

***TAKING THE STING OUT OF THE EUROPEAN WASP***

**EUROPEAN WASP**  
**COMMUNITY IMPACT SURVEY**

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**October 2005**

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## **2.0 Executive Summary**

Dunkeld is located along the southern border of the Grampians National Park, approximately 30km east of Hamilton on the Glenelg Highway. Residents have expressed concern that a recent influx of an introduced pest -the European Wasp (*Vespula germanica*) - could jeopardise the growth and economic development of the Dunkeld region. As a result, a community-based project entitled "Taking the Sting out of the European Wasp" was established. The current survey was undertaken as a component of this umbrella project, and is funded by the Geoff and Helen Handbury Fellowship Program.

The objectives of the survey were to assess and quantify the impact of the European Wasp in Dunkeld across four key areas: feelings, lifestyle, eradication, and financial impact. In spite of the fact that the survey was conducted at the end of the wasp "off" season, results indicate that the European Wasp is of concern for a vast majority of Dunkeld residents. Furthermore, the presence of the European Wasp is negatively impacting upon the lifestyle of many residents of the Dunkeld community, with the wasp causing many people to modify their regular activities. In terms of eradication, most respondents stated that they had tried to eradicate wasps at some point in time. A majority of participants were successful in their attempts at eradication, with nest eradication being the most common method. When it came to what people wanted done about eradication, most suggested research into the most effective methods or employment of a designated person. At this point in time, however, there is not sufficient evidence to conclude that the European Wasp is having a negative effect from a financial perspective.

Given that the European Wasps do not seem to be having a significant impact from a financial point of view, it was recommended that any proposed actions be progressed only after undergoing a feasibility (i.e., cost-benefit) analysis. It was also recommended that a similar survey be undertaken to investigate the financial (and other) impact of European Wasps on local businesses. This would provide a holistic and representative assessment of the impact of European Wasps on the Dunkeld community. Nonetheless, any further action that is taken towards the control of European Wasps in Dunkeld should be a S.M.A.R.T. action. That is, it should be Sustainable, Measurable, Achievable, Realistic, and Time-oriented. Some suggestions for further action were given along these lines.

### **3.0 Background<sup>1</sup>**

Dunkeld is located along the southern border of the Grampians National Park, approximately 30km east of Hamilton on the Glenelg Highway. Supported by a wide and diverse range of primary production, new industries are developing, not the least being tourism. Local and state governments have provided significant funds in recent times for townscaping, in recognition of the role that the town plays as a tourist gateway to the Grampians National Park. Dunkeld is ideally situated to provide a picturesque base from which to explore and experience the:

- Grampians mountain ranges
- Volcanic trail at Penshurst
- Unique district wineries, and
- Southwest coast.

Residents have expressed concern that an introduced pest -the European Wasp (*Vespula germanica*) - could jeopardise the growth and economic development of the Dunkeld region. Twelve years ago there were allegedly few reported sightings of the European Wasp in Dunkeld. In the 12 years since, it is understood that European Wasp numbers have escalated to the point where they are having a significant effect on the everyday life of Dunkeld residents. As a result, a community-based project entitled "Taking the Sting out of the European Wasp" was established. The current survey was undertaken as a component of this umbrella project, and is funded by the Geoff and Helen Handbury Fellowship Program<sup>2</sup>.

Until this survey, no research into the European Wasp had been conducted in the Dunkeld region. Reports of wasp infestations were primarily anecdotal (word of mouth) with control of the pest occurring via small-scale measures such as fly surface spray and plastic bottle bait stations. Hence the current survey attempts to quantify the perceived impact of European Wasps in the Dunkeld community.

### **4.0 Objectives**

The current research has four key objectives in relation to quantifying the impact of European Wasps in the Dunkeld community. They are to assess:

- i. Feelings: concern, awareness and perceived magnitude of issue,
- ii. Lifestyle: the regular activities directly affected by the presence of the European Wasp and how they are affected,
- iii. Eradication: what residents have done by way of attempting to eradicate European Wasps and whether or not these attempts were successful,
- iv. Financial Impact: whether or not the presence of the European Wasp has caused residents any financial loss, and if so how much.

