Australian Government

Rural Industries Research and Development Corporation

Estimating the Potential Public Costs of the Asian Honey Bee Incursion

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by Terry Ryan

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Foreword

One of the crucial issues in developing a response to the Asian Honey Bee incursion in Cairns is determining the appropriate level of industry contributions towards the total cost. The proportion of the costs to be borne by industry can vary between 20 percent and 80 percent, dependent upon the benefit cost analysis. To ensure appropriate proportions of the response are paid it is necessary to identify the public benefits and costs as well as industry benefits and costs.

Beekeepers throughout Australia who rely on the coastal and other high rainfall area eucalyptus forests for production would be beneficiaries of a Response Plan to the Asian Honey Bee incursion, as would industries that depend upon the use of feral and/or managed *Apis mellifera* for pollination services.

This report has two key findings of the potential public costs of the Asian Honey Bee incursion. The costs of public health impacts are conservatively estimated to range from $84,114–$88,637 per 100,000 people. The cost estimates for the public nuisance aspects are estimated to range from $4,580–$33,660 per 100,000 people.

These public costs are an input into determining the contribution of industry to a Response Plan to prevent the Asian Honey Bee becoming endemic. The scale of the identified parameters demonstrates significant public benefits that would arise from an eradication campaign of Asian Honey Bee that are beyond those accruing to the industry itself.

This project was funded from industry revenue which is matched by funds provided by the Australian Government.

This report is an addition to RIRDC's diverse range of over 2000 research publications and it forms part of our Honeybee R&D program, which aims to improve the productivity and profitability of the Australian beekeeping industry through the organisation, funding and management of a research, development and extension program that is both stakeholder and market focused.

Most of RIRDC's publications are available for viewing, free downloading or purchasing online at www.rirdc.gov.au. Purchases can also be made by phoning 1300 634 313.

Peter O'Brien
Managing Director
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Abbreviations

ACIAR	Australian Centre for International Agricultural Research
AHB	Asian Honey Bee (Java haplotype or Apis cerana javana)
AIHW	Australian Institute of Health and Welfare
BEACH	Bettering the Evaluation and Care of Health
CCAHB	Consultative Committee on Asian Honey Bee Eradication
EADRA	Emergency Animal Disease Response Agreement
EPPRD	Emergency Plant Pest Response Deed
GVP	Gross Value of Production
LVP	Local Value of Production

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Executive Summary

What the report is about

The current Asian Honey Bee (AHB) incursion in Cairns is being managed by Biosecurity Queensland and has involved an investment of over $1 million, from initial detection in May 2007 up to 31 December 2009. The response to the incursion to date has not been covered by any current cost sharing arrangements, including the Emergency Animal Disease Response Agreement (EADRA) or the Emergency Plant Pest Response Deed (EPPRD).

The estimated cost of an anticipated Response Plan to prevent the AHB from becoming endemic in Australia, of over $11 million represents approximately 14 percent of the Gross Value of Production (GVP) for the honeybee industry. The EPPRD prescribes that the ‘Agreed Limit’ is calculated using 2 percent of the Local Value of Production (LVP) of the Affected Industry Parties. However, the Deed allows for the ‘Agreed Limit’ to be increased. The GVP of the honeybee industry is estimated as approximately $80 million per annum and the LVP would be approximately $76 million per annum (2007 figures).

One of the crucial issues in developing this Response Plan is determining the appropriate level of industry contributions towards the total cost. The proportion of the costs to be borne by industry can vary between 20 percent and 80 percent, depending upon the outcome of the benefit cost analysis. To ensure appropriate proportions of the response are paid it is necessary to identify the public benefits and costs as well as industry benefits and costs.

This report provides benchmarks for determining and allocating the priced public costs for health and nuisance, for apportioning the appropriate sources of funding of a Response Plan.

Measures of public costs to the environment and other agricultural industries are being developed in a Queensland Government analysis.

Who is the report targeted at?

This report is targeted at government advisers undertaking the benefit cost analysis on the current *Apis cerana javana* incursion at Cairns and the decision-makers who will decide on the level of funding, and by whom, on a Response Plan eradication campaign.

Where are the relevant industries located in Australia

The Australian honeybee industry is distributed throughout Australia and bee farmers are mostly migratory, moving to locations where nectar flows are strongest.

The honeybee industry has approximately 1700 commercial producers.

The science is still to be fully determined of where the Java haplotype or *Apis cerana javana* may become endemic but initial modelling using the Climex model indicates that it could naturalise to tropical and coastal regions in nearly all parts of Australia. Beekeepers throughout Australia who rely on the coastal and other high rainfall area eucalyptus forests for production would be beneficiaries of a Response Plan, as would industries that depend upon the use of feral and/or managed *Apis mellifera* for pollination services.

Background

There is currently an incursion by *Apis cerana javana* at Cairns in Northern Queensland and a Response Plan to prevent its establishment in Australia is being developed.

As part of developing the Response Plan, a benefit cost analysis on the eradication of this bee is to be undertaken. The Queensland Government has responsibility for undertaking the analysis and providing it to a National Consultative Committee on Asian Honey Bees.

The benefit cost analysis will be used to determine the portion of funding levels from industry relative to that from taxpayers.

Aims/objectives

The objective of this report is to provide measures of the priced public costs if the Java haplotype of *Apis cerana javana* becomes endemic in Australia.

This report does not cover unpriced public costs such as effects on native flora and fauna, which would appear to be substantial but difficult to quantify.

Priced public costs include public nuisance, disturbance of social amenities and human heath implication costs.

Methods used

There is very little data on the public nuisance and disturbance of social amenities from existing *Apis mellifera* managed and feral hives. A series of surveys and case studies of different groups with knowledge or experience of particular aspects of the problems was undertaken.

For the measurement of public health issues a review of studies and other information sources that involved the health implications of bee stings was undertaken and used as the basis for deriving estimates of the impacts.

On average, *Apis cerana javana* are expected to replace *Apis mellifera* on a one for one basis. *Apis cerana javana* swarm 2 to 6 times more frequently, and have smaller colony sizes, than *Apis mellifera*. It is therefore assumed there would be greater public nuisance and health costs if *Apis cerana javana* became endemic, even if they replaced the same number of *Apis mellifera*.

The data collected is synthesised to produce estimates of the minimal parameters of public costs if *Apis cerana javana* becomes endemic in Australia.

Results/key findings

Potential public costs if the *Apis cerana javana* becomes endemic in Australia were identified and ranges of parameter estimates were developed.

