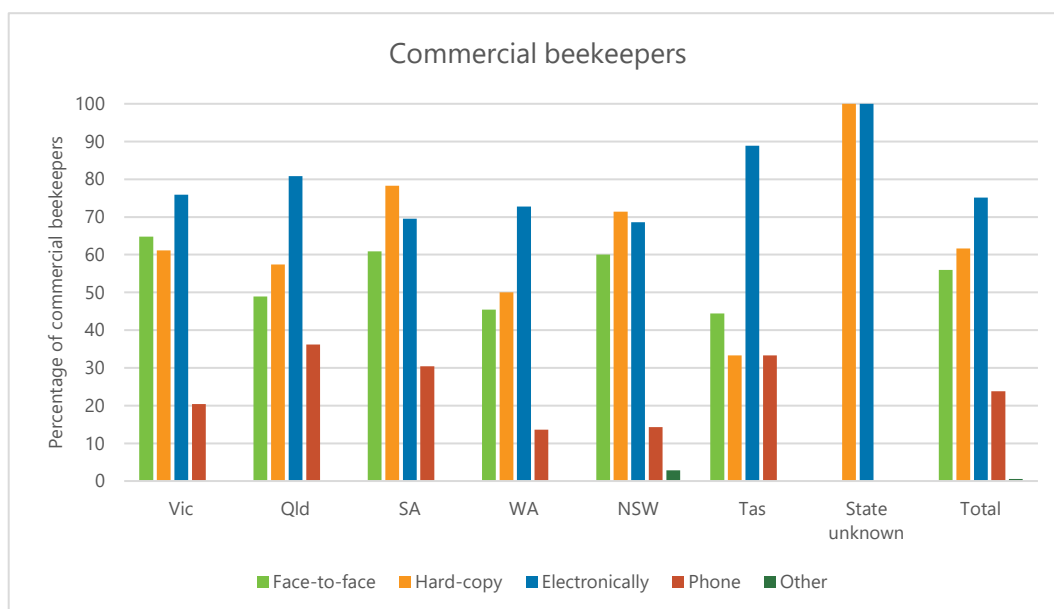


Preferred format for information (face-to-face; hard copy; electronic)

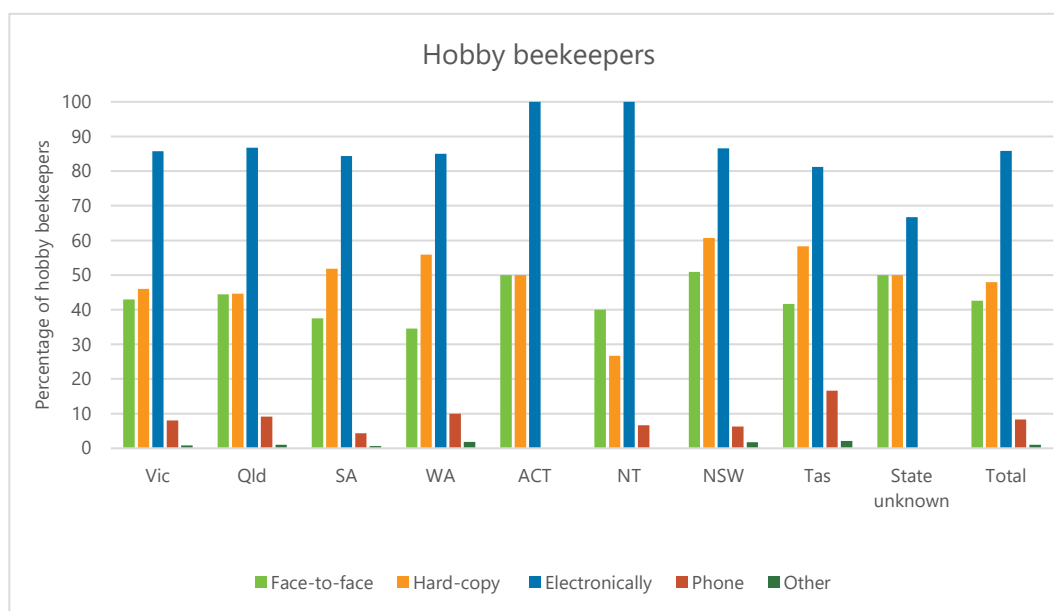
Survey participants preferred to receive their information in a variety of formats including face-to-face (44%), electronically (85%), hard copy (49%) and phone (9.5%). A small percentage (~1%) indicated preference for other types of formats including email, texts, postal, podcasts, videos radio, and webinars (**Figure 35**).