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<sup>1</sup> Components adapted from "Taking the Sting out of the European Wasp" project proposal by Lisa McIntyre (project manager) and Pru McAlpin (project coordinator).

<sup>2</sup> For more information about this program please visit the following web address:

<http://www.communitysustainability.info/assresearch/handbury.html>

## **5.0 Scope**

<b>In Scope</b>	<b>Out of Scope</b>
<ul style="list-style-type: none"><li>• Effect of European Wasps on Dunkeld residents and households in terms of lifestyle and financial factors.</li></ul>	Measuring the effect of European Wasps on: <ul style="list-style-type: none"><li>• Tourism</li><li>• Community groups</li><li>• Schools</li><li>• Industry</li><li>• Ecology</li></ul>
<ul style="list-style-type: none"><li>• Measure subjective elements such as level of concern, awareness, and perceived magnitude of wasp problem for the Dunkeld community.</li></ul>	
<ul style="list-style-type: none"><li>• Gauging community consensus on issues pertinent to eradication of the European Wasp.</li></ul>	
<ul style="list-style-type: none"><li>• Make recommendations for the future management of European Wasps in Dunkeld based upon results of the above dot points.</li></ul>	

## **6.0 Assumptions**

It was assumed that respondents know what European Wasps are (as distinct from bees and other wasp species).

## **7.0 Limitations**

The survey and subsequent report were completed working to tight deadlines. Despite setting out clear milestones from the outset, the delivery of surveys was delayed due to an administrative error on behalf of the contracted courier. The flow on effects of this initial delay meant that the surveys were distributed during the school holiday period. It is possible that the response rate and representativeness of respondents was negatively affected by this delay.

## **8.0 Methodology**

In consultation with the Dunkeld based project committee, researchers from RMIT University developed a survey to address the 5 key objectives (see Appendix A). The survey comprised 18 questions and included provision for general comments.

Surveys were distributed by post to each of the total 394 households in Dunkeld.<sup>3</sup> Because of the delay in distribution, each household was sent a follow up note informing them that the initial deadline for the return of surveys was extended. The eventual response rate was 25.8% ( $n=102$ ). 11 additional surveys were returned subsequent to the official closing date, but were not included as part of this analysis.

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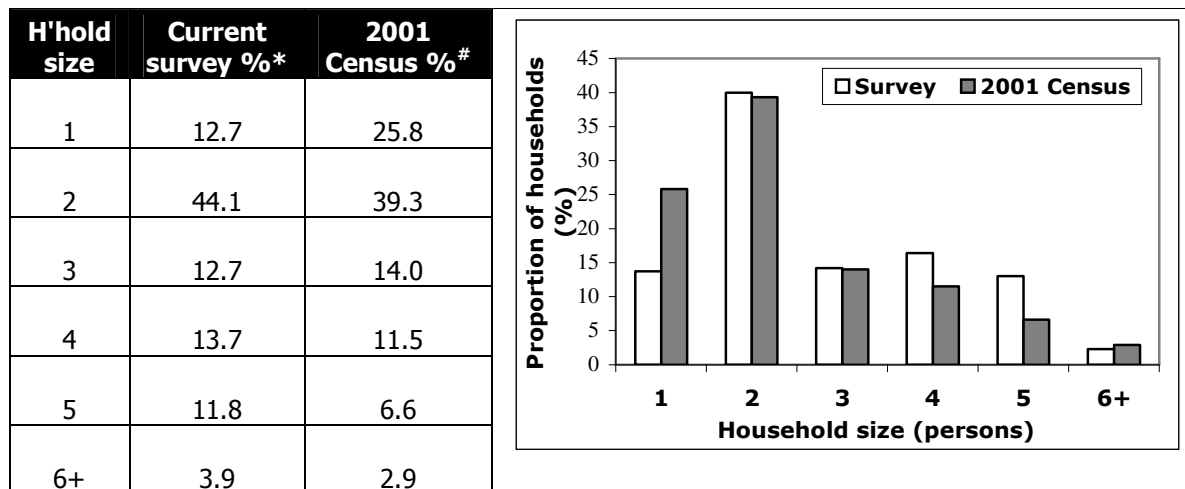
<sup>3</sup> The Dunkeld postmaster is a member of the project committee.