The costs of public health impacts are conservatively estimated to range from $84,114–$88,637 per 100,000 people. The cost estimates for the public nuisance aspects are estimated to range from $4,580–$33,660 per 100,000 people.

These public costs are an input into determining the contribution of industry to a Response Plan to prevent *Apis cerana javana* becoming endemic. The scale of the identified parameters demonstrates significant public benefits.

Implications for relevant stakeholders

The honeybee industry can demonstrate that there are significant public benefits accruing from an eradication campaign of *Apis cerana javana* that are beyond those accruing to the industry itself.

Policymakers and other stakeholders will be better informed of the range of costs that can accrue to the Australian community from the establishment of *Apis cerana javana*.

Recommendations

The Queensland Government, having carriage of the responsibility of undertaking the benefit cost analysis, use of the estimates developed in this report when developing an overarching Response Plan to prevent the Java haplotype of *Apis cerana javana* from establishing in Australia.

Introduction

There is currently an incursion of the Asian Honey Bee (*Apis cerana javana*) at Cairns in far north Queensland and a Response Plan is now being developed to prevent its establishment in Australia.

This type of AHB strain of (hereafter referred to as *Apis cerana javana*) is native to Java, Indonesia, but is now regarded as an invasive pest species in Papua New Guinea (PNG) and the Solomon Islands. Studies on the bee in its new invasive range show that it is not able to be domesticated and its pollination activity cannot be controlled for managed pollination services. The bee produces little honey themselves but will rob honey from European Honeybees (*Apis mellifera*) causing significant colony losses, reduction in commercial honey production and reduced managed pollination services (Anderson, 2004).

In addition to its impact on honey production and pollination services, *Apis cerana javana* is also a threat to social amenity, establishing nests in cavities in houses and creating a nuisance in urban areas. It also has an impact on the environment through forcing native insects and mammals out of their natural nesting sites and by competing for food resources.

There are many unknowns about the ecological niches where *Apis cerana javana* can outcompete *Apis mellifera* in Australia. Experience in different environments in Papua New Guinea, tropical lowlands and temperate highlands, and the Solomon Islands indicate that it could be very competitive in many parts of Australia. Its foraging ability relative to *Apis mellifera* is unknown but it has annihilated the Solomon Islands *Apis mellifera* based industry in outcompeting it for resources. Anderson (2010) supports the assumption that it is reasonable to assume a direct replacement of the two species on a bee for bee basis. With direct replacement of *Apis mellifera* bees by *Apis cerana javana* bees on a one for one basis, the smaller colony sizes and greater propensity to swarm will lead to more nests and more swarms of *Apis cerana javana* relative to *Apis mellifera* and therefore have a greater impact on public nuisance and public health costs.

AHB, as a pest species, is not listed under any cost sharing response deed. The current incursion at Cairns is being managed by Biosecurity Queensland in accordance with the Emergency Plant Pest Response Deed (EPPRD) even though the Response is not covered by any current cost sharing arrangements, including the Emergency Animal Disease Response Agreement (EADRA) or the EPPRD.

As part of the EPPRD process of developing a Response Plan to prevent *Apis cerana javana* from establishing in Australia, a benefit cost analysis on its eradication is to be undertaken. The Queensland Government has responsibility for undertaking the analysis. It is foreshadowed that the Queensland Government will use existing databases and studies for modelling the impact of the bee on agricultural industries should it become established.

Biosecurity Queensland is seeking national cost-sharing for the eradication of *Apis cerana javana* under the EPPRD. Under the rules, an economic analysis is required to support the case for eradication. This is to be provided to a national Consultative Committee on Asian Honey Bee (CCAHB).

The proportions of industry funding under EPPRD can vary from 20 percent industry and 80 percent government to 80 percent industry and 20 percent government. The modelling exercise is to develop estimates of the priced public benefits that accrue from an eradication programme.

The Australian honeybee industry regards this benefit cost analysis as a crucial element in ensuring the long-term economic health of its industry.

This report will be presented to the Queensland Government as a submission assisting in their development of models for examination of the overall costs of *Apis cerana javana* becoming endemic in Australia. To reduce overlap and because of the speed required for the analysis, the Queensland Government is utilising existing models and analyses such as the RIRDC commissioned report from the CIE on pollination benefits for the honeybee industry.

Objectives

The objectives of this report are to estimate the increases in priced public health costs and priced public nuisance costs from *Apis cerana javana* becoming endemic in Australia.

Methodology

There is very little data on the public nuisance and disturbance of social amenities from existing *Apis mellifera* managed and feral colonies. A series of surveys of different groups with knowledge of particular aspects of the problems was undertaken. This was to provide a baseline of existing impacts of *Apis mellifera* in Australia to assess the increased impacts from *Apis cerana javana* becoming endemic. *Apis cerana javana* has characteristics similar to *Apis mellifera* except generally smaller colony sizes, greater propensity to swarm and they are unable to be managed.

Specific requests were made to various government authorities, Commonwealth, State and local governments to obtain specific information. In many cases little information was available.

The Australian and international literature on colony densities was reviewed to assess the reliability of survey results and other information received. Definite conclusions could not be drawn on the existing numbers of potential colonies in Australia. The information is presented in Appendix 1.

For the measurement of public health issues a review of studies and other information sources that involved the health implications of bee stings was undertaken, utilizing data held by public and academic organisations.

The data collected was synthesised to produce estimates of the minimal parameters of priced public costs if *Apis cerana javana* became endemic in Australia.

1. Public Nuisance Costs

1.1 Introduction

This chapter provides estimates of some of the existing costs of *Apis mellifera* swarms and hives as a public nuisance. Public nuisance costs arise from the damage and discomfort for people affected. These costs can include items such as removal or extermination of swarms or hives from private residences and buildings for private individuals and businesses. Removal of hives and swarms from public buildings or facilities are also an additional cost for local governments and their ratepayers.

Not all public nuisance costs can be estimated and there is very limited data on many existing identifiable costs. This study establishes magnitudes of some of the known public nuisance costs that can be estimated for existing *Apis mellifera* colonies and swarms in Australia.

The estimates of this existing cost base are necessary to determine the additional cost impacts of *Apis cerana javana* becoming endemic in Australia.

1.2 Swarm collection costs

Swarms are not inherently dangerous as this is when the bees are seeking a new location to establish a nest. They are usually quite gentle at this stage. Public fears and consequent inappropriate methods of driving them off can cause stinging attacks in some cases. Beekeepers can usually handle them without danger to themselves or the public.