Figure 35: Preferred format of information (face-to-face; hard copy, electronic or phone)

A.



B.



Recommendations

Identification of pests and diseases

Summary: Survey participants were asked to indicate what pests and diseases they could identify. Compared to commercial beekeepers, knowledge of all pests and diseases was more limited amongst hobby beekeepers. Commercial beekeepers generally had a good knowledge of established pests and diseases, however had a more limited knowledge of exotic pests and diseases and exotic bees.

Recommendation: Increase awareness of all pests and diseases amongst hobby beekeepers, through provision of extension materials, and promotion of pest and disease courses such as *Biosecurity for Beekeepers* BOLT course.

For commercial beekeepers, increased focus should be placed on pests and diseases where more limited knowledge exists (eg. braula fly for mainland commercial beekeepers). Increased emphasis should also be placed on the identification of exotic pests and diseases (other than Varroa mites) and exotic bees.

Surveillance:

Summary: According to the Australian Honey Bee Industry Biosecurity Code of Practice beekeepers must regularly inspect their hives for pests and diseases; at least twice in every year, at a minimum of four consecutive calendar months apart. Ninety nine percent of survey participants inspected their hives for established pests and diseases in the last 12 months, with most beekeepers inspecting at the required frequency.

Under the Code of Practice beekeepers are also required to inspect their hives for Varroa and Tropilaelaps mites using sugar shake, alcohol wash or drone uncapping, at least twice a year, at a minimum of four consecutive calendar months apart. Survey results indicate that only 66% of commercial beekeepers and 30% of hobby beekeepers had inspected their hives for these exotic pests in the last 12 months.

Recommendation: Increase awareness of the need for surveillance techniques such as sugar shake, alcohol wash and drone uncapping to detect external exotic mites such as Varroa and Tropilaelaps, and inspection requirements outlined in the Code of Practice. Provide beekeepers with information on how to perform the sugar shake, alcohol wash and drone uncapping surveillance techniques, including factsheets, videos, and face-to-face workshops.

Honey testing for AFB

Summary: The Australian Honey Bee Industry Biosecurity Code of Practice requires beekeepers with 50 or more hives to test their honey annually for American foulbrood. Survey results indicated that only 64% of commercial beekeepers had their honey tested for AFB in the last 12 months.

Recommendation: Increase awareness about the requirement for annual testing of honey for AFB for commercial beekeepers as outlined in the Code of Practice.

Reporting:

Summary: Under the Australian Honey Bee Industry Biosecurity Code of Practice and state/territory legislation, it is a requirement for all beekeepers to report notifiable diseases. Survey results indicated a lack of knowledge amongst all beekeepers about what pests were notifiable. Furthermore, only 82% of hobby beekeepers and 92% of commercial beekeepers indicated they would contact their relevant state/territory government or their Apiary/Bee Biosecurity Officer to report a notifiable pest.

Recommendation: Continue to increase awareness amongst all beekeepers of where to find information on what pests and diseases are notifiable in each jurisdiction and how beekeepers should report these pests. Encourage beekeepers to seek advice about any signs of pests or diseases of which they are unsure.

Training

Summary: Under the Australian Honey Bee Industry Biosecurity Code of Practice, beekeepers with 50 or more hives are required to complete approved pest and disease training every three years. Sixty three percent of commercial beekeepers and 11% of hobby beekeepers indicated that they had completed approved training in the last three years (namely *Biosecurity for Beekeepers* online BOLT course, Certificate III in Beekeeping or Pests and diseases of honey bees module

(AHCBEK306)).