Data was collated and analysed by RMIT Master of Statistics (Business) student Katie Ballagh, under the supervision of Kaye Marion and Professor John Hearne.

## 9.0 Findings

### Overall

The figures below depict the relationship between the household size of survey respondents with that of the 2001 Australian Bureau of Statistics Census.<sup>4</sup> The data shows that one-person households were under-represented in the current sample, while 4 and 5 person households were slightly over-represented.



\*One respondent did not answer this question.

<sup>#</sup> N = 349.

A one sample Kolmogorov-Smirnov analysis revealed no significant differences between the two proportions. We can therefore be reasonably confident that the current sample is representative of the Dunkeld population (refer to Appendix B for calculations).

### Feelings

In response to the first question, almost all respondents expressed a moderate to high level of concern about the presence of the European Wasp.

Question 1	#	%
Not concerned	3	2.9
Somewhat concerned	37	36.3
Very concerned	61	59.8
Missing	1	1.0
TOTAL	102	100.0

<sup>4</sup> Source: ABS Census 2001 Basic Community Profile. Postcode no. 3294. Catalogue no. 2001.0. Table B32 HOUSEHOLD TYPE BY NUMBER OF PERSONS USUALLY RESIDENT(a).

Similarly for the second question, a majority of respondents acknowledged that they had become more aware of the European Wasp during the past 12 months.

<b>Question 2</b>	<b>#</b>	<b>%</b>
Yes - more aware	86	84.3
No - not more aware	15	14.7
Missing	1	1.0
TOTAL	102	100.0

Of the respondents that had become more aware of the European Wasp during the previous 12 months, most respondents said that their heightened awareness was due to direct contact with the wasp.

<b>Question 3</b>	<b>#</b>	<b>%*</b>
Direct contact	52	51.0
Increased sightings	47	46.0
Internet	2	1.7
Mail-out information	16	15.7
Local newsletter	43	42.2
Newspaper article	25	24.5
Other	13	12.7
TOTAL (unique respondents)	86	

\*Multiple responses were permitted for this item.

Where participants answered 'other' to question 3, "talk amongst locals" was a popular response. Children's work at school was also mentioned.

Again based upon the respondents who said that they had become more aware of the European Wasp during the previous 12 months, a majority stated that the presence of the European Wasp is becoming a bigger problem for the Dunkeld community.

<b>Question 4</b>	<b>#</b>	<b>%</b>
Not a problem	1	1.2
Bigger problem	70	81.4
Less problem	1	1.2
Same problem	14	16.3
Missing	0	0.0
TOTAL	86	100.0

## Lifestyle Factors

A majority of respondents stated that the European Wasp interfered with their regular activities.

<b>Question 5</b>	<b>#</b>	<b>%</b>
Yes - interfere	65	63.7
No - does not interfere	37	36.3
Missing	0	0.0
TOTAL	102	100.0

Most respondents stated that the European Wasp interfered with Gardening, closely followed by BBQ's and picnics.

<b>Question 6</b>	<b>#</b>	<b>%*</b>
Gardening	48	73.8
BBQ/Picnics	46	70.8
Work	18	27.7
Sport/Exercise	6	9.2
Domestic duties	15	23.1
Children's outdoor activities	23	35.4
Other	11	16.9
TOTAL (unique respondents)	65	

\*Multiple responses were permitted for this item.

When people answered 'Other' to question 6, common responses were those relating to the effect of the European Wasp on fruit trees (e.g., "destroying fruit") and household pets (e.g., "water for dogs left outside can be very harmful").

When respondents were asked how the European Wasp has interfered with their regular activities, most people stated that they had modified their activities.