Though not a problem as such, swarms are the precursor to the establishment of new nests where public nuisance aspects can be a problem if the nests are in buildings or near buildings and other structures used by the public. The establishment of nests in such locations can lead to stinging by bees as they attempt to defend their colonies.

Bee colonies in managed hives have much lower rates of swarming than feral *Apis mellifera* colonies. Many bee colonies in managed hives have been selected from breeding programs that reduce their swarming tendencies and, because they are managed, the conditions that encourage swarming are reduced. For example, hives size is not a constraint on the size of the bee colony, as beekeepers are regularly removing honey or bees or adding additional boxes. Also most colonies in these hives are regularly requeened.

It is therefore most probable that the great majority of swarms come from feral *Apis mellifera* hives In the New South Wales Government Inquiry into Urban Beekeeping, it was noted in one submission that a pest exterminator said that 95 percent of the swarms that he removed were from feral hives not managed hives. There was no other supporting data for this statement.

In the majority of cases in Australia, swarms of *Apis mellifera* are collected free of charge by beekeepers on private properties Apart from the public service and helpful neighbour attributes displayed by beekeepers there is a value, in many cases, to beekeepers from the free or nominal charge collection of swarms.

In many communities, beekeepers are willing to undertake this role and in some places are expected to undertake it. It can be demonstrated that there is usually little to no financial cost to the community in many cases because of beekeeper removal of hives and swarms. The current circumstances of limited financial cost to the community are unlikely to apply for *Apis cerana javana*, as beekeepers will not be able to hive this bee and thus gain some benefit from collecting swarms. A future cost base with

Apis cerana javana endemic will have to take into account these costs on the basis of full commercial payment to professional exterminators, unlike in the current circumstances.

Existing datasets on swarms are individually limited and there are huge gaps in coverage for determining costs from total number of swarms, collection costs and other ancillary costs such as "building costs".

The New South Wales Government runs an 1800 telephone number for public reporting of swarms. In 2009 there were 120 enquiries. These enquiries are in the first case directed to beekeepers as a first reference point.

There is also an Amateur Beekeepers Association of NSW website with seven participating clubs or branches covering mostly coastal regions from south of Sydney to the mid North Coast which directs people to local beekeepers in their area for removal of swarms. In 2009 there were approximately 1,000 hits on the swarm enquiry tab. Households with swarms using this website were able to obtain contact details for appropriate local beekeepers by entering their Postcode on the website. There were 35 beekeepers registered on their Beekeepers Association website for collecting swarms and the beekeeper running the site collected 14 swarms himself in 2009.

If these 14 swarms was the average for all beekeepers registered on this site then approximately 500 swarms are captured each year by this group alone. There are also other amateur beekeeper associations that are not part of this site that are regularly referred to for swarm removal by local councils. As well, many professional beekeepers are also utilised by local governments, for example the Midwestern Regional Council in New South Wales provided the contact details for local professional beekeepers on their website. There are also many informal arrangements where affected people directly approach beekeepers for the removal of swarms.

As an order of magnitude it is possible to say conservatively that approximately 1000 swarms are removed each year in New South Wales, with a very large proportion of them collected free of charge or at a nominal cost. Extrapolating out to Australia would indicate that there could be of the order of 3,000 swarms removed each year again where many of them are not priced or very lowly priced collections by beekeepers.

There are also some datasets for Queensland from their 1 800 number and the experience in Cairns from dealing with the current *Apis cerana javana* incursion.

The Queensland Government call service for swarms recorded 427 calls in 2009.This is an understatement of the number of calls as people in the Cairns district rang directly through to the office there and did not go through the Queensland Government number.

Many local governments refer directly to beekeepers for collection of swarms and thus do not go through the government 1 800 number. Also professional pest exterminators are called in regularly by private individuals as is done elsewhere in Australia.

On the assumption of at least 500 swarms removed each year in Queensland, this extrapolates to a national total of 2,500 per year in Australia.

1.3 Case study – ACT swarm collection

A case study of swarm collection numbers as a demonstration of potential future cost bases was also undertaken in the ACT.

Canberra has some ecological and geographic characteristics that are different to many other parts of Australia in that it is a highly dispersed city with large areas of eucalyptus forests and other vegetated areas interspersed between the suburbs. It would therefore be expected to have a higher than average swarm rate compared to most other cities. However, some parts of other metropolitan areas such as the Blue Mountains residential areas near Sydney would be of a comparable character to Canberra.

There are two swarm collection lists operating in the ACT for residents to obtain removal of swarms and hives from their private residences. One list is run by a local beekeeping supplies store and another by the Beekeepers Association of the ACT. There was an overlap between the two lists.

A telephone survey was conducted of the members of the Beekeepers Association of the ACT who were on their swarm list on their website. There were a total of 14 members on the list. All 14 members were able to be contacted and responded. In 2008–09, 386 swarms or colonies were collected by the members approached on this list. 2008–09 was held to be a very much an above average year for the number of swarms collected. This will be an underestimate of the numbers of swarms collected or exterminated as not all beekeepers in the ACT were contacted. Beekeepers on the private company list, who volunteered to collect swarms, were not contacted. Nor are there any estimates for swarms collected under private arrangements with individual beekeepers not on any list, or exterminated by private pest exterminators.

Some interviewees on the survey volunteered that there were numbers of feral nests in their local area which they would not attempt to remove because of safety and other factors.

Swarm number collections in Canberra are likely to be much higher than in most other metropolitan regions of Australia but provide an estimate of potential higher level costs for similar types of regions in Australia. Extrapolating this to an Australia wide figure on the conservative assumption of one swarm per thousand residents leads to an Australia wide total of 22,000 swarms per year.

Swarms were not collected from public grounds or facilities because the members of the Beekeepers Association were warned not to collect them because of public liability insurance issues.

The ACT Government is responsible for removal of swarms and nests on public lands and buildings and in 2008–09, 15 feral colonies and six swarms were removed. In this financial year, 12 feral colonies and two swarms have been removed. Averaged over the two years this comes to 17.5 removals per year that would extrapolate to approximately 1100 swarms and nests per year on an Australian basis for removal of swarms and the nests from public properties.

1.4 Pest exterminator costs

Professional pest exterminators are also called in to undertake eradications on nests in houses and on public lands. There is no comprehensive data collection for the private usage of these services.