Recommendation: Continue to promote the *Biosecurity for Beekeepers* BOLT course to commercial beekeepers and investigate mechanisms to increase uptake amongst hobby beekeepers.

Barrier management system:

Summary: Under the Australian Honey Bee Industry it is recommended that all beekeepers should use a barrier system of hive management. Approximately 92% of commercial beekeepers and 33% of hobby beekeepers indicated they knew what a barrier management system was. Of those beekeepers who knew what a barrier management system was 65% of commercial beekeepers and 40% of hobby beekeepers used a barrier management system in their apiaries.

Recommendation: Continue to increase awareness about the benefits of using a barrier management system amongst both commercial and hobby beekeepers.

Appendix 1: Survey questions

2019 HONEY BEE HEALTH SURVEY

The Australian Honey Bee Industry Council, Plant Health Australia and AgriFutures Australia, encourage all Australian beekeepers to take part in this survey.

We are asking these questions to find out how healthy Australian honey bees are, and what pests and diseases might be causing problems for beekeepers.

The results from the survey will be used to decide what help you might need to keep your honey bees healthy. It will also provide statistics for use by the industry.

Just so you know, we can't identify anyone who does this survey, and the raw data will not be distributed to third parties.

Thank you for giving your time to answer these questions. It should only take about 10-12 minutes to complete.

1. What state or territory are you based in?

- | | |
|---------------------------------------|--|
| <input type="radio"/> Queensland | <input type="radio"/> South Australia |
| <input type="radio"/> New South Wales | <input type="radio"/> Western Australia |
| <input type="radio"/> Victoria | <input type="radio"/> Northern Territory |
| <input type="radio"/> Tasmania | <input type="radio"/> Australian Capital Territory |

2. How many hives do you own?

3. How long have you been a beekeeper?

- | | |
|--|-----------------------------------|
| <input type="radio"/> Less than a year | <input type="radio"/> 11-20 years |
| <input type="radio"/> 1-5 years | <input type="radio"/> 21+ years |
| <input type="radio"/> 6-10 years | |

4. Do you consider yourself to be a hobby beekeeper or a commercial beekeeper (primary source of income)?

- ☐ Commercial beekeeper (primary source of income)
- ☐ Hobby beekeeper
- ☐ Not sure

5. Are you aware of beekeeper registration requirements in your state or territory?

- ☐ Yes
- ☐ No

6. What type of hive do you mainly use?

- | | |
|---|---|
| <input type="radio"/> Langstroth | <input type="radio"/> Other |
| <input type="radio"/> Flow hive | <input type="radio"/> Combination of hive types |
| <input type="radio"/> Warre hives | <input type="radio"/> Don't know/not applicable |
| <input type="radio"/> Kenyan top bar hive | |

7. Did you provide pollination services in 2018-19 financial year?

- ☐ Yes
- ☐ No

8. What were the main crops you provided pollination services for in 2018-2019 financial year? (select all that apply)

- | | |
|---|--|
| <input type="checkbox"/> Almonds | <input type="checkbox"/> Lucerne |
| <input type="checkbox"/> Apples | <input type="checkbox"/> Macadamia |
| <input type="checkbox"/> Avocados | <input type="checkbox"/> Pears |
| <input type="checkbox"/> Berries (blueberry/ strawberry/ raspberry) | <input type="checkbox"/> Stone fruit (plums/peaches/nectarines/apricots) |
| <input type="checkbox"/> Canola | <input type="checkbox"/> Watermelon |
| <input type="checkbox"/> Cherries | |
| <input type="checkbox"/> Other (please specify) | |

9. Were you paid for the pollination services you provided in the 2018-2019 financial year?

- ☐ Yes
- ☐ No

10. What was the furthest distance (km) you travelled from your business location to provide pollination services?

- ☐ 0-50 km
- ☐ 51-100 km
- ☐ 101-200 km
- ☐ 201-300 km
- ☐ 301-400 km
- ☐ 401-500 km
- ☐ More than 500 km