<b>Question 7</b>	<b>#</b>	<b>%*</b>
Modified activity	47	72.3
Decreased activity	10	15.4
Stopped activity	3	4.6
Other	8	12.3
Blank	6	9.3
TOTAL (unique respondents)	65	

\*Multiple responses were permitted for this item.

Two of the people who stated 'other' said that the wasp has made them more diligent outdoors (e.g., "we have to be diligent with all outdoor activities"). Additionally, one respondent stated that they had to cover food, and another stated that they no longer give bones to their dogs.

## Eradication

When asked what should be done by way of eradication, most respondents stated that they wanted to conduct research to determine the most effective method.

<b>Question 8</b>	<b>#</b>	<b>%*</b>
Conduct research	72	70.6
Employ people to eradicate	63	61.8
Provide bounty for nests	25	24.5
Other	8	7.8
Missing	3	2.9
TOTAL (unique respondents)	102	

\*Multiple responses were permitted for this item.

Two people who answered 'Other' to this question mentioned that they would like to be educated as to how to eradicate wasps themselves (e.g., "show people how to eradicate them"). Other comments received were loosely related to a theme of developing a central wasp register (e.g., "have a designated person or body available to receive reports of wasps appearance or existence and advertise the existence of that person or body").

In response to Question 9, a majority of respondents stated that they had attempted to eradicate (or employed somebody to eradicate) European Wasps at some stage.

<b>Question 9</b>	<b>#</b>	<b>%</b>
Yes - attempted	66	64.7
No - not attempted	35	34.3
Missing	1	1.0
TOTAL	102	100.0

Of the respondents that stated they had attempted to eradicate wasp nests, most believed that their attempts to reduce the number of European Wasps were successful.

<b>Question 10</b>	<b>#</b>	<b>%</b>
Yes - reduced	54	81.8
No - did not reduce	11	16.7
Missing	1	1.5
TOTAL	66	100.0

Of the respondents that believed they had been successful in reducing the number of European Wasps, a majority stated that they had eradicated the wasp nests.

<b>Question 11</b>	<b>#</b>	<b>%*</b>
Traps	32	59.3
Sprays	13	24.1
Baits	9	16.7
Nests	41	76.0
Other	8	14.8
Missing	0	
TOTAL (unique respondents)	54	

\*Multiple responses were permitted for this item.

In terms of the amount of time spent attempting to eradicate European Wasps, most reported that they spent no more than 5 hours during the 2004/05 financial year.

<b>Question 12</b>	<b>#</b>	<b>%</b>
Less than/equal 5 hours	42	63.6
6 - 10 hours	16	24.2
11 - 20 hours	6	9.1
21 - 50 hours	1	1.5
51 - 100 hours	0	0.0
Greater than 100 hours	1	1.5
Missing	0	0.0
TOTAL	66	100.0

### **Financial Factors**

Most respondents stated that the European Wasp did not cause them any financial loss during the 2004/05 financial year.

<b>Question 13</b>	<b>#</b>	<b>%</b>
Yes - financial loss	20	19.6
No - no financial loss	81	79.4
Missing	1	1.0
TOTAL	102	100.0

Of those who stated that the European Wasp had caused them financial loss, a majority responded that the loss was the same as the 2003/04 financial year.

<b>Question 14</b>	<b>#</b>	<b>%</b>
More than 2003/04	6	30.0
Same as 2003/04	7	35.0
Less than 2003/04	4	20.0
Missing	3	15.0
TOTAL	20	100.0

A majority of respondents said that the European Wasp had cost them money during the 2004/05 financial year due to pest control expenses.

<b>Question 15</b>	<b>#</b>	<b>%*</b>
Pest control expenses	14	70.0
Damage to crops	9	45.0
Loss of clientele	0	0.0
Medical expenses (incl. Vet)	3	15.0
Damage to livestock	0	0.0
Cancel or reorganise events	1	5.0
Other	3	15.0
Missing	0	0.0
TOTAL (unique respondents)	20	

\*Multiple responses were permitted for this item.