A phone survey of 10 pest exterminators, randomly selected and available to answer questions, in Sydney, Melbourne and Brisbane found three prepared to undertake extermination work on honeybees and one beekeeper/registered pest exterminator who would undertake removal as well. In discussions most said there was a general reluctance to undertake this and it is best exemplified by the following quote from a pest exterminator website:

> "Physically removing an established colony of bees from a wall void, chimney or hollow tree is possible, but considering factors of safety to the public, operator or apiarist, in most cases, it is not economical or practical to try and perform this task, as sections of the wall, chimney or tree would need to be removed. The comb inside is then cut out and placed in boxes, and at this point, the bees become very aggressive and it is impossible to ensure the safety of the public. These days, this task would not be attempted by a professional apiarist, Pest Control Operator or other, as the bees themselves are of no commercial value and in most cases, the honey collected would be of low quality."

Many of the pest exterminators contacted say much the same thing but not as publicly. No data is available on the number of exterminations of nests and swarms by professional pest exterminators. It is undertaken by some of them but not all.

The spokesman for the New South Wales Amateur Beekeepers Association also made the observation that beekeepers do not do "building work" and that in his experience about 20 percent of all calls require this."Building work" is the removal of established nests from the cavities of buildings as opposed to the collection of swarms of bees which are usually hanging in the open on a tree and have not commenced building comb.

The data from Cairns shows that seven of the incidents or approximately 10 percent could require building work, even if not undertaken.

1.5 Case Study – Local Government Costs

As a case study of the costs to local government from swarm and colony removal, the local government area of Victoria Park, an inner suburban area of Perth provides one dataset. This council was chosen as it was found to be the only one with data that could be extracted specifically related to the costs of colony and swarm removals. Council officials stated that they did not think that they had a problem with bees or that their council was any different to other metropolitan councils in Perth. There are no known reasons as to why this Council area is different to any other council area in being subject to unusual numbers of swarms, colonies or any other incidents relating to bees.

Table 1 Case study – Local Government Costs of Swarm and colony removal – Town of Victoria Park, Western Australia

	2009	2008	2007	2006
Number of incidents	8	17	15	11
Total cost($)	1,904	3,727	2,855	1,829
Average cost($)	238	219	190	166

Source: Town of Victoria Park, 2010, http://www.vicpark.ws/council/minutes/ (various issues**)**

Table 1 illustrates the costs for a not untypical local government of existing eradications and controls on bee swarms and colonies on council lands only, such as parks and verges, and not in private residences or buildings. The council makes it explicit to residents that they are responsible for removal of nests and swarms on private property. This local government area had a population of 29,500 at the 2006 census and an area of 17.9 km² with a budget last financial year of $20.8 million. The total cost of bee swarms and nest removal of $1904 would barely be noticed in such a budget.

This is an average of 12.75 swarm or nest removals per year for a population of approximately 30,000.

1.6 Cost estimation

A telephone survey of pest exterminators provided estimates for killing colonies but not removing them at about $200. Prices quoted ranged from $175 to $200. None quoted for removal of colonies. The beekeeper/exterminator provided a range of prices for removal in different circumstances. If it was a swarm or nest outside a house, in the garden etc price quoted was $0–$150. If it was on or in a house with easy access to the nest, the price range quoted was $150–$500. If it was a more difficult removal such as from a chimney or two-storey house, the price range quoted was $500–$2,500. The exterminator said the price range would be refined on viewing the affected location. An additional example of prices for such work is a quote for removal of a nest in a chimney in the ACT which was in the range $2,500–$3,000.

Another factor on which a cost cannot be estimated is the problem caused by the killing of feral colonies in situ. Whilst the immediate threat posed by the bees has passed, there are the consequent problems of smell associated with the decaying dead bees and the possible seeping of honey into the house. As there are no bees left in the nest, the honey will not now be heat regulated and it will heat and start to ooze away from the current site. This will cause a problem for the owner and may require costs in cleaning up the sticky mess.

Also, as there is now no moisture regulation in the nest since the bees have been destroyed, the honey could start to ferment and produce a nasty smell. Unless steps are taken to seal off the access to the former nest, there will be robber bees out to collect the honey from the destroyed nest and this activity could be interpreted by the occupier as meaning the nest has not been destroyed. This will result in unnecessary call backs of the pest control person plus added anxiety for the home occupier. This has been known to happen as in one case in the ACT an exterminator was brought back three times in three years to kill a colony until building work was undertaken for its complete removal.

Removal costs of nests may not prove to be a major factor if people are willing to put up with some short-term inconvenience after their extermination and have managed to effectively seal off the nest which is likely to entail additional cost.

In some cases, other insects such as ants will remove the honey and wax moths can remove the honeycomb. In public buildings and houses where there is seepage before other insects can do the removal there can be additional costs from the required "building work".

1.7 Building costs

There is very little data on the extent of "building costs" for removing bee nests. The Cairns data shows that approximately 10 percent of the incidents in the current *Apis cerana javana* incursion involve buildings. Pest exterminators and beekeepers collecting swarms anecdotally report rates of 10 to 20 percent of jobs they deal with involve building work. Indicative costs are that these kinds of jobs will have a minimum cost of at least $500.

Even a five percent occurrence at a minimum price of $500 would significantly increase the level of public nuisance costs for both private individuals and governments responsible for removing nests on public facilities.

In establishing a baseline cost for these public nuisance costs of nest and swarm removal for *Apis cerana javana* becoming endemic, the existing costs paid are not appropriate. As noted, many of these public nuisance costs are now dealt with through non-priced mechanisms such as the free removal of swarms and nests by beekeepers who obtain a benefit from their collection. If there is a reasonable proportion, not necessarily a majority, of swarms that are *Apis cerana javana* rather than *Apis mellifera,* beekeepers are very unlikely to be as willing to travel and visit and collect these swarms as there is no advantage to them. They are all likely to become fully priced removals by professional pest exterminators.

As there is a reluctance to deal with current bee swarms and nests amongst the pest exterminator fraternity and a diminuition of the supply of beekeepers willing to offer a free or nominal service in this regard, there would expect to be price increases for removal and extermination of bee swarms and nests. This has not been estimated.

Estimating the cost increases for this public nuisance will therefore be a function of the prices required for extermination and removal and the increased quantity of swarms and nests likely from

Apis cerana javana relative to *Apis mellifera.* Biosecurity Queensland has provided information that the current incursion of *Apis cerana javana* swarms at the rate of 2 to 6 times the frequency of *Apis mellifera*.