11. In the 2018-19 financial year, was your honey crop

- ☐ below average
- ☐ average
- ☐ above average
- ☐ not sure/not applicable

12. For the 2018-19 financial year, please provide an estimate of **the number** of hives lost to:

Pests and diseases	<input type="text"/>
Exposure to agricultural chemicals (eg. pesticides)	<input type="text"/>
Overwintering	<input type="text"/>
Extreme weather events (eg. bushfire)	<input type="text"/>
Theft/vandalism	<input type="text"/>
Queen loss	<input type="text"/>
Starvation	<input type="text"/>
Multiple factors (please specify)	<input type="text"/>
Other (please specify)	<input type="text"/>

13. Estimate the **number of hives** lost to the following pests and diseases, during the 2018-19 financial year.

American foulbrood	<input type="text"/>
European foulbrood	<input type="text"/>
Chalkbrood	<input type="text"/>
Nosema	<input type="text"/>
Sacbrood	<input type="text"/>
Small hive beetle	<input type="text"/>
Wax moth	<input type="text"/>
Other disease/pests (please specify)	<input type="text"/>

14. In the 2018-19 financial year did you have your honey tested for chemical residues (eg. pesticides, fungicides, herbicides)?

- ☐ Yes
- ☐ No
- ☐ Not applicable

15. Have you heard about the Australian Honey Bee Industry Biosecurity Code of Practice?

- ☐ Yes
- ☐ No
- ☐ Not sure

16. Have you heard about the National Bee Biosecurity Program?

- ☐ Yes
- ☐ No
- ☐ Not sure

17. What pest and disease training have you completed in the last three years? (select all that apply)

- ☐ Biosecurity for Beekeepers online BOLT course (Plant Health Australia)
- ☐ Bee Biosecurity Awareness online BOLT course (Plant Health Australia)
- ☐ Manage pests and disease within a honey bee colony (AHCBEK306/AHCBEK313)
- ☐ Certificate III in Beekeeping (AHC31818/AHC32016)
- ☐ Training or presentation given by Bee Biosecurity Officer
- ☐ Field day demonstration
- ☐ Training at local beekeeping club
- ☐ No training completed
- ☐ Other (please specify)

18. Which of the following **established** pests and diseases can you identify (select all that apply)?

- ☐ American foulbrood
- ☐ European foulbrood
- ☐ Chalkbrood
- ☐ Nosema
- ☐ Sacbrood
- ☐ Small hive beetle
- ☐ Wax moth
- ☐ Braula fly
- ☐ None of the above

19. In the last 12 months, **how often** did you inspect your hives for **established** pests and diseases (eg. American foulbrood, European foulbrood, chalkbrood, sacbrood, nosema, small hive beetle, wax moth)?

- ☐ Weekly
- ☐ Fortnightly
- ☐ Monthly
- ☐ Every two months
- ☐ Every three months
- ☐ Every four months
- ☐ Every six months
- ☐ Once a year
- ☐ Never - did not inspect my hives
- ☐ Other (please specify)

20. In the last 12 months have you had honey samples tested for American foulbrood?

- ☐ Yes
- ☐ No

If not - what were the reasons you did not undertake honey testing for American foulbrood

21. Which of the following **exotic** pests and diseases of bees can you identify? (select all that apply)

- | | |
|--|--|
| <input type="checkbox"/> Varroa mite | <input type="checkbox"/> Asian Hornet |
| <input type="checkbox"/> Tracheal mite | <input type="checkbox"/> Large African hive beetle |
| <input type="checkbox"/> Tropilaelaps mite | <input type="checkbox"/> None of the above |
| <input type="checkbox"/> Deformed Wing Virus | |

22. Which of the following **exotic** bees can you identify? (select all that apply)

- | | |
|--|--|
| <input type="checkbox"/> Asian honey bee | <input type="checkbox"/> Giant honey bee |
| <input type="checkbox"/> Bumblebee | <input type="checkbox"/> None of the above |
| <input type="checkbox"/> Red dwarf honey bee | |

23. In the last 12 months have you inspected your hives for **exotic** pests like Varroa and Tropilaelaps mites using sugar shake, alcohol wash or drone uncapping?