One person who responded 'Other' stated that the European Wasp had caused financial loss by blocking a fire extinguisher.

In terms of the amount of financial loss, most respondents stated that the loss during 2004/05 was at most \$500.

<b>Question 16</b>	<b>#</b>	<b>%</b>
Less than/equal \$500	17	85
\$500 - \$999	1	5.0
\$1,000 - \$1,499	1	5.0
\$1,500 - \$1,999	0	0.0
\$2,000 - \$2,499	1	5.0
Greater than \$2,500	0	0.0
Missing	0	0.0
TOTAL	20	100.0

## **General comments**

There were some invaluable free-text comments provided at the end of the survey. Thirty-two respondents (31.4%) provided comments, which were largely anecdotal accounts of wasp sightings in and around the respondent's place of residence, for example "I haven't had any nests around the house, only queens looking to nest. Last summer I killed about 10 around verandah and doors".

Similar to comments provided under 'Eradication', several respondents mentioned that they would like to know how to control wasps themselves, for example "If wasps became a problem where we live I would like to know the right way to deal with them", and "Inform and eradicate - tell us how to get rid of them!" One person specifically requested that any efforts to control the European Wasp should be undertaken as an independent community initiative: "Do not involve any Government Department in eradication or administration. If you/we do, nothing will happen".

Reassuringly there were also some comments of praise for the project, such as "Very glad you are taking an interest thanks!!" "Keep up the good work", and "The *Taking the Sting Out of the European Wasp* project has been very worthwhile and informative and involving the children from the Dunkeld consolidated school was an excellent idea!".

## **10.0 Discussion and conclusion**

In spite of the fact that this survey was conducted at the end of the wasp "off" season, results indicate that the European Wasp is of concern for a vast majority of Dunkeld residents. Most respondents had become more aware of the wasp during the previous year, with the Local Newsletter being the highest reason outside of increased sightings and direct contact.

A majority of respondents also stated that the presence of the European Wasp had interfered with their regular activities, predominately gardening and BBQ's/Picnics. Most people said that their regular activities had to be modified due to the presence of the wasp.

In terms of eradication, most respondents stated that they had tried to eradicate wasps at some point in time. A majority of participants were successful in their attempts at eradication, with nest eradication being the most common method. When it came to what people wanted done about eradication, most suggested research into the most effective methods or employment of a designated person.

The European Wasp did not cause many respondents financial loss during the 2004/05 financial year. Where the wasp did cause financial loss, the costs were mostly low (less than \$500 per year), with pest control expenses causing the biggest outlay. This equates to an average loss of between \$50 and \$80 per household during the 2004/05 financial year (an estimated total of between \$20,000 and \$33,000 for the region). It is important to note here that these estimates do not take into account the time spent by individuals attempting to eradicate wasps at their place of residence.

In summary, results of the current survey suggest that Dunkeld residents are at least somewhat concerned about the presence of the European Wasp. Furthermore, the presence of the

European Wasp is impacting negatively upon the lifestyle of many Dunkeld residents. At this point in time, however, there is not sufficient evidence to conclude that the European Wasp is having a substantially negative effect from a financial perspective.

### **11.0 Recommendations**

Given that the European Wasps do not seem to be having a considerable impact on Dunkeld households from a financial point of view, it is recommended that any proposed actions be progressed only after undergoing a feasibility (i.e., cost-benefit) analysis. For example, to employ somebody to eradicate wasp nests or conduct further research (as suggested by most respondents) is likely to cost more per year than the effect of the wasps themselves. In this regard it would be beneficial to adapt the current survey to investigate the financial (and other) impact of European Wasps on local businesses. This would then provide a holistic and representative assessment of financial impact.