1.8 Other Public Nuisance Costs

Other public nuisance costs such as veterinary fees for bee stings on dogs and cats have not been estimated. Dogs and cats have also been found to suffer from anaphylaxis due to bee stings. There are regular reports of stings for these animals, however, many can be attributed to European wasps that feed on dog and cat food. European wasps for many laypeople are indistinguishable from honeybees. Stings from bees are more likely at water bowls. Increases in stings due to bees for these animals are likely but from an unknown but probably low base.

1.9 Estimating the extent of the existing public nuisance problems from *Apis mellifera*

To establish the extent of increases in costs from an *Apis cerana javana* incursion becoming endemic, a baseline of existing costs incurred by the existing colonies of *Apis mellifera* needs to be established. The effects of the increased propensity to swarm of *Apis Cerana javana* can therefore be estimated.

Table 2 provides a summary of the existing known public data on the extent of swarms and hives from different data sources within Australia. There is very little information that can be easily collated to provide a summary of the extent of the existing problems. Best estimates need to be derived from the existing data but must be treated with caution. However, in the absence of appropriate information it is necessary to still make the best estimates on known data to ensure good policy outcomes.

Table 2 Estimates of Swarm and Hive Collections – Australia 2009

Source	Number	Australia
NSW 1800 number	120	360
NSW Amateur Beekeepers Association		
- webpage	1,000	3,000
- collections sample	490	1,500
Queensland Government Hotline	427	2,500
Victoria Park, WA	12.75	9,350
ACT private swarm collection	376	22,000
ACT Government	17.5	1,100

Source: NSW, Qld and ACT Governments, Town of Victoria Park, Amateur Beekeepers Association of New South Wales and Beekeepers Association of the ACT

The NSW numbers are not competing estimates but complementary and the most reasonable estimate would be of the order of at least 1,000 swarms collected in 2009 with an Australian estimate of 3,000 swarms. These estimates exclude swarms killed by professional pest exterminators which have not been able to be estimated. The Queensland estimates are also relatively consistent with the NSW estimates but apply only to private properties and exclude swarms on all public lands. Again there are no estimates for swarms killed by professional pest exterminators.

The estimates extrapolated for Australia are based upon relative population sizes and not geographic areas. As the public nuisance aspects affect people this is the better measure rather than using area.

The estimates for local government costs from the Victoria Park case study are an average of the last four years of incidents reported in the council accounts. They are extrapolated to the rest of Australia on the basis of total population. The Victoria Park estimates apply to swarm removal and nest removal but only on council properties and therefore the assumption is that other local government areas in the classification of the urban area share similar. This will greatly understate the total costs as it applies only to local government properties and no private property. The actual average cost paid by the Council last financial year for swarm and nest removal is used for estimating the costs for public lands. This is slightly higher than the quotes provided for swarm removal by pest exterminators though it does not adjust for any additional costs such as "building costs" that would occur in some actual situations.

Table 3 Estimating Public Nuisance Baseline Costs from European Honeybees

	Number of cases	Unit cost($)	Total($m)
Private lands			
- low scenario	3,000	200	0.60
- high scenario	22,000	200	4.40
Public lands			
- low scenario	1,100	238	0.26
- high scenario	9,350	238	2.23
Building costs –low range	205	500	0.10

These estimates are provided as indications from the currently best available sources of the existing costs of *Apis mellifera* as a public nuisance. The costs on private lands are held to be low because many of the swarms are removed by beekeepers at a low or nominal cost. There will be some payments to pest exterminators but they tend to work on existing hives rather than swarms. If *Apis cerana javana* becomes endemic this free service will likely disappear completely. The actual costs are likely to be higher than those provided here as the numbers of colonies and swarms dealt with by pest exterminators are not included.

1.10 Costs per 100,000 of the population

To assist in the modelling of the effects of the spread of *Apis cerana javana*, costing for public nuisance removal of swarms and nests are estimated per 100,000 people likely to be exposed to *Apis cerana javana*.

Private land costs are priced in this exercise at $200 per swarm as is commonly charged by pest exterminators, even though many are now collected free of charge. "Building costs" are provided for private residents at a minimal estimate of $500 per occurrence at a 5 percent frequency rate as an indicative estimate only. The cost ranges will understate the true extent of total costs faced for existing *Apis mellifera* nests and swarms and the impact of an increase in the number of swarms and nests from *Apis cerana javana*.

Table 4 Estimated Public Nuisance Costs per 100,000 people ($)

	Low range	High range
Private lands	2,700	20,000
Public lands	1,410	10,100
Additional “Building costs” at 5 % occurrence	470	3,560

2. Public Health Costs

2.1 Introduction

This chapter provides estimates of some of the existing costs of *Apis mellifera* on public health in Australia. The estimates of this existing cost base are necessary to determine the additional cost impacts of *Apis cerana javana* becoming endemic in Australia because, as noted previously *Apis cerana* has a greater propensity to swarm. Appendix 1 provides information on the smaller average colony size of *Apis cerana* relative to *Apis mellifera* and therefore the increased colony density and potential for increased bee stings..

As noted previously, swarms are the precursor to the establishment of new nests where public health aspects can be a problem if the nests are in buildings or near buildings and other structures used by the public. The establishment of nests in such locations can lead to stinging by bees as they attempt to defend their colonies. Public health incidents due to stinging are much more likely from the presence of hives rather than swarms.

Public health costs are due to the direct costs of deaths, hospitalisations, medical practitioner visits, pharmaceutical medications and sick leave/workers compensation costs from bee stings. There are also indirect costs of venom allergy treatments and additional purchases of anti allergy medicines. Additional costs can include those of pain and suffering from the effects of bee stings.

There are very few directly collected measures of the current and past public health costs due stings from existing *Apis mellifera* nests, both managed and feral. However there is information that allows indirect estimates of some of the public health costs being currently incurred in Australia. Not all these costs can be measured. Therefore the estimates provided will be under estimates of the true existing baseline cost.

The population base for serious medical intervention requirements for treatment of bee stings is large. According to The Australasian Society of Clinical Immunology and Allergy up to 3 percent of an exposed population may give a history of immediate systemic allergic reaction to an insect sting. This is over 600,000 Australians who are potentially subject to this condition. Even for those without this condition, they will have pain and suffering costs and utilise public health facilities for treatment but with lower venom reaction and expense outcomes.

The Queensland Government has stated that *Apis cerana javana* is "aggressive and will sting people" in its warning alerts to citizens. An academic study from 1985 titled “A Simple Pain Scale for Field Comparison of Hymenopterans Stings” published in the Journal of Entomological Science, on a four point scale of severity ranked both *Apis mellifera* and *Apis cerana* as equal.