- ☐ Yes
- ☐ No

If not - what were the reasons you did not inspect your hives?

24. What technique did you mainly use to inspect your hives for **exotic** pests like Varroa and Tropilaelaps mites ?

- ☐ Sugar Shake
- ☐ Alcohol Wash
- ☐ Drone Uncapping

25. Which of the following pests and diseases are notifiable in your state and territory?
(select all that apply)

- | | |
|--|---|
| <input type="checkbox"/> American foulbrood | <input type="checkbox"/> Deformed Wing Virus |
| <input type="checkbox"/> European foulbrood | <input type="checkbox"/> Slow Bee Paralysis Virus |
| <input type="checkbox"/> Braula fly | <input type="checkbox"/> Asian honey bee |
| <input type="checkbox"/> Chalkbrood | <input type="checkbox"/> Africanised honey bee |
| <input type="checkbox"/> Nosema | <input type="checkbox"/> Bumblebee |
| <input type="checkbox"/> Small hive beetle | <input type="checkbox"/> Cape honey bee |
| <input type="checkbox"/> Tracheal mite | <input type="checkbox"/> Dwarf honey bee |
| <input type="checkbox"/> Tropilaelaps mite | <input type="checkbox"/> Giant honey bee |
| <input type="checkbox"/> Varroa mite | <input type="checkbox"/> Not sure |
| <input type="checkbox"/> Acute bee paralysis virus | |

26. Who would you contact if you thought you had a notifiable pest or disease in your hive?

- | | |
|---|--|
| <input type="radio"/> Apiary Officer or Bee Biosecurity Officer | <input type="radio"/> Other beekeepers |
| <input type="radio"/> State/territory government department | <input type="radio"/> Other organisation |
| <input type="radio"/> Exotic Plant Pest Hotline | <input type="radio"/> Don't know |
| <input type="radio"/> Beekeeping club/associations | |

27. Do you know what a barrier management system is?

- ☐ Yes
- ☐ No
- ☐ Not sure

28. Do you use a barrier management system?

- ☐ Yes
- ☐ No
- ☐ Not applicable

29. How often do you requeen?

- | | |
|--|---|
| <input type="radio"/> At least once a year | <input type="radio"/> More than three years |
| <input type="radio"/> Every two years | <input type="radio"/> Never |
| <input type="radio"/> Every three years | |

30. Where do you obtain information on pests and diseases? (select all that apply)

- | | |
|--|--|
| <input type="checkbox"/> Friends or other beekeepers | <input type="checkbox"/> Industry magazines |
| <input type="checkbox"/> Books | <input type="checkbox"/> Bee Biosecurity Officers |
| <input type="checkbox"/> Online | <input type="checkbox"/> Australian Honey Bee Industry Council (AHBIC) |
| <input type="checkbox"/> BeeAware website | <input type="checkbox"/> State or territory agriculture department |
| <input type="checkbox"/> Beekeeping associations and clubs | <input type="checkbox"/> Other |

31. How useful do you find each of the following sources of information on pests and diseases

	Not very useful	Moderately useful	Very useful	N/A
Friends/other beekeepers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Books	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Online	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
BeeAware website	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Beekeeping associations and clubs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Industry magazines	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bee Biosecurity Officers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Australian Honey Bee Industry Council (AHBIC)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
State or territory agriculture department	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

32. In what format do you like to receive information? (select all that apply)

- ☐ Face-to-face
- ☐ Hard-copy (handouts, pamphlets, books)
- ☐ Electronically
- ☐ Phone
- ☐ Other format (please specify)

33. What is your age?

- | | |
|-----------------------------|-----------------------------|
| <input type="radio"/> 0-20 | <input type="radio"/> 51-60 |
| <input type="radio"/> 21-30 | <input type="radio"/> 61-70 |
| <input type="radio"/> 31-40 | <input type="radio"/> 71+ |
| <input type="radio"/> 41-50 | |

34. What is your gender?

☐

Male

☐

Female

☐

Other