Any further action that is taken towards the control of European Wasps in the Dunkeld region should follow the SMART principle. That is, it should be:

**S**ustainable  
**M**easurable  
**A**chievable  
**R**ealistic  
**T**ime-oriented

For example, an action to 'raise awareness' is not SMART, as it is difficult to measure. An action to keep a central register of wasp nest sightings, however, is SMART. Other SMART ideas based upon current survey results include:

- Leveraging off research into eradication techniques that has already been conducted by other (reputable) sources. See links on the survey website for examples, or go to: <http://www.st.rmit.edu.au/WaspSurvey/otherstudies.doc>
- Developing wasp traps as part of school science projects.
- A series of monthly community workshops/information sessions facilitated by an independent European Wasp expert (from the CSIRO, for example). Sessions could be held at the beginning of each wasp season and cover topics such as identifying and eradicating wasp nests, preventative measures, and first aid advice. The Local Newsletter would be an appropriate place to advertise such events, as it seems to have high readership.

In closing, general education about the European Wasp is imperative to ensure that Dunkeld residents feel empowered to control the pests themselves. Whilst getting to the source of the wasp infestation is the ideal solution, in the short-term steps need to be taken to address the high level of concern felt by the Dunkeld community. It is hoped that the suggestions given above might go some way to addressing this concern and subsequently improve the lifestyle of Dunkeld residents.

## **12.0 Appendix A - Survey**

September 2005

### **EUROPEAN WASP COMMUNITY IMPACT SURVEY**

RMIT University invites you to participate in a survey to determine the affect of European Wasps on the Dunkeld region. The study is supported by the Helen and Geoff Handbury Fellowship Program: a fund dedicated to the investigation of social, environmental, educational and economic issues in the Southern Grampians region and surrounds.

To participate in this research you are required to complete a survey questionnaire. The survey contains 18 questions and it is anticipated that the questionnaire will take approximately 10 minutes to complete.

The data collected in this survey will not be used for any purpose other than those relating to the project objectives. This is an anonymous survey and you will not be required to reveal your identity at any stage. Responses are entirely confidential, and results will be presented in such a way that no individual responses can be identified. If you do not feel comfortable participating in the study, you are free to withdraw at any stage. Incomplete questionnaires will be destroyed. Completed questionnaires will be securely stored, and accessible only to the researchers named below.

Should you require further information about this research, or have any concerns about the manner in which this study is being conducted, please do not hesitate to contact Ms. Kaye Marion (RMIT University) on the details provided below. On conclusion of the study, results will be collated and analysed by Ms. Katie Ballagh (RMIT University) and forwarded to Ms. Pru McAlpin (Project Coordinator). For those interested, results of the study will be made available from the 7<sup>th</sup> of October 2005 at the following internet address:

**[www.st.rmit.edu.au/WaspSurvey](http://www.st.rmit.edu.au/WaspSurvey)**.

Thank you for your anticipated cooperation.

Yours Sincerely,

**Prof. John Hearne (RMIT University)**  
**Principal Investigator**  
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**Ms. Pru McAlpin**  
**Project Coordinator**  
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**Ms. Kaye Marion (RMIT University)**  
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**Ms. Katie Ballagh (RMIT University)**  
**Master of Statistics (Business) Student**  
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## **SECTION 1 – FEELINGS ABOUT THE EUROPEAN WASP**

### **1. Which of these statements best describes how you feel about the European Wasp (EW)?**

*(Please tick one)*

- I am not at all concerned about the EW
- I am somewhat concerned about the EW
- I am very concerned about the EW

### **2. Would you say that you have become more aware of the European Wasp during the previous 12 months?**

*(Please tick one)*

- Yes (proceed to next question)
- No (proceed to section 2)

### **3. What has made you become more aware of the European Wasp during the previous 12 months (EW)?**

*(Tick all that apply)*

- Direct contact with EW
- Increased sightings of EW
- Internet
- Mail-out information
- Local newsletter
- Newspaper article
- Other (please specify) \_\_\_\_\_

### **4. Overall, would you say that the European Wasp:**

*(Please tick one)*

- Is not a problem for the Dunkeld community?
- Is becoming a bigger problem for the Dunkeld community?
- Is becoming less of a problem for the Dunkeld community?
- Is about the same problem for the Dunkeld community as it always has been?