It is assumed that both types of bee would have similar impact on hospitalisation rates and medical practitioner visits.

2.2 Hospitalisation costs

The Australian Institute Of Health and Welfare (AIHW) published in 2008 a study on “Venomous bites and stings in Australia to 2005". One of the conclusions of this report was that in the study period of 2002 to 2005 there were 2,754 hospitalisations due to bee stings or 918 per year over the study period. This equates to a hospitalisation rate of 4.6 per 100,000. Adjusting for today's population this is equivalent to 1012 per year. The average stay in hospital was 1.2 days.

Other information was collected for hospitalisations related to other insects such as wasps, hornets and ants to provide a relative ranking of the volume and severity of insect stings and bites on the Australian population. Bee stings were by far the most dominant form of insect bite, accounting for 70.5 percent of hospitalisations from all insects as shown in Table 5.

Table 5 Proportions of All Hospitalisations Due to Insect Stings – Australian Institute of Health and Welfare: 2002–2005

Insect	Number	Proportion
Bees	2,754	70.5
Wasps	793	20.3
Hornets	10	0.2
Ants	347	8.9
Total	3,904	100

Source: AIHW, Venomous bites and stings in Australia to 2005, 2008

Hospitalisation costs were not provided in the AIHW study. In a study for the Australasian Society of Clinical Immunology and Allergy titled "The Economic Impact of Allergic Disease" by Access Economics, costs of hospitalisations for allergic reactions were provided. The most common reason for hospitalisation due to bee stings is from anaphylactic shock or allergic reactions. Data is not available for direct costs of bee sting hospitalisations but the study's costing of all allergic reaction hospitalisation costs provides a proxy that provides an indication of the costs of hospitalisation arising from bee stings. In 2005, Access Economics estimated the cost per separation for allergic reactions in public hospitals was $1235 in 2005 dollars. Indexing this by the CPI, which understates the relatively higher rate of price inflation of health and medical services, provides an estimated cost in 2008–09 dollars of $1,355 per hospitalisation.

2.3 Medical costs

The AIHW study only looked at the hospitalisation impacts of insect stings and not visits to medical practitioners.

There is no overall data of general practitioner patients involving bee stings. However there is a survey from the Australian GP Statistics and Classifications Centre at the University of Sydney from the BEACH (Bettering the Evaluation and Care of Health) program. This survey was conducted between April 2007 and March 2009. The data was not directly comparable with the Australian Institute of Health and Welfare study and though bee stings were specifically included as a category for case management, most insect bites were not allocated between types of insect.

In the survey there were 312 insect bites and stings managed of which 25 were directly attributable to bees and another 15 to mosquitoes for directly attributable insect bites and stings. All others were unspecified as to type of insect. Full details are shown in Table 6.

This unspecified insect bite data was allocated according to the categories in the Australian Institute of Health and Welfare Report with the relative weightings determined by the hospital admission cases for all insects in that study as shown in Table 5.

Table 6 **Estimates of visits to General Practitioners for treatment of bee stings from the BEACH General Practitioners Survey**

Category	Number	Percentage	Total Australia
Total bites and stings	426	100.0	240,000
Total insect bites	312	73.2	176,000
Identified Bee stings	25	5.9	14,000
Unattributed insect stings	272	63.8	153,000
- Proportion of unattributed due to Bee stings	192	45.1	108,000
Total Bee stings	217	50.9	122,000

Source: BEACH, 2009

The BEACH study on bites and stings when extrapolated to Australia showed that general practitioners averaged just over two contacts with patients for bites and stings cases in every 1000 encounters in the program or, according to the study, approximately 240,000 professional attendances on general practitioners per year. This is consistent with the total of 111.4 million visits to general practitioners in 2008–09. According to the percentages in the BEACH survey, insects would account for 176,000 visits. Adjusting the total unspecified insect aggregation according to the percentages of hospitalisations arising from the AIHW report reduces this to 122,000 visits to general practitioners in 2008–09 for bee stings.

Specific cost data is not available for the costs of these medical services. The average cost per visit under Medicare to general practitioners was $40.90 in 2008 - 09. This figure understates any additional payments made by patients above the Medicare rate and does not take into account the differing composition of duration of visits to general practitioners. There is no information on average duration or average type of service provided for patients suffering from bee stings. This totalled $5 million.

An additional cost in the medical area was that for pharmaceutical products prescribed by doctors. In the study over 92 percent of the insect bites and stings managed were prescribed medications. Details of the identified pharmaceutical prescriptions and their rates of usage are provided in table 7. Not all medications were identified so this is an underestimate of the total pharmaceutical costs arising from existing bee sting cases. Prices for the pharmaceuticals were taken for generic brands from epharmacy.com.au. Prices at local pharmacies could be higher. It is also assumed that bee sting pharmaceutical prescriptions are of the same proportion as prescriptions for all insect bites. If the unidentified pharmaceutical prescriptions are allocated according to the relative proportions of identified pharmaceuticals then there would be an additional 63,400 prescriptions at an average cost of $9.23 totalling an additional public health cost of $0.63 million.

Table 7 Estimates of the Number of Identified Pharmacy Prescriptions for Australia

Medication	Proportion	Australia
Cephaxelin	11.9	14,500
Loratidine	8.7	10,600
Mometasone	7.7	9,400
Hydrocortisone topical	7.4	9,000

Source: BEACH, 2009

2.4 Estimates of Direct Public Health Costs

From the datasets for hospitals and general practitioners and average prices, the direct public health costs come to a minimum identified cost of $6.77 million per annum (Table 8). As a high range estimate pharmaceutical costs would increase by $0.63 million for the unallocated pharmaceutical estimates.

These estimates will be underestimates because many costs have not been included and extremely conservative assumptions have been used in deriving them. Only identifiable and measurable costs are included in deriving the estimates.

Table 8 Estimates Of Direct Public Health Costs – 2008–09

Category	Number	Unit cost($)	Total cost($m)
Hospitalisations	1,012	1,355	1.37
General practitioner visits	122,000	40.90	4.99
Medications prescribed			
- Cephaxelin	14,500	6.99	0.10
- Loratidine	10,600	9.95	0.11
- Mometasone	9,400	11.35	0.11
- Hydrocortisone topical	9,000	9.69	0.09
- Unidentified prescriptions	63,400	9.23	0.63
Total cost			7.40

Source: derived from BEACH and AIHW

2.5 Workers compensation/sick leave costs

An indirect cost of the effects of bee stings is the time off work due to sickness. If stinging incidents occur during work time they can generally be claimed on workers compensation where estimates can be made of the magnitude of financial costs.

If people are not in the workforce or engaging in leisure activities there are costs for the individual but these are not estimated.

Australia Post has provided details of workers compensation costs for its postal delivery workers from bee stings in the period 2002 to 2004. There were 280 incidents with a loss of 21.7 work days. This is equivalent to 0.0775 work days lost per bee sting incident. It should be noted that a swarm of *Apis cerana javana* was found in a letterbox in Cairns.

The AIHW in its 2002 to 2005 study of the bee sting hospitalisations found that 4.8 percent of those hospitalised, or 131, were working for income at the time of sting. Unspecified activities accounted for 77.1 percent of all hospitalised bee sting cases. If the same ratio of 21 percent of people working for an income as a proportion of all those identified as undertaking a specific activities was applied to the number of hospitalisations in the unspecified category, then an additional 445 people would have been hospitalised. A range of 131 to 576 people were hospitalised due to bee stings while undertaking paid work (Table 9).

Applying the high and low ratios per year for hospitalisations, to general practitioner visits for bee stings, leads to an estimation of a range between 5900 and 25,600 people affected. Using the ratio of 0.0775 work days lost per bee sting derived from Australia Post this would be a range of 450 to 1,980 days lost due to bee stings (Table 9). Current average weekly earnings for all employees, private and public sector, full-time and part-time is $938 per week. From the data in Table 5, which shows proportion of insect stings due to bees, the total existing costs from *Apis mellifera* stings are estimated at $480,000 per year.

Table 9 Estimation of Workers Compensation/Sick Leave Costs

	Hospitalisation Incidence		**Medical practitioner incidence**	
	Low range estimate	**High range estimate**	**Low range estimate**	**High range estimate**
Number affected	131	476	5,856	25,600
Average Duration of time off work	1.2	1.2	0.0775	0.0775
Work days lost	157	571	450	1,980
Average weekly earnings per day $	188	188	188	188
Total cost $'000	29	107	85	372

Source: ABS and derived from Australia Post data

2.6 Morbidity rates

An average of 2.2 people died from the effects of bee stings in Australia per year over the last 20 years. This is a rate of 0.12 per million of the population per year.(Canyon et al 2001)

Access Economics in their study on allergic reactions estimated a statistical life cost in Australia of $3.7 million (in 2003 dollars) per life. Inflating this rate by the CPI leads to a cost in today's dollars of $4.4 million per life. The current baseline cost for beestings morbidity from existing *Apis mellifera* bee stings is therefore $11.6 million.

2.7 Other Health Costs

There are other public health costs which arise from bee stings but have not been able to be estimated.

In the New South Wales Government report on Urban Beekeeping (2000), the Royal North Shore Hospital stated that "Most teaching hospitals in Australia would have 20–30 people receiving venom immunotherapy (bee, wasp or European wasp). At Royal North Shore Hospital, bee venom allergy is the commonest venom allergy for which patients are receiving treatment." The extent and costs of these have not been estimated or the likely increase in demand if *Apis cerana javana* becomes endemic.

Other costs such as increasing demand for products such as EpiPen as emergency equipment for dealing with anaphylactic shocks have also not been estimated. If usage of products such as these increase, the recurring cost will also increase as the current product range have a maximum shelf life of three years.

There is also the potential costs of how much would people pay to avoid the pain and suffering from a bee sting. Even if costed at a nominal $20 per sting, this would add to a significant sum. This has not been estimated in this report.

2.8 Costs per 100,000 of the population

To assist in the modelling of the effects of the spread of *Apis cerana javana*, costings for the different categories of public health costs are estimated per 100,000 people likely to be exposed to the increased likelihood of stings by *Apis cerana javana.*

Table 10 Estimated Public Health Costs in dollars per 100,000 people ($)

	Low range	High range
Morbidity	52,800	52,800
Hospitalisation	6,233	6,233
General practitioners	22,700	22,700
Pharmaceuticals	1,863	4,727
Workers compensation	518	2,177
Total cost	84,114	88,637

3. Results

The following estimates of parameters can be utilised in the Queensland Government modelling of the cost scenarios if *Apis cerana javana* becomes endemic. Because of the paucity of information on certain of the aspects, high and low ranges of possible costs are provided.

3.1 Public Health Costs

The two major variables that are required for providing detailed estimates are:

- the population in regions likely to be affected; and
- the increase in the number of stings related to the expected increase in colony density where *Apis cerana* replaces *Apis mellifera* in the affected regions.

These two variables are multiplied to provide an impact factor on the population which can then be applied to the specific individual health cost parameters.

For purposes of the modelling, the variables provided are in terms of 100,000 people affected.

Parameters

Morbidity

- Rate 0.012 deaths
- Cost $52,800

Hospitalisation

- Rate 4.6 hospitalisations
- Cost $6,233

General practitioners

- Rate 550 visits
- Cost $22,700

Pharmaceuticals

- Rate 198 identified prescriptions and 288 unidentified prescriptions
- Cost range $1,863–$4,727

Workers Compensation/Sick Leave

- Rate 27–118 days lost
- Cost Range $518–$2,177

The baseline Public Health Costs for determining the impact of *Apis cerana javana* will be in the range of $84,114–$88,637 per 100,000 people. Estimates of the increased colony density of *Apis cerana javana relative* to will enable the incremental costs to be calculated.

3.2 Public Nuisance Costs

The two major variables required for providing detailed estimates in this category are:

- the population in regions likely to be affected; and
- the increase in the number of swarms of *Apis cerana javana* relative to in the affected regions.

Again these two variables are multiplied to provide an impact factor on the population which can then be applied to the specific public nuisance parameters. Again the purposes of modelling the variables provided are in terms of 100,000 people affected.

Parameters

Private land, swarm and colony removal

- Rate 13.5–100
- Cost Range $2,700–$20,000

Building cost

- Rate 0.9–7.1
- Cost Range $470–$3,560

Public lands and facilities

- Rate 6–40
- Cost Range $1,410–$10,100

The baseline Public Nuisance Costs range between $4,580 and $33,660 per 100,000 people. Using the increased swarm density estimates of *Apis cerana javana* relative to *Apis mellifera* provided by Biosecurity Queensland will allow estimates of the potential orders of magnitudes of additional costs that could be incurred.

All parameter values can be utilised to provide reasonable orders of magnitude estimates of the potential impact of *Apis cerana javana* on the public costs to the community.