## **SECTION 2 – LIFESTYLE FACTORS**

### **5. Does the European Wasp interfere with any of your regular activities? *(Please tick one)***

- Yes (proceed to next question)
- No (proceed to section 3)

**6. Which of your regular activities does the European Wasp interfere with?**

*(Tick all that apply)*

- Gardening                       BBQ/Picnics                       Work
- Sport/exercise                       Domestic duties                       Children's outdoor activities
- Other (please specify) \_\_\_\_\_

**7. How has the European Wasp interfered with your regular activities?**

*(Tick all that apply)*

- Modified activity                       Decreased activity                       Stopped activity
- Other (please specify) \_\_\_\_\_

**SECTION 3 – ERADICATION**

**8. In relation to the eradication European Wasps, do you think that funding should be provided to:**

*(Tick all that apply)*

- Conduct research to determine the most effective method of eradication?
- Employ people to eradicate European Wasp nests?
- Provide a bounty to people who eradicate European Wasp nests?
- Other (please specify) \_\_\_\_\_

**9. Have you ever attempted to eradicate European Wasps OR have you ever enlisted the services of somebody else to help you eradicate European Wasps?**

*(Please tick one)*

- Yes (proceed to next question)       No (proceed to section 4)

**10. Did the attempts at eradication reduce the number of European Wasps?**

*(Please tick one)*

- Yes                                       No

**11. Which method(s) were used in the attempts to eradicate the number of European Wasps?**

*(Tick all that apply)*

- Traps                       Sprays                       Baits  
 Nest eradication             Other (please specify) \_\_\_\_\_

**12. During the 2004/05 financial year, approximately how much time was spent attempting to eradicate European Wasps?**

*(Please tick one)*

- Less than 5 hours             6 - 10 hours             11 - 20 hours  
 21 – 50 hours             51 – 100 hours             Greater than 100 hours

**SECTION 4 – FINANCIAL FACTORS**

**13. Did the European Wasp cause you any financial loss during the 2004/05 financial year?**

*(Please tick one)*

- Yes (proceed to next question)     No (proceed to section 5)

**14. Compared to the 2003/04 financial year, was the financial loss you experienced during the 2004/05 financial year:**

*(Please tick one)*

- More than the 03/04 financial year (Proceed to next question)  
 The same as the 03/04 financial year (Proceed to section 5)  
 Less than the 03/04 financial year (Proceed to section 5)

**15. How did the European Wasp cause you financial loss during the 2004/05 financial year?**

*(Tick all that apply)*

- Pest control expenses                       Medical expenses  
    (Including tracking and eradicating)      (Including veterinary)  
 Damage to crops                               Damage to livestock  
 Loss of clientele                               Cancellation or re-organisation of events  
 Other (please specify) \_\_\_\_\_

**16. Keeping in mind the responses you gave to Q.15 (above), please provide an estimate of how much money the European Wasp has cost you during the 2004/05 financial year:**

*(Please tick one)*

- Less than \$500       \$500 - \$999       \$1,000 - \$1,499  
 \$1,500 - \$1,999       \$2,000 - \$2,499       Greater than \$2,500

**SECTION 5 – DEMOGRAPHICS**

**17. In relation to the Dunkeld GPO, where do you live?**

*(Please tick one)*

- North (towards Halls Gap)  
 East (towards Ballarat)  
 West (towards Hamilton)  
 South (towards Warrnambool)

**18. How many persons are usually resident in your household?**

*(Please tick one)*

- One                       Two                       Three  
 Four                       Five                       Six or more