Implications

The parameters developed in the estimates of public nuisance and public health costs from *Apis cerana javana* becoming endemic, are significant in their own right. The parameters can also inform policy modellers and decision-makers of additional costs in not undertaking an eradication campaign.

Recommendations

The model parameters developed in this paper should be utilised by the Queensland Government in its modelling for the benefit cost analysis for the eradication of the Asian Honey Bee.

Appendix 1. Colony Numbers and Sizes

1 Estimating the Colony Population of Australia

To help in the estimation of the impact of *Apis cerana javana* it would be ideal to have good estimates of the existing stock of *Apis mellifera* colonies, both managed and feral. The numbers of swarms and nests emanating from these colonies will be a function of this existing stock. The related changes in public health and public nuisance costs will therefore be able to be calculated from expected changes in the numbers of nests and swarms from *Apis cerana javana* relative to *Apis mellifera*.

Managed *Apis mellifera* hive statistics are available and reasonably robust. Commercial beekeepers make up the great majority of hives and are well reported. Amateur beekeepers have a much lower registration rate but account for a much smaller number of hives. There is a reasonably high degree of confidence in estimating the number of managed hives in Australia. Registered hives in Australia in 2006–07 totalled 570,000. Not all states and territories require registration.

For density of feral *Apis mellifera* colonies in Australia there is a very large range of estimates as presented in Table 11. The estimates vary according to climatic and vegetation conditions. Oldroyd (1998) found colony aggregations in small areas rather than random or organised dispersal of feral nest sites. A simple observation of these studies is that, as would be expected, wood lands, whether open or riparian, contain much larger concentrations of feral honeybee colonies than grasslands.

Table 11 Estimates of feral Apis mellifera hive-density – Australia

Location	Habitat	Area(ha)	Number of feral colonies	Colonies/ hectare
Cromer CP (SA)	open woodland	15	6	0.4
Scott CP (SA)	open woodland	9	1	0.1
Ngarkat CP (SA)	mallee - heath	3,600	4	0.001
Mt Rescue CP (SA)	mallee - heath	2,000	7	0.004
Flinders Chase NP (SA)	mallee - forest	200	45-80	0.2–0.4
Wyperfeld NP (Vic)	riparian woodland	35	27	0.77

Source: Paton

The data shown in Table 11 are estimates of the abundance of feral colonies in locations in SA and Victoria. The range of values represents annual fluctuations in numbers of colonies recorded in the study area. Note that in most cases only small areas have been systematically searched and densities calculated from those studies should be treated cautiously.

A selection of international studies of feral honeybee nest densities show a similar range but all have their own unique characteristics (Table 12). For example, in the US, a Californian study site was said to have a relatively poor number of nests due to a lack and dispersal of appropriate cavities for honeybee swarms to establish in. A New York State example showed there was a very high attrition rate of feral honeybee colonies during the winter in a forest due to severe cold and snow conditions.

Table 12 Estimates of feral Apis mellifera colony density – International

Location	Habitat	Area(ha)	Number of feral colonies	Colonies/ hectare
California	Mediterranean	24,800	164	0.07
New York	temperate forest	1,100	8	0.07
Costa Rica	open woodland	,1250	38	0.03

Source: Seeley, Wenner and Thorp

It would be extremely difficult, if not impossible, to measure the total number of feral bee colonies in Australia. As a means of determining the potential spread, density of hives and impacts of *Apis cerana javana* using a variable of total number of *Apis mellifera* hives in Australia would not be appropriate for measurement effects.

As an example of the density of *Apis cerana javana* hives, Father David Galvin, a leading Solomons Island beekeeper and ACIAR sponsored speaker to Apimondia 2007, has estimated that there are five nests per hectare on "disturbed grounds" on the island of Makira.

2 Sizes of hives

Managed hives in Australia can vary in size from 10,000 bees to 80,000 bees with an industry norm of 50,000 bees per hive. Feral bee colonies are generally acknowledged to be smaller with approximately 20,000 bees per colony, though varying in size from 10,000 to 40,000 bees.

There is very little information in the way of scientific evidence on the sizes of feral hives in Australia. However, there are studies from North America that generally confirm the Australian industry knowledge. From Paton there is:

> "...general information on the sizes of feral colonies of honeybees in North America, where feral colonies ranged in size from 10,000-30,000 bees, occupied nest cavities that ranged in volume from 15-80 L ... Feral colonies usually swarmed at least once per year ...For comparison, commercially-managed colonies in North America usually consisted of 20,000-60,000 bees, had hives with volumes of 125-250 L ...Survival was high and only about 25% of the colonies in commercial apiaries swarmed each year."

Apis cerana javana colonies are much smaller. The data from Cairns indicates that established nests have a mean and a median of less than 5,000 bees but a range of 600 to 9,000 in total per nest.

A study by Dyer and Seeley estimated the average size of *Apis cerana* colonies in Asia as comprising 8,000 bees.

The differing data sources show that *Apis cerana javana* colonies are generally much smaller than *Apis mellifera* colonies, with estimates ranging from one fifth to one third the size of a typical *Apis mellifera* colony.

3 Implications

As *Apis cerana javana* nests are much smaller on average than *Apis mellifera* hives, even allowing for the same number of bees in an area, there will be a greater number of nests. On the assumption of *Apis cerana javana* becoming endemic in Australian regions, there would be at least three times as many nests of *Apis cerana javana* compared to feral *Apis mellifera* nests in the regions where they have been replaced because of the smaller colony sizeThis does not take into account the likely short-term costs of very extensive swarm and nest numbers as it goes through the invasive stage. After the invasive stage it could be assumed that *Apis cerana javana* nest numbers will achieve an equilibrium with the availability of local resources (pollen, nectar and number of suitable cavities).

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Estimating the Potential Public Costs of the Asian Honey Bee Incursion

By Terry Ryan

Publication No. 10/026

The current Asian Honey Bee (AHB) incursion in Cairns is being managed by Biosecurity Queensland and has involved an investment of over $1 million, from initial detection in May 2007 up to 31 December 2009.

One of the crucial issues in developing a response to the Asian Honey Bee incursion in Cairns is determining the appropriate level of industry contributions towards the total cost. The proportion of the costs to be borne by industry can vary between 20 percent and 80 percent, dependent upon the benefit cost analysis. To ensure appropriate proportions of the response are paid it is necessary to identify the public benefits and costs as well as industry benefits and costs.

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Cover photo: *Apis cerana javana* workers. Courtesy Dr Denis Anderson, CSIRO Entomology

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