**General Comments**

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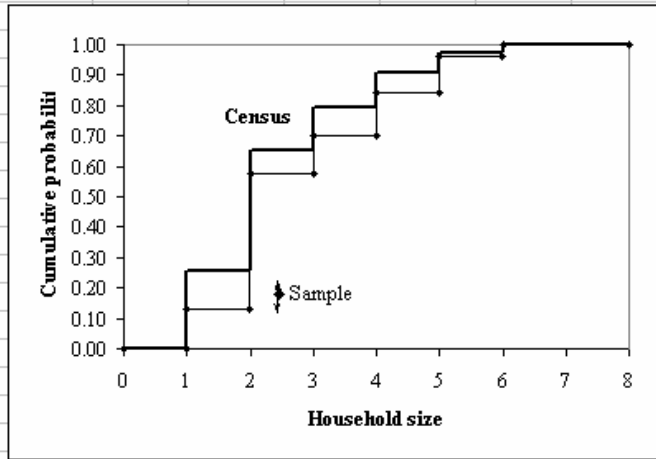
**THANK-YOU FOR YOUR TIME**

Please place your survey in the reply paid envelope provided and post by 21<sup>ST</sup> September 2005.

For more information about the European Wasp, please visit the website:  
[www.st.rmit.edu.au/WaspSurvey](http://www.st.rmit.edu.au/WaspSurvey)

**Appendix B - Household size - Supplied by Ms. Kaye Marion (RMIT University)**

	A	B	C	D	E	F	G	H	I	J	K	L
1	A slightly lower proportion of one person households responded to the survey than are in the population but the difference is not statistically significant. So this gives us some degree of confidence that the sample is representative of the population.											
2												
3												
4												
5	<b>Household size</b>	<b>Sample</b>	<b>Census</b>	<b>Max Distance</b>								
6	0	0.00	0									
7	0.99999	0.00	0		<b>p-value &gt;</b>							
8	1	0.13	0.26	0.13	0.10							
9	1.99999	0.13	0.26									
10	2	0.57	0.65	0.08								
11	2.99999	0.57	0.65									
12	3	0.70	0.79	0.09								
13	3.99999	0.70	0.79									
14	4	0.84	0.91	0.06								
15	4.99999	0.84	0.91									
16	5	0.96	0.97	0.01								
17	5.99999	0.96	0.97									
18	6	1.00	1.00									
19	8	1.00	1.00									
20												
21	<b>n =</b>	<b>102</b>	<b>394</b>									
22												
23	<b>alpha =</b>	<b>0.1</b>	<b>0.05</b>	<b>0.025</b>	<b>0.01</b>	<b>0.005</b>	<b>0.0001</b>					
24	<b>c(alpha)</b>	<b>1.22</b>	<b>1.36</b>	<b>1.48</b>	<b>1.63</b>	<b>1.73</b>	<b>1.95</b>					
25	<b>Critical value =</b>	<b>0.13554</b>	<b>0.15109</b>	<b>0.16442</b>	<b>0.18108</b>	<b>0.19219</b>	<b>0.21663</b>					
26												



	A	B	C	D	E
5	<b>Household size</b>	<b>Sample</b>	<b>Census</b>	<b>Max Distance</b>	
6	0	0	0		
7	0.99999	=B6	=C6		<b>p-value &gt;</b>
8	1	0.128712871287129	0.258	=MAX(B8:C8)-MIN(B8:C8)	0.1
9	=1+A7	=B8	=C8		
10	2	0.574257425742574	0.651	=MAX(B10:C10)-MIN(B10:C10)	
11	=1+A9	=B10	=C10		
12	3	0.702970297029703	0.791	=MAX(B12:C12)-MIN(B12:C12)	
13	=1+A11	=B12	=C12		
14	4	0.841584158415842	0.906	=MAX(B14:C14)-MIN(B14:C14)	
15	=1+A13	=B14	=C14		
16	5	0.96039603960396	0.971	=MAX(B16:C16)-MIN(B16:C16)	
17	=1+A15	=B16	=C16		
18	6	1	1		
19	8	=B18	=C18		
20					
21	<b>n =</b>	<b>102</b>	<b>394</b>		
22					
23	<b>alpha =</b>	<b>0.1</b>			
24	<b>c(alpha)</b>	<b>1.22</b>			
25	<b>Critical value =</b>	<b>=B24*SQRT(((\$B\$21+\$C\$21)/(\$B\$21*\$C\$21)))</b>			
26					